

U.S. Trade and Development Agency



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Project Resource Guide



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Project Resource Guide

Introduction	1
TDA Success in the Region	1
Identifying and Developing Projects.....	3
Briefing Book Organization	4
Acknowledgements	4
Notes	5
Regional Overview	7
Introduction	7
Political and Economic Climate.....	7
Chemical, Petrochemical, and Refining Industries	8
Conclusion.....	9
Country Profile – Bulgaria.....	10
Project Profiles – Bulgaria	
LUKOIL Neftochim Refinery and Petrochemical Complex Modernization Project.....	13
NEOCHIM Energy Efficiency Project.....	17
NEOCHIM Mixed Fertilizers Project	20
Orgachim Energy Conservation Project.....	23
Country Profile – Croatia.....	25
Project Profiles – Croatia	
Rijeka Refinery Upgrading Project	29
Sisak Refinery Upgrading Project.....	32
Sisak Refinery Soil Remediation Project.....	35
Country Profile – Czech Republic	38
Project Profiles – Czech Republic	
Unipetrol Spolana Cyclohexane/Cyclohexanone/Caprolactam Unit	41
Chemopetrol Ethylbenzene Production Plant	43
Chemopetrol C5 Treatment Project	45
Chemopetrol Pyrotol Unit/Aromatics Expansion	48
Kaucuk SBR Lattices Production Plant	51
Unipetrol / Kaucuk HIPS Unit Expansion Project.....	54



Project Resource Guide

Kaucuk Solution Styrene-Butadiene Rubbers	57
Country Profile – Hungary	60
Project Profiles – Hungary	
TVK Wastewater Treatment Project	63
TVK Polyethylene Plant Expansion Project	66
Country Profile – Poland.....	69
Project Profiles – Poland	
Zachem Chlorine Capacity Expansion Project.....	72
Zachem Phosgene, Epichlorohydrin and Allyl Chloride Derivatives	75
Kedzierzyn Nitric Acid and Neutralization Plant Project	78
Kedzierzyn Oxo Aldehyde and Oxo Alcohol Derivatives Project.....	81
Kedzierzyn Methanol Plant Project	84
Rokita Propylene Oxide Capacity Expansion Project.....	87
Dwory Polystyrene Conversion Equipment.....	90
Dwory Solution SBR and Latex Capacity Expansion Project	93
Country Profile – Romania	96
Project Profiles – Romania	
Rompetrol VEGA Refinery’s Soil and Groundwater Remediation Projects	100
Rompetrol VEGA Refinery Upgrading Project	104
Rompetrol Petromidia Petrochemical Upgrading Project.....	107
Rompetrol Petromidia Refinery In-Line Blending Project	110
Petrom Petrochemical Plant Expansion	113
Petrom Delayed Coker and Calciner Project.....	116
Petrom New Alkylation Unit	119
Petrom Acrylonitrile Unit Upgrading Project	122
Country Profile – Slovakia	125
Slovnaft and its Cooperation with TDA.....	128
Project Profiles – Slovakia	
Slovnaft Aromatics Project	133
Slovnaft Steam Cracker Revamp	135



Project Resource Guide

Slovnaft Polyethylene Project	137
Slovnaft Polypropylene Project.....	139
Plastika Nitra Expansion and Modernization	142
Chemolak Coil Coating Technology.....	145
Appendix I.....	147



Project Resource Guide

Chemical, Petrochemical, and Refining in Central and Eastern Europe

Owners, operators and sponsors of chemical, petrochemical, and refining projects from seven (7) Central and Eastern European countries: Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, and Slovakia will present over 35 projects at this conference. U.S. companies will have an opportunity to meet with over 30 industry and government executives from these countries to discuss these upcoming projects, and identify new opportunities to work together.

Lower production costs in Central and Eastern European countries have led to the increased export of chemicals, petrochemicals, and refined products—creating a need for increased production and plant expansion. At the same time, these Central and Eastern European countries are raising their pollution-control and product standards to meet those of the European Union (EU). This requires the modernization of old facilities and installation of clean and efficient new technologies.

As the countries of Central and Eastern Europe aim toward EU accession, these industries will be facing stiff competition from other European chemical and petrochemical producers and refiners. These market pressures combined with lower labor and feedstock costs are aiding the development and creation of chemical, petrochemical and refining industries that are expected to become important players on the international market.

The conference will highlight a number of large projects in the chemical, petrochemical, and refining industries. These projects are sponsored by established companies and range from an estimated total cost of \$4,000,000 to over \$350,000,000. These projects are

TDA Success in the Region

Since the early 1990s, the U.S. Trade and Development Agency (TDA) has been providing feasibility grants for chemical, petrochemical and refining projects in Central and Eastern Europe. The initial requests were generally for upgrading or modernizing refineries. In recent years, not only have the number of grant requests increased, but they have also included funding requests for feasibility studies, definitional missions, and other activities in support of chemical and petrochemical projects.

TDA's grants for feasibility studies and funding of other activities in this region have led to successful implementation of many projects – some of which will be presented at this conference. The three (3) following examples typify TDA's success stories.

MOL Refinery Modernization

Since the late 1990s, modernization of three (3) petroleum refineries in Hungary has led to the export of U.S. goods and services valued at over \$13,000,000. This value is expected to increase as modernization efforts are scheduled to continue through 2005. Foster Wheeler, Chevron, and Honeywell to have supplied engineering services, process licensing, and/or equipment for these refineries.



Project Resource Guide

selected to be featured in this Project Resource Guide because they either are in early planning stages and require feasibility assessments, or EPC or equipment bid packages are about to be issued. Sponsors of some of these projects are seeking joint venture partners, technology licensors, or equipment suppliers to partner with for export of technology or machinery. Projects included are:

New Projects: to meet EU motor fuel standards for 2005.

New Petrochemical Projects: Ethylbenzene, Polypropylene, Benzene Derivatives, Polyethylene Terephthalate, Cyclohexane, Cyclohexanone, Caprolactam, C5 Treatment, SBR Plants, plant for production of dyes, detergents, and cosmetics, and a PET plant.

New Refinery Projects: Alkylation units, Calcining units, In-line product blending systems, Hydrocrackers, hydrogen plant, sulfur plant, HDS unit, MHC, Amine units.

Petrochemical Expansion and Modernization Projects: Polyethylene plant expansion, SBR Lattices plant expansion, Ethylene unit capacity expansion, Benzene capacity expansion, Caprolactam and polyacetal plant expansion, Acrylonitrile unit revamping, HDPE plant expansion, DMT plant modernization.

Chemical Projects: Fertilizer plant expansion, chlorine plant modernization and expansion, syn-gas modernization, new methanol plant, propylene oxide plant modernization and expansion, caprolactam plant expansion and modernization.

Energy Efficiency and Environmental Projects: Waste heat recovery, cogeneration, reconstruction of underground piping, soil

In 1990, TDA funded a feasibility study for the modernization and expansion of these refineries. The study assessed the refineries' modernization needs for meeting future demands for environmentally acceptable unleaded gasoline and low-sulfur fuel oil. The primary contractor was Foster Wheeler International and this work was completed in 1992. TDA approved funding for an additional scope of work on the study in 1993. The new scope of work consisted of a reevaluation of investment costs based on MOL's more recent data and developing a time-phased refineries' investments plan. This work was completed in 1993. TDA's total grant amounts for these studies was \$560,000.

Slovnaft Refinery Modernization:

To date, this effort in Slovakia has led to the export of U.S. services, technology, and equipment valued at over \$20,000,000. UOP, ABB Lummus Global, and STRATCO have entered into process licensing agreements with Slovnaft. Fluor Daniel, Raytheon and Honeywell have formed a joint venture to provide Slovnaft with engineering, construction, and procurement (EPC) services.

In 1992, TDA approved funding of \$314,000 for a feasibility study to assess the modernization of the Slovnaft Refinery. The primary contractor was Bechtel International and the feasibility study was completed in 1994. These efforts have also resulted in project specific activities that are currently at various stages of development. Two of these projects — a new Polypropylene Project and an Ethylene Modernization Project, are described in



Project Resource Guide

remediation, wastewater treatment, contaminated ground water treatment.

Those projects that are at early planning stages but are well defined, have a high potential for export of U.S. technology, equipment and services, meet a potential market need, and have a high likelihood of obtaining financing were recommended to be considered by TDA for feasibility grants. Grant Agreements for some of these projects are anticipated to be executed by TDA and project sponsors during the course of the conference. Projects that are at very early planning stages, and not ready for a detailed feasibility study, but could eventually present an opportunity for export of U.S. technology, equipment and services are recommended to be considered by TDA for technical support — to introduce project sponsors to U.S. technologies and technology suppliers.

Identifying and Developing Projects

Princeton Energy Resources International, LLC (PERI), a consulting and engineering firm, and INTRATECH inc., a consulting firm, were retained by TDA to identify, characterize, and assess the viability of the projects presented in this guide. The approach included a review of previously funded projects and assessment of their current status and identification of new projects. PERI and INTRATECH inc. explored potential projects with the project sponsors to determine *their priority* and likelihood that the projects could *attract financing* and be completed within planned schedule and budget.

PERI and INTRATECH inc. requested project sponsors and owners provide certain information regarding each project. This information was initially screened to identify projects meriting further consideration.

detail in this Project Resource Guide. These projects present additional export opportunities for U.S. firms.

Chemopetrol's HDPE Project:

This project will result in over \$40,000,000 of revenue from sales of technology (including licensing fees) and equipment for U.S. firms. The website for the Chemicals Industry reports "Union Carbide partly merged its operations with Exxon to create a technology joint venture called Univation Technologies." The joint venture provided the process technology for the HDPE plant for the first time in Eastern Europe. Chemopetrol has also reported planning to expand plant capacity from 200 metric tons per year to 300 metric tons, adding potential revenue sources for the U.S. firms.

This project was identified as a suitable project for TDA's feasibility funding during a definitional mission to the Czech Republic in 1996 and Chemopetrol, an affiliate of Unipetrol received a \$300,000 grant for the a feasibility study. Union Carbide Polyolefins Development Company was selected by Chemopetrol to conduct the study.



Project Resource Guide

Selected projects were then reviewed with the project sponsors and a team visited the project sites to collect additional information. The available information was then used to determine project viability. PERI and INTRATECH inc. also assisted project sponsors in preparing project profiles for inclusion in this guide and presentation at the Central and Eastern Europe Chemicals Conference scheduled to be held on November 18- 20, 2001 in New Orleans, Louisiana. Each project profile includes the following:

- Sponsor's corporate history;
- Technical and commercial description of the project;
- Assessment of feedstocks availability;
- Assessment of market potential for the products;
- Budget level cost estimates;
- Financing strategy; and
- Assessment of potential for exported U.S. goods and services during project implementation.

The project profiles are designed to provide engineering, construction and financing firms, potential investors, and equipment and technology suppliers with sufficient technical, commercial, and economic information to make a preliminary assessment of their interest in the project.

Briefing Book Organization

This Project Resource Guide is available on both CD-ROM and in hardcopy. Project Profiles are grouped by country and are presented following a brief Country Profile.

Acknowledgements

Project Sponsors and Owners

The PERI and INTRATECH inc. team wishes to express its deepest appreciation to project owners, sponsors, and developers in Central and Eastern Europe for their superb cooperation with the team prior to, during, and following the team visit to project sites. The project team also wishes to acknowledge the contribution of the project sponsors who submitted project descriptions, costs, financial data and other information that was used to compile Project Profiles.

U.S. Trade and Development Agency (TDA)

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U.S. Foreign Commercial Services (FCS)

The FCS provided valuable background information, and supported the team with contacts and logistics in the countries visited.

INTRATECH inc.

INTRATECH inc. provided invaluable support with identifying, assessing, and providing input for preparing Project Profiles for the projects in Czech Republic, Poland, and Slovakia. INTRATECH inc. also visited project sites and project sponsors in these countries. PERI's team would like to especially thank INTRATECH inc. for their contribution to the preparation of this Project Resource Guide.



Project Resource Guide

Others

Many information sources were used to develop background information for preparing this Project Resource Guide. In particular, the Country Profiles include information provided by the European Bank for Reconstruction and Development, The World Bank, and the U.S. Foreign Commercial Services.

Notes

Below is a listing of the abbreviations used throughout the Project Resource Guide.

Abbreviation	Meaning
ABS	Acrylonitrile butadiene styrene
BGN	Bulgarian currency unit
BOO	"Build, Own, Operate"
BOSD	Barrels of oil per standard day
bpd	Barrel per day
BR	Polybutadiene rubber
BTX	Benzene, toluene, xylene
C4, 5, 6 etc.	Hydrocarbon structures
C&E	Central and Eastern (Europe)
CEE	Central and Eastern Europe
CEFTA	Central European Free Trade Agreement
CEI	Central European Initiative
CEOG	CE Oil & Gas
CPN	Centralna Produktow Naftowysch
DADMAC	Diallyldimethylammonium
DCPD	Dicyclopentadiene
DCS	Distributed control system
DEPA	Danish Environmental Protection Agency
DFI	Direct foreign investment
DMT	Dimethylterephthalate
DT	Deutsche Telekom AG

Abbreviation	Meaning
EBRD	European Bank for Reconstruction and Development
EFPA	Environmental Fuel Project Apollo
EFTA	European Free Trade Agreement
EMU	European Monetary Unit
ENI	Ente Nazionale Idrocarburi (Italy)
EPC	Engineering, Procurement, Construction
EPS	Expandable polystyrene
E-SBR	Emulsion styrene-butadiene rubber
ETOX	Ethylene oxide
EU	European Union
FCC	Fluidized catalytic cracking
FCCU	Fluid catalytic cracking unit
FCS	U.S. Foreign Commercial Services
FDI	Foreign direct investment
FSU	Former Soviet Union
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GPPS	General purpose polystyrene
HDPE	High-density polyethylene
HDS	Hydrodesulfurization
HIPS	High-impact polystyrene
HMWPE	High molecular weight polyethylene
HRK	Croatian currency unit
HUF	Hungarian Forint
IGCC	Integrated gasification combine cycle
IMF	International Monetary Fund



Project Resource Guide

Abbreviation	Meaning
INA	Industrija nafte d.d (National Oil Company of Croatia)
IRR	Internal rate of return
ISO	International Standards Organization
ISPA	Instrument for Structural Policies for Pre-Accession
KRASOL	Special liquid polystyrene
kt/y	Thousand tons/year
LDPE	Low-density polyethylene
LLDPE	Linear Low Density Polyethylene
LPG	Liquid propane gas
MAEG	Minimum acceptable environmental goals
MHC	Moderate pressure hydrocracker
MM	Millions
MOL	Hungarian Oil and Gas Public Limited Company
MSE	Millennium Science & Engineering, Inc.
MT	Metric tons
MTD	Metric tons per day
MTY	Metric tons per year
MW	Megawatt
NATO	North Atlantic Treaty Organization
NPG	Neopentyl glycol
NPV	Net present value
OECD	Organization for Economic Cooperation and Development
OGFA	Oil and Gas Framework Agreement
O&M	Operations and management
OPIC	Overseas Private Investment Corporation
PB	Polybutadiene
PE	Polyethylene

Abbreviation	Meaning
PERI	Princeton Energy Resources International
PET	Polyethylene terephthalate
PFO	Pyrolysis fuel oil
PHARE	Poland and Hungary Action for the Restructure of the Economy
PKN	Polski Koncern Naftowy
PP	Polypropylene
PVC	Polyvinyl chloride
REGENOX	Regenerative oxidation catalyst system
RTV	Room temperature vulcanized
SAA	Stability and Association Agreement
SAPARD	The Special Assistance Programme for Agriculture and Development
SBR	Styrene-butadiene rubber
SBS	Styrene-butadiene-styrene
SEZ	Special economic zones
SK	Slovak currency unit
S-SBR	Solution polymerized styrene-butadiene rubber
t/d	Metric tons per day
TDA	U.S. Trade and Development Agency
TDI	Toluene diisocyanate
TMP	Trimethylolpropane
TRCC	Deep conversion plant
VAT	Value added tax
VGO	Vergion Gas Oil
WTO	World Trade Organization
XPS	Extruded polystyrene
X-SBR	Carboxylated styrene-butadiene lattices



Project Resource Guide

Introduction

Central and Eastern European countries are undergoing significant industrial and economic reform and restructuring. Seven of these countries are the focus of this conference. They are:

- Bulgaria
- Croatia
- Czech Republic
- Hungary
- Poland
- Romania
- Slovakia

This section provides an overview of their political and economic climate as well as their chemical, petrochemical, and refining industries.

Political and Economic Climate

In general, the EU accession process shapes the transition to a market economy and the development of commercial rules and regulations in these countries. Poland and Hungary signed framework agreements for Central and Eastern European (CEE) countries to prepare for membership in the EU in 1991. Bulgaria and Romania signed this agreement in 1993. The Czech Republic, Hungary and Poland were invited to begin accession negotiations in 1996. Bulgaria, Romania, and Slovakia were invited in 1999, and Croatia was invited in 2000.

These countries must meet a series of requirements, generally referred to as the “Copenhagen Criteria,” before they can become a full member of the EU. These requirements include:

- Political Criteria – achieving stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities.
- Economic Criteria – establishing a functioning market economy, and the capacity to cope with competitive pressure and market forces within the EU.
- Administrative Criteria – demonstrating the ability to take on the obligations of membership, including adherence to the political, economic, and monetary goals of the EU.

Accession candidates must also bring their legislation into line with EU’s common body of law “*acquis communautaire*.” However, acceding to the EU does not guarantee inclusion in the European Monetary Union (EMU). To become a member of the EMU, countries must meet four additional criteria, known as the Maastricht Convergence Criteria. They are:

- Inflation – a rate within 1.5% of the best performing EU countries in terms of price stability.
- Public Finance – absence of an excessive government deficit and debt.
- Exchange Rate Stability – observance of the normal margins of the exchange rate mechanism without severe devaluation for two (2) years.
- Long Term Interest Rates – a rate within 2% of the rates in the three countries with the lowest inflation rates.



Project Resource Guide

The timing and number of countries that will be admitted during various phases of the accession process is unclear. The most optimistic projections indicate that the first tier candidates (Czech Republic, Hungary, and Poland for the purposes of this briefing book and conference) could potentially enter the EU in 2004. In the meantime, the candidate countries, including those present at this conference, are focusing on implementing major political and economic reforms, such as industry restructuring and privatization, and developing viable legal structures, contract laws, regulatory systems, capital markets, and trade policies for meeting the Copenhagen Criteria. They are also implementing specific legislative and regulatory policies to conform to stringent EU environmental, health, and safety regulations and product standards (standards for motor fuel are presented in Appendix I).

Each country has a unique socioeconomic context, causing variation in the transition process and different privatization schemes. Reform has continued, even in the face of economic decline, decreased production, and loss of traditional markets. These countries have recently begun to recover economically mostly due to the infusion of foreign capital and increased exports, as well as domestic demand. The petroleum sector, particularly the petroleum retail sector, has become one of the fastest growing sectors in some of these countries, partly due to the introduction of foreign competition and investment.

EU membership means that the chemical, petrochemical and petroleum refining industries in these countries will face stiff competition from the present EU chemical, petrochemical, and refining industries. However, they are provided an opportunity to expand their markets in the short term, by taking advantage of their lower labor costs and

by maximizing utilization of available capacity; and in the long term by improving operational efficiency.

Chemical, Petrochemical, and Refining Industries

There are a number of issues facing the chemical, petrochemical, and refining industries of Central and Eastern Europe. First, these countries, with the exception of Romania, produce very little oil or natural gas. They are dependent on imports, mainly from Russia, to meet their energy needs as well as the demand of their chemical and petrochemical industries for raw material and primary hydrocarbon building blocks.

Another major issue is that the chemical, petrochemical, and refining industries in these countries are generally in need of updating and upgrading. They suffer from decades of neglect and have outdated, inefficient, and energy intensive technologies that lack sufficient environmental safeguards.

The pre-EU accession period has provided the chemical industry with a window of opportunity to boost its exports to Western Europe, by taking advantage of their lower labor costs and attracting foreign investment. In the long term, these industries can, with some capital investment, take advantage of their existing excess capacity to compete in the EU market. Investment will be needed to improve production efficiency (or product yield), reduce energy consumption, and minimize pollution. Investments will also be required to remediate environmental damage.

Privatization efforts, along with increased competition, have led to a number of consolidations, mergers, cross border alliances among these industries. In the Czech Republic, Unipetrol has strengthened its



Project Resource Guide

position by acquiring Chemopetrol, Kaucuk, Paramo, and Ceska Rafinerska. The current privatization of Unipetrol has attracted an number of potential foreign investors including U.S., Russian, Austrian and Dutch interests. Slovnaft in Slovakia and MOL of Hungary recently formed a strategic alliance. In addition, MOL owns 32.9% share in TVK, Hungary's largest petrochemical producer, MOL is also reported to have an interest in acquiring a major refinery in Poland. LUKOIL, the largest oil producer in Russia, is also a majority shareholder in LUKOIL Neftochim in Bulgaria. LUKOIL also owns a refinery in Romania.

Similarly, Orgachim, a paint producer in Bulgaria, and Policolor of Romania, just across the border, are combining their resources to reduce operating costs and market their products.

Conclusion

Alliances, mergers, and acquisitions are aimed at a more effective market positioning to improve market shares domestically, regionally within Central and Eastern Europe, and eventually in Western Europe.

These developments have also created a significant opportunity for further cooperation among U.S. industry leaders and their counterparts in these countries, where U.S. technologies are prominent and often preferred.



GDP (in US\$ Billion)	12.0
GDP Growth (est.)	5%
GDP Per Capita (US\$)	1,463
Population (Million)	8.2
Credit Rating	B+

Source: European Bank for Reconstruction and Development & The World Bank

Executive Summary

Bulgaria, one of the most stable countries in the region, has experienced real economic growth in every year since 1998. Inflation has been single digit or close to single digit. Corporate and income taxes have been reduced and are among the lowest in Central and Eastern Europe.

Bulgaria was invited to begin EU membership negotiations in 2000 and, to date, over a quarter of the required agreements are closed. In anticipation of the country's eventual full membership in the EU and in order to be

competitive in an open market, the Bulgarian chemical, petrochemical, and refining sectors face a major effort to eliminate past environmental neglects, to improve product quality, and increase energy and operational efficiency. These sectors require hundreds of millions of dollars of capital infusion and new technologies to overcome many years of neglect and the inefficiencies of a centrally planned economy.

Despite privatization of state owned enterprises and steps taken to promote financial discipline, the restructuring of these enterprises, particularly smaller private firms, has been slow. Restructuring is impeded by the lack of new commercial credit and by insider ownership. In addition, low labor productivity, an underdeveloped capital market, and weak bankruptcy laws limit the mechanism for disciplining and removing ineffective management.

Political and Economic Climate

In 1996 and 1997, the early transition period that began with the close of the communist era ended. Parliament was dissolved two years ahead of schedule. Elections in 1997 resulted in the formation of a clear reformist majority government for the first time since the start of transition. The new government took radical measures toward economic stabilization and reforms. In a relatively short time, the government achieved economic stabilization, passed important legislation, and initiated economic reform in many areas. The EBRD reports that despite an unfavorable external environment, including the Russian crises in 1998 and Kosovo in 1999, Bulgaria has achieved macro-economic stability and a strong economic recovery. Foreign exchange reserves have recovered sharply, inflation has stayed moderate, important progress has been



made in privatization, and foreign investment has increased.

The economy grew by about 5% in 2000. There was rapid growth in the output of services and industry, while the agricultural sector performed poorly—impacting the fertilizer industry—due to a summer drought. Economic growth in 2001 has slowed due to a general economic slump in Europe and reduced price competitiveness of Bulgarian goods, caused partly by an appreciation of the Euro-Lev exchange rate. Assuming the U.S. economy continues to slow down, the Lev will continue to appreciate with the Euro against the U.S. Dollar.

The inflation rate increased from 6.2% in 1999 to 11.4% in 2000 and is forecast to drop to 4% by the end of 2001.

Investment Climate

Foreign direct investment (FDI) in Bulgaria has increased sharply since 1997. Net FDI was over US\$2.4 billion for the period 1998–2000, with petroleum and chemicals accounting for over 11% of the total. The U.S., with over US\$235.5 million, was the sixth largest investor in Bulgaria during the same time period. Germany with over US\$498 million, Italy with about US\$413 million, and Greece with \$328 million in investment are the three top-ranking investors in Bulgaria. About 90% of foreign investment came from 28 large investors. The largest investments were made in the financial, trade and services, and chemical and petrochemical sectors. U.S. investment in Bulgaria is expected to increase in the coming years primarily due to continued privatization efforts in the banking, telecommunication, energy, transportation, water and wastewater sectors.

In recent years, the Bulgarian government has encouraged foreign investment by providing a more favorable regulatory environment. In 1999, Bulgaria liberalized its foreign currency exchange legislation. Currently, there are no restrictions on the transfer of investment related funds. Import of national and foreign exchange cash by resident and non-resident is free, while export of over BGN 20,000 (around US\$10,000) or its equivalent in foreign exchange requires a permit from the Bulgarian National Bank. Currently, acquisition of land by foreigners is still forbidden by law, but land ownership rules are anticipated to change. Bulgaria is also benefiting from three pre-accession investment instruments (PHARE, SAPARD, and ISPA) financed by the EU. The EU's PHARE finances environmental projects. The Special Assistance Programme for Agricultural and Development (SAPARD) supports a national agricultural and development plan and the Instrument for Structural Policies and for Pre-Accession (ISPA) provides funding for transportation structural projects in 2000–2006. In 2000–2002, the annual allocation for Bulgaria is roughly 100 million Euro from PHARE, 52 million Euro from SPARD, and between 82 to 125 million Euro from ISPA.

In 2000, the corporate tax rate was reduced from 25% to 20% for companies with taxable profits of greater than US\$26,300, while the tax rate for companies with lower taxable profits was reduced from 20% to 15%. This made the corporate tax rate in Bulgaria among the lowest in the region.

Bulgaria is a member of the World Trade Organization (WTO), a party to the Central European Free Trade Agreement (CEFTA) and has an Association Agreement with the EU. Bulgaria has liberalized trade in industrial and agricultural goods with other (Poland, the



Czech Republic, Hungary, Romania, Slovakia, and Slovenia) members of CEFTA. Exports to the EU are almost entirely duty free, making it Bulgaria's most important trading partner.

Among the EU countries, Germany, Italy, and Greece are Bulgaria's leading partners for both imports and exports. Turkey is also an important partner, especially for exports. Russia, however, accounts for the largest share of imports – mostly minerals, fuels, oil, and gas. Chemicals, plastics, and rubber account for more than 10% of imports each. On the export side, metallurgy, bulk-chemicals, and agricultural products are the most predominant sectors.

other countries in the Central and Eastern European region, as well as Western Europe, is expected as these markets are developed.

U.S. Presence

From 1998 to 2000, U.S. investment in Bulgaria amounted to US\$235 million. U.S. technologies are prominent, particularly in the refining and petrochemical sub-sectors. The estimated costs for upgrading and modernizing the chemical, petrochemical and refining complexes in Bulgaria can easily exceed US\$600 million, of which about US\$300 million is expected to be imported.

Sector Overview

The sector is privatized and the refining, petrochemical, and chemical industry enterprises (including fertilizer, paint and dye) are undergoing extensive restructuring. The major players in the sector include LUKOIL Neftochim (previously Neftochim) in refining and petrochemicals, Agropolychim and Neochim in fertilizer and inorganic chemicals, Solvay in specialty chemicals and plastics, and Orgachim in paint and dyes. Neftochim is the largest oil and petrochemical complex in the Balkans and its privatization brought about the largest foreign investment deal of 1999.

In general, the sector is utilizing 30% to 50% of its available capacity and requires substantial upgrading and modernization to reduce operating costs, which include raw materials, labor, and energy. This must be done in order to be competitive in an open and free market, and to meet the EU's product standards and environmental regulations.

The effort to increase utilization of the available capacity is based on an expected increase in both the domestic and export markets. However, strong competition from



LUKOIL Neftochim Refinery and Petrochemical Complex Modernization Project



Planned Additions / Expansions

- Refinery capacity expansion
 - Viskbreaker unit
 - Hydrocracker unit
 - Hydrogen plant
 - Sulfur plant
- Gasoline and Diesel fuel quality improvement
 - Ethylene plant
 - Polyethylene plant
 - Polypropylene plant

Project Summary

Sector	Refining and Petrochemical
Location	Bourgas, Bulgaria
Capital Required	\$500 million
Export Potential	\$150 - \$200 million
Project Sponsor	LUKOIL
TDA Funding	\$450,000
Project Status	Feasibility study underway

Project Discussion

Project Background

The LUKOIL Neftochim Refinery and Petrochemical Complex at Bourgas is Bulgaria's primary refinery and petrochemical production facility. The complex is composed of a 210,000 BOSD refinery and a petrochemical complex featuring over 30 production units, including base chemicals and polymer production units.

The refinery has a processing complex for the manufacture of a wide range of products such as gasoline, liquefied gas, jet and diesel fuel, heating oil, and bitumen.

The petrochemical plant can produce ethylene, benzol, toluene, phenol, and acetone. The polymer plant produces polyethylene, polypropylene, polyester, and latex. The complex is highly integrated to ensure the ability to react to market changes. The original facility was built in 1964 with various petrochemical facilities added during the 1960s and 1970s. Many of the units utilize U.S. or western European technologies.

Design Capacity

Total, (Crude Oil)	10.5 million MTY
Ethylene	400,000 MTY
Polyethylene	84,000 MTY
Polypropylene	75,000 MTY
Polyester	25,000 MTY
Polyacrylonitrile	25,000 MTY
Latex/Rubber Polymer	45,000 MTY

In 1999, JSC LUKOIL (LUKOIL) acquired a majority share of Bulgaria's government-owned Neftochim Refinery and Petrochemical Complex at Bourgas, forming LUKOIL Neftochim-Bourgas. As part of its acquisition,



LUKOIL Neftochim Refinery and Petrochemical Complex Modernization Project



LUKOIL has committed to invest over \$400 million in modernizing the facility.

Modernization Plan

At present, less than half of the crude oil feedstock is converted into valuable transportation fuels. The remaining residue is sold as high sulfur fuel oil, a low value product.

LUKOIL Neftochim's goal is to have a modern refinery that produces essentially all clean fuel products, and to increase the refinery throughput by converting high sulfur oil. The refinery is also looking at expanding capacity by installing facilities for the processing of high sulfur vacuum residue material from a LUKOIL-owned refinery in the Ukraine.

The planned study will examine several alternative configurations for the refinery modernization aimed at vacuum residue conversion. Simultaneously, it will examine the impact of expanding plant-operating capacity from 6.0 million MTY to 8.0 million MTY of crude and vacuum residue.

The petrochemical complex modernization will involve the de-bottlenecking of one of the ethylene units to produce added ethylene and propylene. These intermediates, in combination with increased aromatics production (as the result of increased refinery operating capacity), will enable the facility to expand petrochemical/polymer production. The final unit expansion or additions will be determined based on a planned supply and demand analyses of the petrochemical market in Europe, Russia, and Turkey.

The modernization program is being carried out in three phases. Phase one (1) has already started and includes:

- A 600,000 MTY catalytic reformer
- Integration of the crude unit with the vacuum unit
- FCC unit modernization
- A new computerized motor fuel loading system.

This phase is scheduled for completion in the years 2001 – 2003.

The second phase involves installation of the residue upgrading facility. This facility will be designed to convert most of the vacuum residue material to lighter and cleaner fuel products, primarily low sulfur fuel oil and diesel, and to reduce high sulfur fuel oil production. In addition to conversion and expansion of an existing FCCU pre-heater to a hydrocracker, this phase is expected to include the design and installation of:

- A vacuum residue hydrocracker,
- A Hydrogen plant, and
- A sulfur plant.

The third phase of the modernization program will focus on the petrochemical/polymer complex. The initial step in this phase will be the expansion of one of the ethylene units from 150,000 MTY to 200,000 MTY. Based on the market demand, both the polyethylene and polypropylene plants are also expected to be expanded. The TDA funded feasibility study will focus on the second phase and the initial step of the third phase of modernization.



LUKOIL Neftochim Refinery and Petrochemical Complex Modernization Project



Project Guidance Parameters

Project Costs

The modernization and residue upgrading of the refinery is estimated to have an initial cost of \$500 million, of which \$150-\$200 million is anticipated to be imported.

Known Initiatives

To date, LUKOIL has committed approximately \$80 million to modernize the refinery's existing catalyst reformer and isomerization units (Phase 1).

LUKOIL Neftochim has selected ABB Lummus Global to develop a master plan for the modernization of the facility. A feasibility study, funded by TDA and cost shared by ABB Lummus Global, is currently being carried out to evaluate various available options.

Modernization Schedule

LUKOIL has committed to investing over \$400 million over the next five years at the LUKOIL Neftochim facility.

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Phase 1	4 th	2002
Phase 2	4 th	2003
Phase 3	4 th	2005

Project Financing

LUKOIL Neftochim envision that financing could be arranged in part through the U.S. Ex-Im Bank by utilizing a Russian Oil and Gas Framework Agreement (OGFA) type arrangement. Under OGFA, the borrower

must be a privately controlled firm. LUKOIL Neftochim is owned by LUKOIL (58%), private enterprises or individuals (25%), and the Bulgarian Ministry of Industry (17 %).

Ex-Im Bank's support for local cost financing and its willingness to allow non-guaranteed lenders to share in the OGFA security umbrella could prove to be a sufficient inducement for lenders to provide 100% of the financing needed for the project.

Debt service and debt service reserve requirements are expected to be met by export revenue from LUKOIL's existing oil and refined product production and export.

U.S. Competitiveness

U.S. engineering firms, technology licensors, manufacturers and suppliers could compete for the sale of engineering services, refining and petrochemical technologies, equipment (e.g.; pressure vessels, pumps, compressors, heaters), high-alloy pipe and valves, instrumentation, computer based distributed control systems, and catalysts.

Conclusion

This project is a high priority for LUKOIL Neftochim and is important to further the development of Bulgaria's free market economy.

The project maximizes the use of existing facilities and infrastructure to produce high value and quality products for domestic use and export.

LUKOIL is one of the world's largest vertically integrated oil companies. It is the largest oil producer and one of the largest



LUKOIL Neftochim Refinery and Petrochemical Complex Modernization Project



refiners in Russia. It also has three refineries outside of Russia.

Key Contacts

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integrated fertilizer complex since 1951. In the 1980s, NEOCHIM commissioned a new ammonium nitrate unit and in the early 1990s shut down certain units to reduce environmental emissions. Today, NEOCHIM mainly produces ammonium nitrate, ammonia, formaldehyde and urea.

The company was privatized in 1999, with current ownership as follows (approximate percentages): EUROFERT SA – 40% Karimex Chemicals International SA – 14% and the remainder is owned by the Bulgarian State, various privatization funds and individuals. The State participation should be reduced to zero next year.

Planned Additions / Upgrades

- Small scale gas and steam turbines
- Reformers
- Air compressors
- Gas compressors

Design Capacity

Ammonium nitrate	630,000 MTY
Nitric acid	480,000 MTY
Ammonia	410,000 MTY
Formaldehyde	110,000 MTY
Sodium Nitrate	12,000 MTY
Sodium Nitrite	8,000 MTY
Ammonium Bicarbonate	6,000 MTY

Project Summary

Sector	Chemicals
Location	Dimitrovgrad, Bulgaria
Capital Required	\$20 million
Export Potential	\$15 million
Project Sponsor	NEOCHIM SA
TDA Funding	\$254,000
Project Status	RFP issued

Project Discussion

Project Background

NEOCHIM SA, with a current operational capacity of 630,000 MTY, is one of the Bulgaria's leading ammonium nitrate producers. NEOCHIM has operated an

NEOCHIM products are sold domestically and in Europe, the Middle East, and recently in the U.S. NEOCHIM exports a limited amount of ammonium nitrate to the U.S.

Although the major sections of NEOCHIM's fertilizer complex are less than 20 years old, a large amount of heat and steam is dissipated into the atmosphere due to the poor insulation design in the reforming and reactor stages of the ammonia production line. In addition, a large amount of steam and waste gases (200,000 m³/h) are emitted into the atmosphere during the summer months. NEOCHIM would like to assess the viability of upgrading and/or retrofitting various reactor systems in order to improve the plant's energy



efficiency and use the waste steam and gases for power generation.

Project Location

The plant is located on a 570-acre site in Dimitrovgrad, approximately 200 km east of Sofia, 45 km north of Kurdzhali, and 40 km south of Stara Zagora. The site is easily accessible by rail and road from major cities within Bulgaria and also from Turkey and Greece.

Scope of Feasibility Study

NEOCHIM received a grant in the amount of \$254,000 to conduct a feasibility study to assess the viability of capturing waste heat and gases for power generation. A plant audit will be conducted to analyze operations in detail and identify key plant areas requiring retrofits and upgrades. A plant audit will be carried out and detailed operating data will be collected over an extended period. This data will be analyzed to assess plant performance and identify plant bottlenecks, energy losses, equipment operating efficiency, and key areas of the plant requiring upgrades or retrofits to improve plant energy efficiency. Finally, the amount of available waste heat, steam, and synthetic gases will be identified, and the potential for their capture and the viability of their conversion to power in a small-scale cogeneration facility will be assessed.

Project Guidance Parameters

Project Costs

The plant retrofit, upgrading, and addition of a small cogeneration plant is reported to cost about \$20 million of which about \$15 million is anticipated to be the value of imported equipment and services.

Project Schedule

NEOCHIM is committed to reducing environmental emissions and improving plant operating efficiency and profitability. In order to maintain its market share and competitiveness, NEOCHIM also has to minimize operating costs. NEOCHIM plans to complete plant upgrades and retrofits at different stages during summer time plant shutdowns.

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	4 th	2001
Engineering and Construction		2003
Cogeneration Facility Start-up		2004

Project Financing

The project will be implemented in stages depending on availability of funds and the feasibility results.

U.S. Competitiveness

U.S. engineering firms, technology licensors, manufacturers and suppliers could compete for sale of engineering services, technologies, equipment (e.g., compressors, gas turbines), and catalysts.

Conclusion

NEOCHIM is committed to reducing environmental emissions and improving plant operating efficiency and profitability. In order to maintain its market share and competitiveness, NEOCHIM also has to minimize operating costs. This project will allow NEOCHIM to realize a substantial energy cost saving.



Key Contacts

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NEOCHIM Mixed Fertilizers Project



Planned Additions

- Manufacturing Facilities to produce mixed Fertilizers

Project Summary

Sector	Chemicals
Location	Dimitrovgrad, Bulgaria
Capital Required	\$80-140 million
Export Potential	\$24-42 million
Project Sponsor	Neochim
Project Status	Preplanning

Project Discussion

Project Background

NEOCHIM is a 50 year old company that produces a range of fertilizers and other products, including: ammonia, nitric acid, nitrous oxide, ammonium bicarbonate, ammonium nitrate, potassium nitrate, sodium nitrate and sodium nitrite.

The company was privatized in 1999, with current ownership as follows (approx percentages): EUROFERT SA – 40%, Karimex Chemicals International SA – 14% and the remainder is owned by the Bulgarian State, various privatization funds and individuals. The State participation should be reduced to zero next year.

NEOCHIM sells approximately 50% of its products domestically and the remainder is exported.

Company products are used in the following applications:

- Agricultural fertilizers
- Derivative chemicals & resins
- Concrete & cement additives
- Flocculants for mining
- Food & medical industries
- Metallurgy
- Glues for furniture manufacture
- Anti-friction materials for machinery
- Reinforced glass fibers
- Synthetic fibers
- Plastic electrical components
- Insulation
- Fungicides
- Explosives

Today, NEOCHIM mainly produces ammonium nitrate, ammonia, formaldehyde and urea.



Design Capacity	
Ammonium nitrate	630,000 MTY
Nitric acid	480,000 MTY
Ammonia	410,000 MTY
Formaldehyde	110,000 MTY
Sodium Nitrate	12,000 MTY
Sodium Nitrite	8,000 MTY
Ammonium Bicarbonate	6,000 MTY

Project Description

The company has identified an opportunity to market additional products for the domestic market. Excessive use of ammonium nitrate fertilizers in the past has resulted in high soil acidity and low crop yields in Bulgaria. This has created an opportunity for the production and sale of mixed fertilizers to increase potassium and calcium content in the soil.

NEOCHIM has excess ammonia production capacity that can be used to feed the new plant. This reduces overall capital costs and balances the company's ammonia production capacity with the overall plant needs. The project would require external funding as the company has insufficient cash flow from current operations.

The company believes that the domestic farming community would be able to purchase the new fertilizers using EU agricultural support programs. In addition, the anticipated restructuring of land ownership will permit foreigners to own and farm land, and export products, which is expected to increase demand for the company's products.

Project Guidance Parameters

Project Costs

The plant addition is estimated to have a cost of \$80-140 million of which about \$24-42 million is anticipated to be imported. This estimate is based on the capital cost of a similar plant in the region.

Project Location

The plant is located on a 570-acre site in Dimitrovgrad, approximately 200 km east of Sofia, 45 km north of Kurdzhali, and 40 km south of Stara Zagora. The site is easily accessible by rail and road from major cities within Bulgaria and from Turkey and Greece.

Scope of Feasibility Study

Further work is needed to assess the technical and economic viability of the project and develop a plan for the financing of the project.

Known Initiatives

The company received a grant from TDA for a feasibility study to improve the plant cost structure, largely based on energy conservation and reduced emissions. The project will utilize excess steam to generate power. The power will be consumed inside the plant, and represents approximately 25 – 33% of plant power demand. Total project cost is estimated at \$10 million.



Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing	4 th	2002
Construction	3 rd	2003
Plant Start-up	4 th	2003

Project Financing

The project will require external financing as NEOCHIM financial resources are limited. The debt portion for the project is expected to be arranged through financial institutions such as U.S. Ex-Im Bank, OPIC, EBRD, and commercial banks.

U.S. Competitiveness

U.S. suppliers of technology, equipment, DCS control systems, catalysts, engineering and construction services are well positioned to provide equipment and services required for this project.

Conclusion

This project has a high priority for NEOCHIM because it will improve utilization of the existing plant, provide crucial new products for the domestic market, and replace costly imports. Better utilization of the plant should improve NEOCHIM's competitiveness and help the company achieve their profit potential.

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Orgachim Energy Conservation Project



The company has 35%-38% of the domestic market and exports to Russia, and other Eastern European countries as well as Middle Eastern countries. About 40 domestic paint producers supply 90% of the local market, with only 10% importing to the country.

Orgachim's plant is located in Rousse, Bulgaria, which is on the Danube. Current utilization of the plant is only 30%, due to low domestic demand. Much of the equipment is 30 years old, although a phthalic acid unit, utilizing BASF catalytic distillation technology, was installed about 8 years ago. This particular unit runs at about 60%-70% of capacity. The Rousse plant employs 580 people.

Planned Additions

- 1 MW power generation from vented steam
- Other, unidentified, energy reduction initiatives

Project Summary

Sector	Chemicals
Location	Rousse, Bulgaria
Capital Required	\$1 – 1.5 million
Export Potential	<\$1 million
Project Sponsor	Orgachim
Project Status	Preplanning

Project Discussion

Project Background

Orgachim is the largest paint manufacturer in Bulgaria and the Balkans, and is part of a group including Policolor of Romania. They produce a whole range of industrial and consumer paints and lacquers. The company was established in 1901 and privatized in 1998.

Project Description

The plant is labor-intensive and has poor energy efficiency. The company is convinced that they need to reduce costs and operate at a higher capacity utilization in order to be profitable. The company would like to evaluate the potential for utilizing the available excess steam in a combined cycle mode to generate electricity. Steam is not required for the production of paint but it is a by-product and currently being wasted while electricity is being purchased. A project to reduce energy use is expected to cost about \$1-1.5 million. However, the project is not well defined and would benefit from further planning.

The company believes that with a lower cost structure, they could be competitive in export markets and increase plant capacity. This project works to achieve this. Given their high share of the domestic market, the company would seek export markets for incremental products.



Project Guidance Parameters

Project Costs

The plant energy conservation initiative is estimated to have a cost of \$1-1.5 million of which up to \$1 million is anticipated to be imported.

Known Initiatives

The management team has taken a number of steps to reduce operating costs and improve plant operation. Improving product quality and reducing costs has made Orgachim the leading supplier of resins in Bulgaria and has eliminated imports. Orgachim has reduced labor and utility costs by introducing automated quality control monitoring systems.

Plant Energy Conservation Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	4 th	2001
Financing		2002
Construction		2002

Project Financing

Orgachim plans to commit its internal resources for up to 20% the project capital cost requirement. The balance is expected to come from the U.S. Ex-Im Bank, OPIC, EBRD, and commercial banks.

U.S. Competitiveness

U.S. suppliers of equipment, DCS control systems, and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This project has a high priority for Orgachim because it will reduce their production costs and therefore allow them to be more competitive in the European market.

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GDP (in US\$ Million)	22.4
GDP Growth (est.)	3.5%
GDP Per Capita (US\$)	\$5,091
Population (Million)	4.4
Credit Rating	BBB-

Source: European Bank for Reconstruction and Development & The World Bank

Executive Summary

Following political changes that took place in 2000, Croatia has taken important steps toward improving its investment climate, progressing with privatization and economic stability. The government's expenditures were reduced from 20% of GDP in 1999 to 12.8% in 2000. The inflation rate has been controlled and corporate and income taxes have been reduced. Croatia is a member of the WTO, NATO's Partnership for Peace Program, and the Stability Pact for Southeastern Europe. Croatia also began discussions with the EU on Stability and Association Agreement (SAA) in

2000. The SAA is a precursor to beginning full negotiations on EU accession.

In anticipation of the country's eventual full membership in the EU and in order to be competitive in an open market, Croatia's chemical, petrochemical, and refining industries face a major environmental clean-up, product quality improvement, and energy and operational efficiency effort. These sectors require hundreds of millions of dollars of capital infusion and new and more effective technologies to overcome many years of neglect and the market inefficiencies of a centrally planned economy.

Despite the current government's serious efforts to accelerate the privatization of state-owned assets and the closure of money losing enterprises, INA, which is engaged in oil exploration, refining, and distribution and other related oil and gas businesses, is still a state-owned monopoly. Other petrochemical, fertilizer and chemical enterprises appear to be in need of extensive restructuring.

Political and Economic Climate

Following the breakup of the Socialist Federal Republic of Yugoslavia (SFRY), Croatia was internationally recognized in January 1992. In the 1990s, the country suffered from war and economic hardships caused by the costs of reconstruction and the accommodation of refugees and displaced persons. The elections of January 2000 brought a broad coalition of parties to power supporting economic reform and full integration with the EU. In a short time, the new government implemented constitutional changes enhancing the role of the Parliament, curtailing the executive powers, strengthening the independence of the courts, and protecting the rights of minorities. The Government also took steps to reduce the size of government, achieve macro-economic



stabilization, accelerate growth, reduce unemployment, impose restrictive constraints on non-profitable state-owned enterprises, accelerate privatization, and facilitate foreign investment. The new government has also succeeded in normalizing Croatia's foreign relations and ended the country's international isolation. It has joined WTO and the NATO's partnership for peace Program, the Stability Pact for South-Eastern Europe. The Pact supports the countries in the region in their efforts to foster peace, democracy, respect for human rights, and economic prosperity. Croatia also benefits from funds made available by the international financial institutions (for infrastructure projects) under the umbrella of the Stability Pact. In addition, Croatia has begun discussions with the EU on SAA. The SAA is the precursor to beginning full negotiations on EU accession that among other things has led to almost duty-free export to the EU. The country is also in the process of becoming a member of Central European Free Trade Agreement (CEFTA). Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia are current members of CEFTA.

The EBRD reports that Croatia has achieved good results in terms of macro-economic stabilization in the last few years. The economy grew by about 3.5% in 2000 almost entirely as a result of growth in the tourism industry. In 2001, the economic growth is expected to be 4%. The impact of the economic slow down in Europe is expected to be offset by an increase in FDI and the continued strong performance of the tourism industry.

Croatia's inflation rate increased from 4.2% in 1999 to 6.2% in 2000 and is forecast to decrease, due to lower oil prices and tariffs on imported goods.

Investment Climate

The new government has taken concrete steps to improve Croatia's attractiveness to foreign investors. In 2000, the government introduced legislation to provide investment incentives, reduced corporate and payroll taxes, revised the privatization framework and drafted plans for the liberalization of the energy and telecommunication sectors.

The new investment legislation provides favorable terms for the sale or lease of real estate, rewards creation of new jobs, encourages worker's retraining, and offers reduced corporate taxes depending on the level of investment and the number of jobs created.

Croatia has 12 free zones. Companies located in the free zones are exempt from paying custom duties or taxes on goods and products that are not intended for the domestic market. Those organizations engaged in infrastructure projects with a value exceeding HRK 1 million (about \$130,000) in the free zones also enjoy a five-year tax holiday. Other companies in the free zone are subject to 50% of the standard corporate tax. In 2000, the corporate tax was cut to a 20% standard rate, pension insurance contribution to 8.75% and health insurance to 7%. The value added tax is 22% and import duties vary depending on the products but will be reduced to 10% or less by 2005.

Foreign investors have mostly been interested in the large privatization deals. The largest foreign investment to date was the purchase of a 35% stake in Hrvatske Telekomunikacije (HT) by Deutsche Telekom AG for US\$850 million in 1999. Net FDI was over US\$2.7 billion in 1998 – 2000, with telecommunications accounting for over 27% and financial enterprises for over 12% of the



total. Other sectors attracting foreign investment included pharmaceuticals, electronics, gas exploration and distribution, food and soft drinks, and cement. The U.S., with 24% of the FDI since 1993, is the leading investor in Croatia, followed closely by Austria (23.4%) and Germany (22.8%).

In 2000, Croatia joined the World Trade Organization (WTO), and has committed to reduce agricultural and industrial protection. In 2000, Croatia also started negotiating a Stabilisation and Association Agreement with the EU, which will liberalize trade between the two sides. The EU has also lifted tariffs on 95% of goods exported to the EU from Croatia. Croatia is also in the process of joining the Central European Free Trade Agreement (CEFTA).

The EU countries, particularly Italy and Germany, are Croatia's main trading partners. Croatia's economy is closely integrated with that of western Herzegovina leading to substantial exports to this region of Bosnia and Herzegovina. In recent years, imports from other transition countries, especially Hungary and the Czech Republic, have increased.

The main Croatian exports are shipbuilding, chemicals, pharmaceuticals, food products, metals, building materials, textiles and clothing. The imports primarily include fuel and capital goods.

Sector Overview

The principal player in the sector is Industrija nafte d.d. (INA), an integrated state-owned company that covers a whole range of activities. It has a monopoly in gas distribution, operates the two largest refineries in the country, and conducts oil and gas exploration activities in Croatia and abroad.

About two-thirds of the country's crude oil consumption comes from fields operated by INA, located in Angola, Egypt and Russia. About one-third of Croatia's natural gas demand is also supplied by INA; the remainder is imported from Russia. INA, jointly with ENI of Italy, is developing new offshore gas fields. INA also owns a 35% share in the Adriatic oil pipeline, JANAF, which runs from oil terminal at Omisalj on the island of Krk and is linked to pipeline networks in Hungary and Slovakia. INA also owns a network of about 400 gasoline stations in the country.

INA closely cooperates with other oil companies in Hungary, Romania, and Austria. INA management has expressed a desire for partnership between INA and MOL, Hungary's largest oil and gas company.

The petrochemical sector is dominated by DIOKI d.d., which until 1997 was a member of INA. Currently, a 51% share of the company is held by the Privatization Investment Funds. DIOKI's production exceeds the demand in both Croatia and the former Yugoslavia. In 2000, over 82% of DIOKI's products were exported to EU countries. DIOKI is under going extensive restructuring, and is reported to have difficulty obtaining raw materials, including natural gas. DIOKI reported operating losses in 2000. Other fertilizer and chemical producers in Croatia are in need of extensive restructuring, and have had some difficulty purchasing raw materials, and reported negative operating cash flows in recent years.

In general, the sector is utilizing 30% to 70% of its available capacity, and requires substantial upgrading and modernization to reduce operating costs, if they are to be competitive in an open and free market and



meet the EU's product standards and environmental regulations.

The efforts to increase the utilization of the available capacity are primarily based on expected demand increase in the export markets. However, Croatia's refineries, petrochemical, and chemical producers are expected to meet strong competition from other regional producers targeting the same markets.

U.S. Presence

From 1993 to 2000, the U.S. investment in Croatia amounted to more than US\$379 million. U.S. technologies are particularly prominent in the refining and petrochemical sub-sectors.



Rijeka Refinery Upgrading Project



Planned Additions

- Phase I - EU Product Specifications
 - New MHC
 - HDS Expansion
 - Sour water stripper
 - Amine unit
 - H₂ and Sulfur Plants
- Phase II – IGCC Power Generation

Project Summary

Sector	Refining
Location	Urinj, Rijeka, Croatia
Capital Required	\$141 million Ph I \$350 million Ph II
Export Potential	\$50 Million
Project Sponsor	INA
Project Status	Preliminary Planning

Project Discussion

Project Background

INA, a 100% state owned company, is an oil and gas exploration, oil processing, and distribution company in Croatia. It produces crude and natural gas domestically, operates two refineries and about 400 service stations in Croatia. INA has production assets and interests in Angola, Egypt, and Serbia. It also owns 187 service stations and 8 storage facilities in Serbia, which are expected to be returned to INA's control shortly.

The Company operates two fuel refineries, at Sisak and Rijeka. They also operate a lube base stock manufacturing facility at Mlaka. Products are marketed both domestically, in a network of service stations, and exported to neighboring countries. INA is undergoing restructuring and is planned to be privatized in 2002-2003.

Sisak Refinery is a deep conversion refinery that includes FCC and coking/calcining units. The plant has a maximum capability of 4 million MTY, but currently operates at 2.5 million MTY. The Sisak refinery is an inland, niche plant that serves local domestic markets as well as the neighboring countries of Yugoslavia and Bosnia and Herzegovina. The plant was heavily damaged during the war, but continued operations almost uninterrupted. The damage was repaired at a cost of about \$80 million.

Rijeka Refinery is a 4.5 million MTY capacity refinery located at the Adriatic coast some 12-km south of city of Rijeka. It is connected to the Adriatic pipeline terminal on the island of Krk by a 5-km submarine oil pipeline. The refinery produces a wide range of products including liquefied gas, gasoline, jet and diesel fuel, heating oil, fuel oil, and liquefied

**Rijeka Refinery Upgrading Project**

sulfur. It also provides long residue to Mlaka and heavy fuel to a 400 MW power plant.

The Rijeka Refinery was originally built in 1883, at the site of Rijeka's current town center. The refinery was built at its current location in 1965, and was expanded in 1971, then from 1977 through 1981. The latest addition of HDS and MHC units were completed in 1997 to meet new product specifications. The refinery was built to a large extent based on UOP technologies.

Design Capacity	
Total, (crude oil)	4,500,000 MTY
Vacuum Distillation	1,700,000 MTY
Catalytic Reforming	780,000 MTY
FCC	1,000,000 MTY
Visbreaker	610,000 MTY
Mild Hydrocracker/HDS	600,000/1,000,000 MTY
Isomerisation (to be restarted)	233,000 MTY
Claus	20,000 MTY

Project Description

The refinery upgrading is proposed to be carried out in two phases. The first phase is to allow production of EU specification fuels by 2005 and improve the ability to process higher sulfur crude. Currently, the refinery processes 3.5 million MTY of Russian crude. The second phase is to eliminate production of high sulfur fuel oils beyond 2005 and produce electricity for use within the refinery and for sale.

The first phase involves the expansion of the existing gas oil hydrodesulfurization (HDS) unit, construction of a new moderate pressure hydrocracker (MHC), sour water stripper, amine unit, and hydrogen and sulfur plants. Hydrogen plant technology under consideration includes Foster Wheeler, Howe

Baker, Linde, and Lurgi. Licensors for the sulfur plant considered to date include Parsons and Lurgi.

The second phase of the project, which is scheduled for the post-2005 period, is designed to eliminate high sulfur fuel production. The refinery is examining the potential construction of an IGGC plant to produce power from the heavy fuel oils. Such a plant would produce 350 MW capacity. The power generated would essentially replace that produced by a neighboring power plant, which is scheduled to be shut down. Refinery power consumption is approximately 35 MW.

Potential competitive technologies to be considered include vacuum residue hydrocracking or flexicoking.

Project Guidance Parameters**Project Costs**

The Phase I plant modifications are anticipated to cost approximately US\$141 million. The company is exploring "Build, Own, Operate" (BOO) concept for the hydrogen manufacture and sulfur recovery as a way of reducing their initial capital costs.

The second phase of the project is estimated to cost about \$350 million.

Known Initiatives

The refinery is currently restarting and revamping the Isomerization and Reformate splitter units to meet the benzene limit specification in gasolines (1% vol.) at a cost of US\$8 million. This project would enable Rijeka to produce additional blended gasoline, meeting EU2000 specification. The refinery is also upgrading an existing small hydrodesulfurization unit for middle

**Rijeka Refinery Upgrading Project**

distillates. This project will reduce sulfur content in a portion of the diesel pool to 50 ppm. Estimated cost for this project is US\$1.5 million.

The refinery has also received an EBRD loan to implement seven environmental projects regarding the protection of air and sea and waste disposal, in four years.

INA has also been in discussions with technology suppliers, gathering technical and cost information, and gauging technology suppliers' interest in providing financing support for the project. A feasibility study is needed to assess technical and economic viability of available options.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing & Construction		2002-2005
Plant Start-up (Ph I)	1 st	2005

Project Financing

Project financing has not yet been addressed. However, INA has limited ability to fund these projects from its cash flow and is seeking partners for the financing of these projects.

U.S. Competitiveness

The Rijeka refinery is built mostly on UOP based technologies giving U.S. firms an added advantage over their European and Japanese competitors. UOP, Chevron, ABB Lummus Global, Parsons, and many other U.S. firms are well positioned to provide technology,

equipment and services required for this project.

Conclusion

The company views this project as critical for its future competitiveness. The refinery will have to produce fuels meeting EU specifications by 2005. Elimination of high sulfur fuel oils by IGCC technology has the potential to bring the company into the power business, producing almost 10% of Croatia's electricity demand.

Key Contacts**Country Sponsor****INA**

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Sisak Refinery Upgrading Project



Planned Additions and Expansions

- Phase I – New Hydrocracker, HDS, H₂ and Sulfur Plants, FCC unit upgrade, coke calciner expansion, in-line product blending equipment, automation equipment at truck and rail car loading stations
- Phase II – Deasphalting and Bitumen production facilities

Project Summary

Sector	Refining
Location	Sisak, Croatia
Capital Required	\$209 million
Export Potential	\$75 million
Project Sponsor	INA
Project Status	Preliminary Planning

Project Discussion

Project Background

INA is the state oil company in Croatia. The state is preparing to privatize the company, possibly next year. It produces crude and

natural gas domestically and operates two refineries and about 400 service stations in Croatia. INA has production assets and interests in Angola, Egypt, and Serbia. It also owns 187 service stations and 7 storage facilities in Serbia, which are expected to be returned to INA's control shortly, 65 in Bosnia and Herzegovina, and 6 in Slovakia, among other.

The company operates two fuels refineries, at Rijeka and Sisak. They also operate a lube base stock manufacturing facility at Mlaka. Products are marketed both domestically in a network of service stations, and exported to neighboring countries. The Rijeka plant also produces asphalt and supplies heavy fuel oil to a neighboring 400 MW power plant. The Sisak refinery is a deep conversion refinery that includes FCC and coking/calcining units. The plant has a maximum capability of 4 million MTY, but currently operates at 2.5 million MTY. The Sisak refinery is an inland, niche plant that serves local domestic markets as well as the neighboring countries of Yugoslavia and Bosnia Herzegovina. The plant was heavily damaged during the war, but continued operations almost uninterrupted. The damage was repaired at a cost of about \$80 MM.

Project Description

The project will be implemented in two phases. The first phase is to allow the production of EU specification fuels and the expansion of secondary units to balance the crude unit rate of 4 million MTY. The refinery currently does not produce any EU grade products. The second phase is to upgrade the refinery to maximize production of white products and, essentially, eliminate high sulfur fuel oil production at the higher crude rate.



Sisak Refinery Upgrading Project



The first phase involves the construction of a new moderate pressure hydrocracker (MHC), a gas oil hydrodesulfurization (HDS) unit, and hydrogen and sulfur plants to meet EU specifications. A short-term measure of FCC gasoline desulfurization (toluene dealkylation unit converted to ISAL) is being considered before the MHC is completed.

In-line blending equipment will also be added to reduce the quality of giveaways and maximize the utilization of existing equipment. In addition, the truck loading station will be automated, and the rail car loading facilities will be modernized.

A de-bottleneck of the refinery is planned concurrently to allow secondary units to balance total crude run of 4 million MTY. Central to this element of the project are an FCC de-bottleneck (including new riser, catalyst, cooler, new feed nozzles and improved catalyst cyclones), estimated at US\$5 million, and a coke calciner expansion, estimated at US\$2.3 million.

The second phase of the project, which is scheduled for the post-2005 period, is designed to eliminate high sulfur fuel production. The refinery is reviewing de-asphalting technology, along with additional bitumen production, to achieve this objective.

Equipment requirements include reactors, towers, drums, pumps, compressors, furnaces, hydrogen purification equipment, specialized petroleum coke calcining equipment, piping, electrical distribution equipment, and process control systems. For the in-line blending and loading facilities, specialized equipment will include quality monitoring and control systems, weigh stations, and gasoline blending optimization software and hardware.

Project Guidance Parameters

Project Costs

The plant modifications are anticipated to cost approximately US\$209 million for the first phase. The Company is exploring “Build, Own, Operate” (BOO) concepts for the hydrogen manufacture and sulfur recovery as a way of reducing initial capital costs.

The second phase of the project has not been estimated at this time.

Known Initiatives

The refinery is revamping an existing naphtha hydrodesulfurization unit to desulfurize middle distillates and coker gas oils. This project will reduce the diesel pool sulfur content to 350 ppm (from 5000 ppm). Estimated cost for this project is US\$4 million.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing & Construction		2002-2005
Plant Start-up (Ph I)	1 st	2005

Project Financing

Project financing for the current US\$4 million desulfurization project has been provided by the EBRD. The company has not yet addressed financing of the proposed upgrades in project.

**Sisak Refinery Upgrading Project****U.S. Competitiveness**

U.S. suppliers of technology, equipment, DCS control systems, catalysts, specialized blending and product loading equipment, engineering and construction services are well positioned to provide equipment and services required for this project.

Conclusion

The refinery has the potential to be a highly competitive niche producer, due to location, freight costs for imports, and significantly better configuration than neighboring plants in Bosnia and Yugoslavia. The projects will be required to keep the plant viable and meet EU product specifications, as well as to improve competitiveness by matching secondary units to crude capacity.

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Sisak Refinery Soil Remediation Project



Planned Additions

- Reconstruct underground piping
- Sub-surface environmental remediation

Project Summary

Sector	Refining
Location	Sisak, Croatia
Capital Required	\$20 to \$25 million
Export Potential	\$5 to \$7 million
Project Sponsor	INA
Project Status	Preplanning

Project Discussion

Project Background

INA is the state oil company in Croatia. The state is preparing to privatize the company, possibly next year. It produces crude and natural gas domestically, operates two refineries and about 400 service stations in Croatia. INA also has production assets and interests in Angola, Egypt, and Yugoslavia. It also owns 187 service stations and 8 storage

facilities in Yugoslavia, which are expected to be returned to INA's control shortly.

The Company operates two fuels refineries, at Rijeka and Sisak. They also operate a lube base stock manufacturing facility at Mlaka. Products are marketed both domestically, in a network of service stations, and exported to neighboring countries. The Rijeka plant also produces asphalt and supplies heavy fuel oil to a neighboring 400 MW power plant. The Sisak refinery is a deep conversion refinery that includes FCC and coking/calcining units. The plant has a maximum capability of 4 million MTY, but currently operates at 2.5 million MTY. The Sisak refinery is an inland, niche plant that serves local domestic markets as well as neighboring countries of Serbia, Bosnia, and Herzegovina. The plant was heavily damaged during the war, but continued operations almost uninterrupted. The damage was repaired at a cost of about \$80 million.

Project Description

The Sisak refinery site has been active for over 70 years. In that time, there has been significant contamination of the sub-surface due to equipment leaks, tank leaks and process spills. In addition, the war activity caused major damage resulting in the leakage of hydrocarbons into the substructure.

Due to the porosity of the soils, there exists significant risk of sub-surface plumes spreading to the Kupa and Sava Rivers, which are tributaries of the Danube basin. Croatia is a signatory of the *Convention of the Danube River Basin Protection and the Use of the Danube River*, and the refinery is therefore required to test subsurface conditions, determine the state of their underground piping, replace piping as needed, and remediate any soil or water contamination.



Sisak Refinery Soil Remediation Project



Requirements include specialized soil and water treatment and clean-up equipment. Other equipment requirements include pumps, piping, tanks, filtration devices, and centrifuges.

Project Guidance Parameters

Project Costs

Based on review of similar projects, PERI (Princeton Energy Resources International) estimates that project costs could range from US\$20 to US\$25 million. However, the extent of the soil contamination, the amount of soil that has to be remediated, or measures that have to be taken to protect water sources are not fully identified yet.

Known Initiatives

INA and Sisak are committed to improving the operational efficiency of the refinery, reduce costs, and minimize refinery's emissions. Extraordinary measures were taken during the war to repair equipments and vessels and to minimize potential contamination of soil and ground water. Sisak is also revamping an existing naphtha hydrodesulfurization unit to desulfurize middle distillates and coker gas oils. This project will reduce the diesel pool sulfur content to 350 ppm (from 5000 ppm). The estimated cost for this project is US\$4 million.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Plant Start-up		2004

Project Financing

The Company has not yet addressed financing for this and INA has limited ability to fund this project from cash flow. However, funding is available for environmental projects in Croatia from EU as part of the EU accession process. Project financing for the current US\$4 million desulfurization project has been provided by EBRD.

In the past, the EBRD and the World Bank have provided financing for other projects in Croatia designed to address problems with sewage systems and water pollution.

U.S. Competitiveness

U.S. suppliers of technology and specialized equipment are well positioned to provide equipment and engineering services required for this project. U.S. companies such as CEVA International, Inc. and Colt America, Inc. are providing technologies and engineering services for similar projects in the region.

Conclusion

The refinery has the potential to be a highly competitive niche producer, due to its location, freight costs for imports, and significantly better configuration than neighboring refineries in Bosnia and Yugoslavia. The project will be required to keep the hydrocarbons from reaching the groundwater and contaminating the Kupa and Sava Rivers and eventually, the Danube River.



Sisak Refinery Soil Remediation Project



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industries face a major environmental clean-up, product quality improvement, and energy and operational efficiency effort. These sectors require capital infusion, and new and more effective technologies to overcome many years of neglect and market inefficiencies of a centrally planned economy.

The Czech government has recently embarked on a rapid privatization of Unipetrol having recently gone through a bidding process and selection of a short list of potential candidates for the acquisition of the outstanding State holdings in Unipetrol. A decision on the final selection is expected early in 2002. As full entry into the EU approaches, the Czech government will come under increasing pressure to divest itself of its remaining assets in Unipetrol.

GDP (in US\$ billion)	50.8
GDP Growth (est.)	2.5
GDP Per Capita (US\$)	4,932
Population (Million)	10.3
Credit Rating	A-

Source: European Bank for Reconstruction and Development & The World Bank

Political and Economic Climate

Following the break-up of Czechoslovakia, The Czech Republic was internationally recognized in 1993. In the early 1990s, the country launched a radically liberal economic transition program that included a large-scale devaluation of the local currency, price and trade liberalization, a rapid enterprise transformation, and an innovative voucher privatization program. While there was initial success, the economy began to flounder in 1996 partially because of a lack of reforms in the state-dominated banking sector. Following three years of decline, the Czech economy turned the corner in 2000 and has embarked on the path of economic recovery and growth. Even with the decline in the late 1990s, the Czech Republic is one of the most economically advanced countries in Central and Eastern Europe and it has stable and well functioning democratic institutions. The Czech Republic is at the forefront of the EU enlargement process; out of a total of 31 chapters in the accession negotiations, 29 have

Executive Summary

Following the reforms that took place in 1998, the Czech Republic's economy improved and began recovering in 2000. The Czech Republic has one of the most advanced economies in the region and has attracted much foreign investment, especially due to greenfield projects and the privatization process. It is a member of the WTO, NATO and the OECD and is in the EU accession negotiation process.

In anticipation of country's eventual full membership in the EU and in order to be competitive in an open market, the Czech chemical, petrochemical, and refining



been opened and 13 have been provisionally closed by 2000. The country is also a member of Central European Free Trade Agreement (CEFTA). Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia are current members of CEFTA. In addition, the Czech Republic is also a member of the WTO, NATO and the OECD.

The economy grew by about 2.5% in 2000 as a result of banking and capital market reforms, bank privatization, and improvements made in the investment environment. Economic growth in 2001 is expected to grow to 3% due to large FDI inflows made in the past few years.

The inflation rate almost doubled to 4.0% in 2000 due to price deregulation and high oil prices. The decision to complete price deregulation by the end of 2002 and oil prices may affect the inflation rate in the next few years.

Investment Climate

The Czech Republic has been one of the region's most successful countries in attracting FDI with over US\$20 billion of foreign investment recorded since 1990. The campaign to attract foreign direct investment has been extremely successful over the last few years, as net FDI investment totaled US\$4.5 billion in 2000. For two years in a row, FDI into the country doubled, clearly surpassing that of all other Central and Eastern European countries in per capita terms in 1999 and 2000. The sharp increases in FDI that started in 1998 can be attributed to two factors: the introduction of investment incentives for both foreign and domestic investors and an acceleration of the privatization process.

A new investment law was passed in May 2000 that codified and simplified the original scheme put forth in 1998. The following incentives are currently offered: tax holidays of 10 years for new companies and 5 years for expansions of existing companies; job creation grants in regions with high unemployment; training and retraining grants in regions with high unemployment; and local incentives, such as the provision of low cost development land. These incentives have requirements, however, such as the requirement that the investment be made into the manufacturing sector, the investment be at least US\$10 million equivalent with at least US\$5 million equivalent in equity, and investment into machinery be at least 40% of the total investment. In addition, the Czech Republic allows duty free import of machinery and equipment and support for small companies.

The Czech Republic has 8 free trade zones established in several cities throughout the nation. The rules for operation within a commercial or industrial customs free zone are the same as in the EU; materials, components and semi-finished products are exempted from customs duties and VAT if they are exported into a free trade zone. If the goods are used in the manufacturing or processing of a final product that is then re-exported, it is also exempt from duties and VAT. Czech tax codes are generally in line with European tax policies with corporate income tax set at 31% and the VAT generally set at 22%.

As mentioned above, foreign investors have been interested in both greenfield companies, due to investment incentives and the privatization process. As of December 2000, there were 37 companies that had been awarded incentives to invest of more than US\$1.5 billion. In 2000, the most notable greenfield investments were in the electronics



and automotive sectors, with Philips, a Dutch company, starting the construction of a US\$624 million television plant that, when completed, will be the Czech Republic's largest greenfield investment to date. Privatization has also been and is expected to continue as a significant source of FDI, with the privatization of the banking and financial sectors being important over the past few years and the telecommunications and electronics sectors gaining in importance over the next few years. Germany, with a 27% share, leads the world in foreign investment in the Czech Republic, followed by the Netherlands (22.2%), Austria (13.7%), UK (5.2%), and U.S. (5.0%).

The Czech Republic is a member of the World Trade Organization (WTO) and joined the OECD in 1995. The Czech Republic is also a member of the Central European Free Trade Agreement (CEFTA), and is at the forefront of the EU accession process.

The EU countries, particularly Germany, are the Czech Republic's most important trading partners. The Czech Republic also does a significant amount of trading with CEFTA and Slovakia, with which it shares a customs union.

The main Czech exports are manufactured goods. The main imports are food, energy and capital goods.

Sector Overview

The principal player in the sector is Unipetrol, a holding company that assembles a major part of the Czech refining and petrochemical industry. Unipetrol was formed from the merger of the Kaucuk and Chemopetrol groups into the country's third largest industrial company. Unipetrol is listed on the Prague stock exchange, with about 40% of its

shares tradable and the remaining 60% held by the government. Through its various parts, Unipetrol is involved in all branches of the refining and petrochemical industry. It is capable of producing motor fuels, LPG, solvents, aromatics, hydrogenates, fuel oils, bitumens, sulfur, aromatic hydrocarbons and their derivatives, alcohols, polyolefines, hydrocarbon gases, urea, ammonia, phenols, industrial gases, SBR, polystyrene plastics, and operates the largest retail chain of fuel stations in the Czech Republic.

As the Czech Republic moves closer to full accession with the EU, the government will face pressure to further divest itself of its shares in companies such as Unipetrol.

In general, Czech producers have inherited old and inefficient plants from the communist era that show an excessive use of raw materials, poor energy efficiency, and low utilization of existing capacity. They are eager to modernize and replace them with modern and efficient, environmentally friendly technology and equipment. It is realized that they must do this if they are to be competitive in the global marketplace and meet European Union standards. Unipetrol is currently determining the feasibility of adding a variety of new lines and expanding their current capacity.

U.S. Presence

By 2000, the U.S. ranked 5th in investment in the Czech Republic. The Czech Republic encourages the importation of U.S. equipment by not applying duties and VAT to foreign imported machinery. With the possibility of expansion by companies such as Unipetrol, and the need for environmental cleanup by Czech companies as the country nears EU accession, there exists an opportunity for U.S. companies.



Unipetrol Spolana **Cyclohexane/Cyclohexanone/Caprolactam** **Unit**



Planned Additions / Expansions

- Addition of new Cyclohexane / Cyclohexanone / Caprolactam Units and expansion of production from 44,000 MTY to 80,000 MTY

Project Summary

Sector	Petrochemicals
Location	Litvínov / Neratovice Czech Republic
Capital Required	\$230 million
Export Potential	\$160 million
Project Sponsor	Unipetrol/Spolana
Project Status	Pre-feasibility Study

Project Background

Chemopetrol, a subsidiary of Unipetrol, is the largest petrochemical company in the Czech Republic. Chemopetrol produces ethylene, polyethylene, polypropylene, benzene, ethylbenzene, alcohols and agricultural chemicals at its Litvinov site.

The Litvinov site is located in the Usti nad Labem region in the northwestern part of the country – near Germany.

Recently, the Czech Government decided that Spolana should become a new subsidiary of Unipetrol. Spolana is located 100 km southeast of Chemopetrol at Neratovice. Spolana has the following production Units: linear alpha olefins, polyvinyl chloride, specialty chemicals, and industrial chemicals.

Caprolactam Project

The existing Caprolactam unit is currently being supplied with Cyclohexanone, produced in Chemko Strazske/Cenon (Slovakia). The distance between Neratovice and Strazske is 700 km. Chemopetrol is a main benzene supplier to Chemko. The intention of this project is to reduce transportation costs and to establish an independent cyclohexanone supply. At the same time, they would like to increase production of caprolactam at Spolana consistent with current market expectations. While the capacity remains to be defined, it is expected that the existing capacity of 44,000 MTY will be increased to approximately 80,000 MTY. Since both Chemopetrol and Spolana have their own hydrogen source, the Cyclohexane Unit can be installed either at Chemopetrol or at Spolana, while the other two units (Cyclohexanone and Caprolactam) should be built at Spolana.

Project Guidance Parameters

Project Costs

A pre-feasibility study, conducted by Spolana in 1996, aimed at the construction of a new cyclohexanone Unit arrived at an investment cost of US\$60 million for the cyclohexanone unit alone. Investment costs for the new



Unipetrol Spolana **Cyclohexane/Cyclohexanone/Caprolactam** **Unit**



cyclohexane/ cyclohexanone/ caprolactam units production train is estimated at US\$230 million. Of this amount, approximately US\$125 million of equipment and services could be sourced from the U.S.

- EBRD
- U.S. Ex-Im
- OPIC
- Commercial banks

Known Initiatives

- Spolana had been negotiating with Allied Signal Inc. in 1995 for a potential strategic partnership but the negotiation had failed.
- A pre-feasibility study was completed by Spolana in 1997.
- Spolana/Unipetrol has approached TDA for funding for a detailed feasibility study for the project that would analyze the options and prepare a bankable document for a recommended expansion strategy.
- An initial authority approval is expected to be issued within 6 months of the feasibility study completion.

U.S. Competitiveness

A number of U.S. suppliers of industrial plant equipment including rotating equipment, columns, DCS, catalysts, and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This Project has been considered by Unipetrol as one of high priority in order to remain competitive in the region and to be able to export to EU markets.

Key Contacts

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing	1 st	2003
Engineering	2 nd	2003
Construction	2 nd	2004
Plant Start-up	3 rd	2004

Project Financing

Unipetrol is supportive of this Project and would provide funding for the Project provided the results of the feasibility study are favorable. Potential sources of financing include:

Country Sponsor

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Chemopetrol Ethylbenzene Production Plant



The Litvinov site is located in the Usti nad Labem region in the northwestern part of the country – near Germany. The site is a large chemical, oil refining, coal mining and power generation complex. The existing 125,000 MTY ethylbenzene uses ethylene and benzene that are produced at Litvinov. The existing ethylbenzene plant is old and uses an obsolete technology for ethylbenzene production.

The Kaucuk chemical complex is located at Kralupy, north of Prague. The Czech Oil Refining Company also operates a refinery at this site. The main chemical plants are a new 130,000 MTY styrene plant, a polystyrene plant, a styrene butadiene rubber plant, and a butadiene extraction plant.

Planned Additions / Expansions

- New 180,000 MTY to 300,000 MTY Ethylbenzene Plant.

Project Summary

Sector	Petrochemicals
Location	Litvinov, Czech Republic
Capital Required	\$30 million
Export Potential	\$5 million
Project Sponsor	Unipetrol/Chemopetrol
Project Status	Project approved by Unipetrol

Project Discussion

Project Background

Chemopetrol, a subsidiary of Unipetrol, currently operates an ethylbenzene plant at its Litvinov site. Essentially all of the plant output is supplied to another Unipetrol subsidiary, Kaucuk, for the production of styrene.

Kralupy receives ethylbenzene from Litvinov via a pipeline with a capacity of 180,000 MTY. The Litvinov site also has ethylbenzene pipeline connections to Neratovice and Bohlen in Germany. Railroad loading is also available at Litvinov for benzene and ethylbenzene.

At Unipetrol's request, TDA provided \$230,000 for a feasibility study to evaluate the technical and economic viability of constructing a new ethylbenzene production plant. The study was competitively bid and Chem Systems of Tarrytown, New York, was awarded a contract by Unipetrol. Chem Systems also offered \$80,000 of cost sharing and completed the feasibility study in December 1999.

New Plant

Chem Systems evaluated the feasibility of constructing a new plant at Litvinov and Kralupy using the two leading technologies, liquid and vapor phase, for ethylbenzene production. Several plant capacity options were also analyzed, including:



Chemopetrol Ethylbenzene Production Plant



- 180,000 MTY of ethylbenzene
- 300,000 MTY of ethylbenzene
- 180,000 MTY, with the capability to expand to 300,000 MTY within 5 years of plant start-up.

On the basis of this feasibility study, Unipetrol approved construction of a new ethylbenzene facility.

Project Guidance Parameters

Project Costs

The new plant is estimated to cost about US\$40 million of which about US\$20 million is anticipated to be imported.

Known Initiatives

Unipetrol recently approved required capital investment for the project.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	4 th	1999
Financing	2 nd	2001
Engineering	2 nd	2001
Construction	2 nd	2003
Plant Start-up	2 nd	2003

Project Financing

Financing was arranged through a syndicated loan.

U.S. Competitiveness

Alternative process technologies were considered by Unipetrol. ABB Lummus Global/ UOP was selected as a turnkey contractor.

Conclusion

This project is a high priority for Unipetrol as indicated by Unipetrol approval of the project capital investment.

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Project Discussion

Project Background

Chemopetrol, a subsidiary of Unipetrol, is the largest petrochemical company in the Czech Republic. Chemopetrol produces ethylene, polyethylene, polypropylene, cumene, phenol, ethylbenzene, and agricultural chemicals at its Litvinov site.

The Litvinov site is located in the Usti nad Labem region in the northwestern part of the country – near Germany. Because of a unique feedstock, Chemopetrol's steam cracker is one of the most important unit operations at this site. In the U.S. and Europe, a typical steam cracker feedstock contains 80 percent naphtha and 20 percent lighter products. In contrast, the feedstock to this steam cracker contains more than 51 percent materials that are heavier than naphtha. Consequently, steam cracker yield of lower value liquid products (C5 cut, C9 cut, and fuel oil) are higher than usually expected.

Chemopetrol is evaluating the technical and economic feasibility of a project (known as Project C5+) for converting the lower value products to higher value-added products such as:

- DCPD
- Isoprene
- Piperylene
- Naphthalene concentrate
- Dimethylstyrene for hydrocarbon resins production
- Pitch

Planned Additions / Expansions

- Addition of facilities for deep treatment of steam cracker C5 liquids to produce:
 - 80% pure Dicyclopentadiene (DCPD)
 - 99% pure Isoprene
 - 85% pure Piperylene

Project Summary

Sector	Petrochemicals
Location	Litvinov, Czech Republic
Capital Required	\$25 million
Export Potential	\$18 million
Project Sponsor	Unipetrol/ Chemopetrol
Project Status	Feasibility study on-going



The Project C5+ consists of seven (7) stages:

1. Production of 94% pure DCPD from light pyrolysis gas by distillation.
2. Deep treatment of C5 cut.
3. Production of higher than 99% pure DCPD using products from stages 1 & 2.
4. Production of biphenyl concentrate.
5. Production of naphthalene concentrate.
6. Production of C10 cut (for production of resins).
7. Deep treatment of pyrolysis fuel oil (PFO) for pitch production.

The stage 2, “Deep treatment of C5 cut” also known as the C5 Treatment Project is the most important stage of the seven stages of the “Project C5+.” The feasibility of the C5 Treatment Project heavily influences the viability of the entire “Project C5+.” It represents more than 70% of the total costs and 30% of the reported anticipated margin increase.

At Chemopetrol’s request, TDA provided \$255,000 to conduct a feasibility study that evaluates the technical and economic viability of the C5 Treatment Project. Chemopetrol awarded Chem Systems of Tarrytown, New York, the contract to perform the study. The scope of work includes evaluating process options available for converting C5 (propane) to higher value products and the potential market for these products.

Project Guidance Parameters

Project Costs

The implementation cost of the C5 Treatment Project is estimated to be approximately \$25 million of which up to \$18 million is anticipated to be imported.

Known Initiatives

Chemopetrol has completed a preliminary study of the C5 Treatment complex. Chemopetrol has also completed preliminary feasibility studies for some of the other stages of “C5+ Project” and has identified additional technical data/information needed for conducting feasibility study for other stages. Chemopetrol has also began searching for strategic partners to assure that the new slated products can find export markets and further be refined.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Plant Start-up	2 nd	2004

Due to privatization efforts of Unipetrol, the project schedule is being reevaluated. A decision to go ahead with the project is expected in the first quarter of 2002.

Project Financing

Chemopetrol has indicated that Unipetrol is supportive of this project and would provide funding for the project provided the results of the feasibility study are favorable. Potential sources of financing include:

- EBRD



Chemopetrol C5 Treatment Project



- U.S. Ex-Im
- OPIC
- Commercial banks.

U.S. Competitiveness

A number of U.S. companies, including UOP and Koch-Glitsch Technologies, have successfully provided technologies for converting C5 to higher value products in the U.S. and abroad. In addition to exporting technology, U.S. suppliers of industrial plant equipment, including rotating equipment, columns, DCS, catalysts, and engineering services, are well positioned to provide equipment and services required for this project.

Conclusion

This project has a high priority for Chemopetrol and Unipetrol in order to maintain market share. Chemopetrol, traditionally a basic petrochemical producer, has determined that it must diversify its products, improve product quality and produce higher value products in order to remain competitive in the region and export to EU markets.

Key Contacts

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Chemopetrol Pyrotol Unit/Aromatics Expansion



Planned Additions / Expansions

- Evaluation of extension or modification of existing Pyrotol Unit (part of Steam Cracker Complex).
- Increase capacity of benzene production by approximately 35% from 176,000 ton/year to approximately 240,000 ton/year
- Styrene extraction

Project Summary

Sector	Petrochemicals
Location	Litvinov, Czech Republic
Capital Required	\$54 million
Export Potential	\$26 million
Project Sponsor	Unipetrol/Chemopetrol
Project Status	TDA grant approved

Project Discussion

Project Background

Chemopetrol, a subsidiary of Unipetrol, is the largest petrochemical company in the Czech Republic. Chemopetrol produces ethylene, polyethylene, polypropylene, cumene, phenol, ethylbenzene, and agricultural chemicals at its Litvinov site.

The Litvinov site is located in the Usti nad Labem region in the northwestern part of the country – near Germany. Because of a unique feedstock, Chemopetrol's steam cracker is one of the most important unit operations at this site. In the U.S. and Europe, a typical steam cracker feedstock contains 80 percent naphtha and 20 percent lighter products. In contrast, the feedstock to this steam cracker contains more than 51 percent of materials that are heavier than naphtha. Consequently, steam cracker yields of lower value liquid products (C5 cut, C9 cut, and fuel oil) are higher than usual.

Chemopetrol currently processes the pyrolysis gasoline by partially hydrotreating the C6-C8 cut through a Pyrotol unit (licensed by the Houdry company) which was constructed 21 years ago (1980). It then recovers benzene for chemical feedstock usage.

Chemopetrol will be increasing the capacity of its steam cracker from 435,000 ton/year to 560,000 ton/year of ethylene production, along the lines recommended in a feasibility study funded by TDA. This expansion will automatically increase production of other products including the pyrolysis gasoline fraction. This would allow Chemopetrol to increase benzene production by about 35% from the current level of 176,000 ton/year to approximately 240,000 ton/year of 99.9%



Chemopetrol Pyrotol Unit/Aromatics Expansion



purity benzene. It could also allow the recovery of byproduct styrene.

Project Guidance Parameters

Project Costs

The implementation cost of the Aromatics Recovery Project is estimated to be between \$10 million and \$54 million depending on the final processing scheme selected. Potential U.S. export potential should be around \$12 million to \$24 million.

Known Initiatives

Over the last several years, Chemopetrol has worked with TDA's assistance to increase its production of chemical feedstocks, chemical intermediates and final products. This has involved:

- Expansion of the Steam cracker at Litvinov
- C5 Treatment Project
- Ethylbenzene Production
- Cyclohexane/Caprolactam Production (under consideration)
- HIPS expansion

Benzene production and utilization is a key activity for Chemopetrol and Unipetrol's companies Kaucuk, Kralupy and Spolana. The effort to recover the increased benzene (and styrene) production resulting from the steam cracker expansion is important for Chemopetrol in its quest to optimize product revenue and efficiency.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing & Construction		2002-2004
Plant Start-up	2 nd	2004

Project Financing

Chemopetrol has indicated that Unipetrol is supportive of this project and would provide funding for the project provided the results of the feasibility study are favorable. Potential sources of financing include:

- EBRD
- U.S. Ex-Im
- OPIC
- Commercial banks

U.S. Competitiveness

Chemopetrol's steam cracker and aromatic extraction units were originally constructed by the Lummus Corporation using U.S. technology. U.S. sources would hence be favored for the implementation of this project.

Conclusion

A feasibility study is required to determine the best technical and economical route to increasing benzene production from the Litvínov steam cracker unit, considering the following possibilities:

- Installation of new benzene extraction distillation
- Styrene extraction



Chemopetrol Pyrotol Unit/Aromatics Expansion



- De-bottlenecking existing Pyrotol unit
- Other possibilities (e.g., selling the rest of BTX fraction, which cannot be processed by the existing Pyrotol unit)

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Kaucuk SBR Lattices Production Plant



Planned Additions/Expansions

- SBR Lattices Expansion

Project Summary

Sector	Petrochemical
Location	Kralupy nad Vltavou
Project Sponsor	Unipetrol a.s.
Project Status	Preliminary Planning

Project Discussion

Project Background

Kaucuk a.s. is a major petrochemical company in the Czech Republic and is the country's sole producer of synthetic rubbers and polystyrene plastics. The production of synthetic rubbers was started in 1963 by putting into operation a plant for the manufacturing of emulsion styrene-butadiene rubber (E-SBR), trade name KRALEX. The present total capacity of the emulsion SBR plant is 75,000 metric tons of several grades E-SBR.

Besides solid emulsion styrene-butadiene rubber, a new low capacity plant (2,000 MTY) started the production of special liquid polybutadienes (KRASOL). Other Kaucuk products are polystyrene plastics, such as expandable polystyrene, high-impact polystyrene and ABS polymers.

Emulsion polymerized elastomers E-SBR belong to the core business of the Kaucuk company. The existing emulsion SBR plant is in relatively good technical condition due to the company's recent extensive investments into technological and environmental improvements. With the use of available sources of raw materials, utilities and experienced staff, the production of solid E-SBR could be suitably extended by the manufacturing of SBR dispersions - emulsion polymerized styrene-butadiene lattices.

The emulsion polymerization technologies for the production of solid SBR and SBR lattices have many common features. While SBR latex is the dispersed counterpart of its solid E-SBR form, the latex manufacture and applications have developed into a separate entity from the solid rubbers, with very different production technology, markets and end uses. Though a low-concentration SBR latex is an intermediate product in the solid E-SBR process, the production of high quality SBR lattices with very specific properties cannot be designed within the existing solid E-SBR manufacture (e.g., by increasing the polymerization capacity or by a treatment of the common E-SBR latex), but it is necessary to build a new SBR latex plant.

Currently there are two main groups of styrene-butadiene lattices: The basic styrene-butadiene copolymer dispersions (SBR latex) and carboxylated styrene-butadiene lattices (X-SBR latex). The consumption of X-SBR lattices dominate in most industrial



applications. Kaucuk assumes that the implementation of the plans should result in a production of a wide range of SBR lattices with the carboxylated X-SBR latex as the main product.

According to all current forecasts, the demand for the styrene-butadiene lattices in Europe is expected to grow at about 3.6%. Most of the latex applications are in the paper and textile industries.

Project Description

The objective of the project is the construction of a plant for the production of styrene-butadiene lattices. The plant should supplement the existing manufacture of solid emulsion SBR (trade name KRALEX) and provide various grades of SBR lattices, predominantly for the paper and textile applications.

The designed initial capacity of the styrene-butadiene lattices plant is 15,000 dry metric tons per year (i.e. about 30,000 tons of latex) with the possibility of gradually increasing the production.

Project Guidance Parameters

Project Costs

Capital costs of the project have not yet been estimated.

The first estimation is being processed.

Known Initiatives

The plans are in an early initial stage. A market study was made by Kaucuk (September 2001) that focused on European market potential. The study includes market

analysis and updated information on styrene-butadiene lattices.

A domestic market potential has been researched by the Kaucuk company during August-October 2001. The end users of SBR latex in the Czech Republic – mostly companies in the paper and textile industries – have been contacted and the data on their potential latex consumption have been gained. The research results lead to the conclusion that the substantial part of the lattices production should be exported to other European countries.

Project Schedule

The project implementation is assumed in following time periods:

Planned Completion Schedule	
Activity	Year
Feasibility study	2002
Engineering and design	2003
Construction of the plant	2003-2004
Production start (50% capacity)	2005

Project Financing

Kaucuk assumes that the financing of the project could be arranged as a combination of their own resources and bank loans. The ratio between various sources is to be determined according to the overall costs and the specific project agreements.

Conclusion

The project implementation can be significant for the further development of emulsion synthetic rubbers business of the Kaucuk company. The main part of the SBR latex production should be directed to the Central and Western European region.



Kaucuk SBR Lattices Production Plant



The project planning is in an early stage. The most important first step is an expert feasibility and market study that would estimate the economics of the project, latex market potentials and identifiers, possible licensors and technology suppliers.

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Unipetrol / Kaucuk HIPS Unit Expansion Project



Planned Additions/Expansions

- Mass HIPS Unit – Capacity Expansion

Project Summary

Sector	Refining and Petrochemical
Location	Kralupy, Czech Republic
Capital Required	\$14 million
Export Potential	\$4 million
Project Sponsor	Unipetrol, a.s.
Project Status	Feasibility study underway

Project Discussion

Project Background

Unipetrol, a.s. is a holding company, which assembles a major part of the Czech refining and petrochemical industry. Kaucuk, a.s. (joint stock company) is a chemical company founded in 1957. It is a company fully owned by Unipetrol, a.s. and focuses on production

of Polystyrenes, (GPPS, HIPS, EPS), SBR, ABS and liquid PB.

Production Units:

- Polystyrenes (GPPS, HIPS, EPS)
- SBR
- ABS
- Butadiene
- Styrene
- Liquid Polybutadiene

HIPS belongs to the core business of the Kaucuk company. In its early stages, HIPS was produced by suspension technology but it is now manufactured by a continuous mass polymerization process. HIPS Unit was started in 1985 with a capacity of 38,000 MTY, and uses a technology under Cosden's license. Both extrusion and injection molding HIPS grades are manufactured.

Important environmental improvements have been made but the production portfolio, technology and capacity have not been changed. To keep its market position in the growing markets in Western, Central and Eastern Europe, Kaucuk has decided to improve the quality of their HIPS products while reducing costs. The capacity expansion is the most effective way to decrease the production costs, thus, Kaucuk has decided to expand the capacity of the existing continuous mass polymerization unit from 38,000 MTY to 60,000 MTY.

HIPS Unit expansion also incorporates measures to improve HIPS quality.



Capacity Expansion Plan

A Kaucuk sponsored feasibility study will be completed in December 2001.

The significant quality improvement of the existing HIPS production portfolio is one of the most important conditions for the successful capacity expansion.

The goal of the HIPS quality improvement is focused on the material, final products and processing properties.

At present, a thermal initiated mass continuous polymerization process is used. As a part of the expansion plant, it will be replaced by the chemical initiated polymerization. The extrusion HIPS grade will be improved first.

An additional goal is to decrease the residual volatiles content in the final polymer. Therefore, the de-volatilization part of the HIPS production unit will be modified as a part of the expansion project.

The capacity expansion will be carried out stepwise without a long-term production interruption.

The expansion program is foreseen to be carried out in the following steps:

1. Chemical initiated continuous mass polymerization development. (It has been started.)
2. Capacity expansion to 42,000- 44,000 MTY
3. Modification of the de-volatilization facility; capacity expansion to 50,000 MTY
4. Capacity expansion to 60,000 MTY.

Project Guidance Parameters

Project Costs

Capital costs of the project are estimated at US\$14 million.

Known Initiatives

The feasibility study, including project cost estimates for capacity expansion to 60,000 MTY and product quality improvement, was made by Raytheon Engineers & Constructors Litwin s.a. (1999)

Preliminary studies were made in cooperation Kaucuk with a group of external specialists, including a U.S. specialist.

Kaucuk has started the development of the chemical initiated continuous mass polymerization tailor-made for the HIPS production unit.

Project Schedule

Project Schedule – Time Periods	
Activity	Year
Step 1	2001–2002
Step 2	2002
Step 3	2003
Step 4	2004

Project Financing

KAUCUK assumes to finance the project as follows:

- Steps 1, 2 - own resources
- Steps 3, 4 - combination of own resources and bank loans.



Unipetrol / Kaucuk HIPS Unit Expansion Project



The ratio of own resources and bank loans will be determined according to the conclusions of Kaucuk's feasibility study and to the final Kaucuk's investment decision.

U.S. Competitiveness

The Kaucuk's HIPS production is connected with the company Cosden (Fina Cosden). U.S. engineering companies and manufacturers of the equipment and instrumentation are among possible suppliers.

Conclusion

The Project is a part of Kaucuk's long-term plans.

Following the preliminary studies, Kaucuk decided to develop the chemical initiated continuous mass polymerization process for the HIPS-unit.

Further, steps will be decided according to the conclusions of the Kaucuk's feasibility study.

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Planned Additions /Expansions

- Construction of facility to produce 60,000 MTY of solution styrene butadiene rubbers

Project Summary

Sector	Petrochemicals
Location	Kralupy nad Vltavou
Capital Requirement	\$50 million
Project Sponsor	Unipetrol a.s.
Project Status	Preliminary, seeking partner & technology

Project Discussion

Project Background

Kaucuk a.s. is a major petrochemical company in the Czech Republic and is the country's sole producer of synthetic rubbers and polystyrene plastics. The production of synthetic rubbers was started in 1963 by putting into operation a plant for the manufacture of emulsion styrene-butadiene

rubber (E-SBR) under the trade name KRALEX. The present total capacity of the emulsion SBR plant is 75,000 MTY of E-SBR in several grades. Later, a new low capacity plant (2,000 MTY) was constructed to produce special liquid polybutadienes (KRASOL). Other Kaucuk products are polystyrene plastics, such as expandable polystyrene, high-impact polystyrene, and ABS polymers.

Elastomers are a part of the core business of the Kaucuk company. Though the existing emulsion SBR plant is in very good condition and the company has recently extensively invested in technological and environmental improvements, it is necessary to be prepared for the anticipated market demand. According to all European, as well as worldwide forecasts, the demand for the emulsion SBR should gradually decrease in favor of the more technically advanced solution polymerized styrene-butadiene rubbers (S-SBR). The solution process allows better control of basic polymer parameters and results in better rubber properties, especially when used for the manufacture of tires. S-SBR consumption is expected to increase worldwide over the next five years. Accordingly, the company is planning the construction of a new plant for the manufacturing of the solution polymerized butadiene elastomers.

The butadiene solution anionic polymerization technology allows the production of several types of elastomers in the same process and equipment as S-SBR. Most of the major producers of solution butadiene-based rubbers cannot only manufacture S-SBRs, but also thermoplastic SBS elastomers and polybutadiene rubbers (BR). The combined production is more flexible and can better cope with the market changes. Thus, a combined plant (S-SBR, SBS and BR) could also be an interesting alternative option. An



up-to-date study of the potential markets for their products, alternative technologies and plant configurations, plant capital and O&M costs needs to be carried out to assess the project economics.

The manufacturing of solution SBR has been a part of the company's plans for a long time. Nevertheless, during the 1990's these plans had to be postponed due to other large investment priorities, such as the construction of new plants for the production of styrene monomer and polystyrene plastics.

Project Description

The objective of the project is to construct a synthetic rubber plant for the manufacture of solution styrene-butadiene rubbers (S-SBR). These products are intended as a broadening of the existing production line of emulsion styrene-butadiene rubbers (E-SBR) that are manufactured by the company, and a possible future replacement of the existing E-SBR production.

The initial design capacity of the new S-SBR plant is 60,000 MTY.

Project Guidance Parameters

Project Costs

The capital costs of the project are estimated at US\$50 million.

This estimate is based on previous feasibility and marketing studies in 1996-1997, recent initial discussions with two possible licensors and suppliers of the technology, and also on some experience with similar projects.

Known Initiatives

A feasibility study was carried out in 1996-97 by the ICF Kaiser Engineering and Construction Group ("Marketing and Economics Feasibility of Constructing a Solution Styrene Butadiene Rubber Plant in the Czech Republic," December 1996, prepared for Unipetrol).

ICF Kaiser evaluated E-SBR and S-SBR market and identified solution SBR technology suppliers and licensors. Among the companies identified were two U.S. companies that were contacted as potential licensors or partners in the project.

Project Schedule

The project is a part of Kaucuk's long term plans. The project is to be implemented in following time periods:

Planned Completion Schedule	
Activity	Year
Engineering and design	2002-2003
Financing & construction	2004-2005
Production start	2005

Project Financing

Kaucuk assumes that the financing of the project could to be arranged as a combination of its own resources and bank loans. The ratio between the various sources is to be determined according to the overall costs and the specific project agreements.

Conclusion

The project is a high priority for Kaucuk due to the demand for high quality synthetic rubber in the Central European region.



The implementation of the project would make use of Kaucuk's existing raw material sources, available infrastructure, off-site facilities and experienced technical staff trained in synthetic rubber production technologies.

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GDP (in US\$ billion)	45.6
GDP Growth (est.)	5.0%
GDP Per Capita (US\$)	4,560
Population (Million)	10.0
Credit Rating	A-

Source: European Bank for Reconstruction and Development & The World Bank

Executive Summary

Since 1990, Hungary has pursued economic and political strategies and programs to build an open and free market economy and a political system based on democratic values. To date, over 80% of the economy is privatized and recent years have witnessed mergers, acquisitions, and regional expansion of some of the largest and most successful Hungarian companies, including its oil and petrochemical companies. The FDI inflow was about US\$2 billion in 2000 even though most forgiven investment incentives were phased out. Hungary continues to attract foreign investment primarily due to a stable and favorable investment environment and skilled labor force. According to the EBRD, greenfield projects have attracted most of recent foreign investments, as the privatization process is nearly completed.

Hungary is a founding member of the WTO and CEFTA. In 1998, Hungary began accession negotiations with the EU and is a front-runner among the Central and Eastern European countries for full membership. Hungary also became a member of NATO in 1999.

Hungary's chemical, petrochemical, and refining industries have attracted considerable foreign investment and have participated in recent mergers and expansions in the region. The industry has taken the necessary steps to meet the EU's product standards and improve efficiency. However, significant investment is required in the energy sector and processing industry, including petrochemical and chemical industries, to bring Hungary closer to EU environmental standards.

Political and Economic Climate

Historically, Hungary enjoyed one of the most liberal and advanced economies of the former Eastern bloc countries. By the late 1980s, Hungary had taken a number of economic and market oriented measures such as passing a joint venture law, joining the IMF, and enacting significant corporate and income tax legislation that paved the way for the ambitious market-oriented reforms of the 1990's. Consecutive governments since 1990 have aimed to build an open and free market economy and a democratic political system. Today, Hungary is a well functioning and stable multi-party democracy with a prosperous economy and has one of the most stable and mature financial markets. Hungary has attracted over US\$20 billion in foreign investment in the last decade – more than any other country in Central and Eastern Europe on per capita basis over the past decade. Hungary is a member of WTO, CEFTA, and NATO.



Hungary is also a front-runner among Central and Eastern European countries for full membership in the EU. The EU began accession negotiations with Hungary in 1998. Negotiations have progressed well, as 13 chapters of 31 have been closed and negotiations continue for the remaining chapters. The Hungarian government has also committed to complete preparation for full membership by the end of 2002. Since 2000, the EU has provided Hungary three pre-accession instruments, PHARE Programme, SAPARD, and ISPA, for financing agricultural and rural development and environmental and transportation infrastructure projects. The EBRD reports that Hungary experienced economic growth of approximately 5% in 2000 and projects that the economy will continue to grow at about 5% annually. Prices dropped by 0.3% in 2000 compared to 1999. Falling oil prices, the strengthening of the Euro, and its monetary policy are likely to support some disinflation in 2001.

Investment Climate

Since 1990, Hungary has attracted over US\$23 billion in foreign direct investment (FDI), about one-third of all FDI in all Central and Eastern Europe. The U.S., with 35% of total investment, is the largest single investor. Much of the early investment was the result of the privatization of state-owned enterprises. In recent years, however, most of FDI has been directed toward greenfield projects. Foreign-owned companies generate about 77% of Hungary's exports, 33% of GDP, and 25% of private sector employment. The EBRD reports that more than 18,000 joint ventures are registered in Hungary and more than 35 of the world's 50 largest multinationals have a Hungarian subsidiary. Eighty multinational companies are reported to have their regional headquarters in Hungary. Hungary's well

developed financial and commercial infrastructure, well educated and skilled labor force, and transparent transactions have been the primary factors in continuing to attract foreign investors. Favorable policies toward foreign investors and special tax incentives (which were in place until 1995) contributed to early foreign investment.

The privatization of state-owned enterprises is about 80% complete. The state still owns some large companies such as the main electric grid company, the railways, and 25% shares in a pharmaceutical company and MOL, the Hungarian Oil and Gas Company.

The establishment of foreign owned companies is governed by the 1998 Act on Investments of Foreigners in Hungary. This act also grants significant rights and benefits to foreign investors. It provides protection against losses resulting from nationalization, expropriation, or similar measures, and guarantees free repatriation of invested capital and dividends. Hungary has also adopted the EU's anti-discrimination laws; therefore investment incentives are available to all qualified investors, regardless of their nationality. Current investment incentives include:

- 100% corporate tax holiday through 2011 for investments greater than HUF 10 billion (about US\$42 million).
- 100% corporate tax holiday through 2011 for investments greater than HUF 3 billion (about US\$12.6 million) in designated underdeveloped areas.
- Regional support in Hungary's 19 counties in the form of grants, loans, support for interest payment for greenfield projects creating more than 100 jobs.



- Interest support for capacity-increasing investments by small and medium size enterprises.
- Wage support, training subsidies, social security cost reimbursement, and commuting expenses.
- Export credit subsidies including subsidies for promotions.
- Custom-free zones.

Currently, the corporate tax rate is 18%, the VAT rate is 25% and employer's social security contribution rate is 33%. The top personal income tax rate is 40%.

The average tariff on imported products was 12.4% in 2000. Tariffs for industrial products imported from the EU will be eliminated by the end of this year. About 90% of all industrial products are also traded duty free among the members of CEFTA, which includes Hungary, the Czech Republic, Slovakia, Poland, Bulgaria, and Romania (Croatia is in the process of joining CEFTA). The EU countries account for about 75% of exports and 67% of imports. Germany, Austria and Italy are Hungary's most important trading partners and Russia is Hungary's primary provider of energy resources. In recent years, exports of apparel and clothing accessories, automobile parts, and machinery have increased while the share of its food industry, although still important, has dropped. Hungarian imports primarily include fuel and capital goods.

Sector Overview

Hungarian Oil and Gas Company, MOL, is the largest company in the country, a dominant force in the sector, and increasingly a major player in the region. MOL dominates importing and marketing of oil and it refines

products in the country. It owns the largest oil retail network representing 34% of the market, has one-third stake in TVK Rt., one of Hungary's largest petrochemical companies, and holds a monopoly in the gas market. MOL was privatized in 1994 and foreign investors hold approximately 55% of its shares, the state 25% plus a golden share, and domestic investors the remaining shares. MOL purchased a 36% stake in Slovnaft, a major refinery in Slovakia, and is planning expansion into Poland. MOL also has retail operations in Romania and has announced large-scale expansion plans there.

TVK Rt. and BorsodChem Rt. are two of the largest companies in the country. BorsodChem is a leading producer of plastic raw material and operates subsidiaries that dominate the field of plastic processing. TVK is a major producer and processor of ethylene and polyethylene in the region. Recently, a large number of small and medium size enterprises and foreign owned chemical plants have also been established to support manufacturing of components for the automotive industry.

U.S. Presence

From 1990 to 2000, the U.S. investment in Hungary amounted to about US\$2 billion. Although the U.S. firms have not made a major contribution to investments in the chemical, petrochemical or refining sectors, the U.S. technologies are applied in these sectors. Some of the U.S. corporations active in Hungary include GE, GM, Ford, and Coca-Cola.



TVK Wastewater Treatment Project



Planned Expansions and Additions

- Expansion of an existing wastewater treatment facility
- Addition of salt removal/separation technology

Project Summary

Sector	Petrochemical
Location	Tiszaújváros, Hungary
Capital Required	>\$5 million
Export Potential	>\$2 million
Project Sponsor	TVK
Project Status	Preliminary Planning

Project Discussion

Project Background

TVK, with a market capitalization of US\$400-US\$500 million, is one of the top three petrochemical companies in Eastern Europe and is the 12th largest company in Hungary in terms of sales. TVK is the sole producer of polyolefin in Hungary supplying domestic plastic companies and several Western and Eastern European companies. About 50% of TVK products are exported to several European countries; the remainder is consumed domestically.

The TVK plant at Tiszaújváros includes the following major facilities:

- A 360,000 MTY Steam Cracking unit. This cracker largely converts naphtha into ethylene, but can also be fed LPG's and atmospheric gas oils. Linde is the technology supplier.
- A 200,000 MTY High Density Polyethylene (HDPE) unit using Philips technology.
- Two Low Density Polyethylene (LDPE) units. The oldest unit, built in 1970, is based on ICI's technology and has a capacity of about 135,000 MTY. The newer unit, built in 1991, is based on BASF technology.
- Three polypropylene plants. The oldest line, using Sumitomo technology, is shut down. The two newer units are based on Basell (Himont/Montell) technology. One unit has a capacity of 115,000 MTY, the other 140,000 MTY and is being expanded to 175,000 MTY.
- Granulation, packaging and storage facilities.

TVK receives naphtha feed from the MOL Danube refinery via a dedicated pipeline. Byproduct pygas, gas oils, C4's, etc. are returned to MOL.

The site can also deliver or receive ethylene via pipeline from Ukraine (Oriana). This capability has been used to cover ethylene plant maintenance shutdowns, allowing downstream units to continue production and continue supply to BorsodChem, a chemical company in Kazincbarcika, located in the northeastern region of the country.

Most of the products are in granular form and are shipped by trucks to customers. Products are marketed domestically and abroad. More than 50% of the products are exported from



TVK Wastewater Treatment Project



Hungary using TVK's own sales offices in Austria, Germany, Italy, and the UK. Technologies and costs are equivalent to Western plants, so freight plays the largest role in determining where products can be economically placed.

Project Description

Following a planned expansion of the steam cracker by 250,000 MTY and the equivalent downstream units, the wastewater discharge increase and the salt content of the wastewater will exceed the permitted quantity for discharge into the Tisza River. TVK will need a technology survey and implementation plan to mitigate the increased salt content. TVK expects to receive waivers for the salt-water discharge from Authorities in support of their expansion project. However, the expectation is that such a waiver will not be for a long period and that the water will require treatment in the long term. Capital cost has not been determined, pending a technology review. However, TVK is assuming an estimate of greater than US\$5 million.

Equipment required for this project potentially includes reactors, separation technology and equipment, filters, pumps, storage tanks, piping, electrical distribution, and process controls.

Project Guidance Parameters

Project Costs

The wastewater treatment project is estimated to cost in excess of US\$5 million with over US\$2 million potential for the import of technology, equipment, and services.

Known Initiatives

TVK has embarked on a US\$450 million expansion project at the site, to be completed by 2004. The project includes expansion of the steam cracker by 250,000 MTY. The increased ethylene production will be absorbed by equivalent downstream polyethylene capacity increases plus sales to BorsodChem.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Plant Start-up	4 th	2006

Project Financing

Project financing has not yet been addressed. However, project financing is not anticipated to be difficult considering TVK's past experience in financing large-scale projects and the availability of funds for environmental projects in Hungary as a part of the EU pre-accession process.

U.S. Competitiveness

U.S. companies such as Calgon Carbon Corporation, Tempest Environmental Systems, USFilter, Industrial Waste Water Services, and many others can provide technologies, specialized equipment and the engineering services required for this project. European companies such as Ondo Degremont may also compete for this project.

Conclusion

TVK are expanding their facilities significantly, and need to make investments in wastewater treatment to maintain and improve



TVK Wastewater Treatment Project



their current discharge quantities and to comply with the existing and future water discharge regulations and permits.

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TVK Polyethylene Plant Expansion Project



Planned Additions

- Expansion of Existing High Density Polyethylene Plant

Project Summary

Sector	Petrochemical
Location	TVK Site; Tiszaújváros, Hungary
Capital Required	>\$30-40 million
Export Potential	>\$9-12 million
Project Sponsor	TVK
Project Status	Preliminary planning

Project Discussion

Project Background

TVK, with a market capitalization of US\$400-US\$500 million, is one of the top three petrochemical companies in Eastern Europe and the 12th largest company in Hungary in terms of sales. TVK is the sole producer of polyolefin in Hungary supplying domestic plastic companies and several Western and Eastern European companies. About 50% of TVK products are exported to several European countries; the remainder is consumed domestically.

The TVK plant at Tiszaújváros includes the following major facilities:

- A 360,000 MTY Steam Cracking unit. This cracker largely converts naphtha into ethylene, but can also be fed

LPG's and atmospheric gas oils. Linde is the technology supplier.

- A 200,000 MTY High Density Polyethylene (HDPE) unit using Philips technology
- Two Low Density Polyethylene (LDPE) units. The oldest unit, built in 1970, is based on ICI's technology and has a capacity of about 135,000 MTY. The newer unit, built in 1991, is based on BASF technology.
- Three polypropylene plants. The oldest line, using Sumitomo technology, is shut down. The two newer units are based on Basell (Himont/Montell) technology. One unit has a capacity of 115,000 MTY, the other 140,000 MTY and is being expanded to 175,000 MTY.
- Granulation, packaging and storage facilities.

TVK receives naphtha feed from the MOL Danube refinery via a dedicated pipeline. Byproduct pygas, gas oils, C4's etc. are returned to MOL.

The site can also deliver or receive ethylene via pipeline from Ukraine (Oriana). This capability has been used to cover ethylene plant maintenance shutdowns, allowing downstream units to continue production and continued supply to BorsodChem, a chemical company in Kazincbarcika, located in the northeastern region of the country.

Most of the products are in granular form and are shipped by trucks to customers. Products are marketed domestically and abroad. More than 50% of the products are exported from Hungary using TVK's own sales offices in Austria, Germany, Italy, and the UK. Technologies and costs are equivalent to



TVK Polyethylene Plant Expansion Project



Western plants, so freight plays the largest role in determining where products can be economically placed.

Project Description

TVK plans to optimize the utilization of the ethylene production resulting from their on-going steam cracker expansion project by processing ethylene to polyethylene. TVK's ethylene plant expansion is partly predicated on the sales of ethylene to BorsodChem. In the event these sales do not materialize, TVK would have surplus ethylene. TVK is contemplating restarting an old ICI LDPE or expanding their Philips HDPE plant to process any potential ethylene surplus. A feasibility study needs to be conducted to evaluate which one of the above two options is more viable.

Project Guidance Parameters

Project Costs

The polyethylene expansion project is estimated to cost US\$30-US\$40 million of which US\$9 to US\$12 million is expected to be imported.

Known Initiatives

TVK has embarked on a US\$450 million expansion project at the site, to be completed by 2004. The project includes the expansion of the steam cracker by 250,000 MTY. The increased ethylene production will be absorbed by equivalent downstream polyethylene capacity increases plus sales to BorsodChem.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility study	1 st	2002
Financing & construction		2002-2004
Plant Start-up	1 st	2004

Project Financing

Project financing has not yet been addressed.

U.S. Competitiveness

U.S. firms such as Parsons, Kellogg, Stone & Webster, ABB Lummus Global, could be very competitive in supplying the engineering services required for this project.

Conclusion

TVK are expanding their facilities significantly. The polyethylene expansion project will optimize the use of their ethylene production capability and allow the utilization of any potential excess should BorsodChem fail to purchase ethylene from TVK. TVK will import additional ethylene should BorsodChem continue purchases of ethylene from TVK.



Key Contacts

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environmental cleanup, modernization, and energy and operational efficiency improvements. These sectors require hundreds of millions of dollars of capital infusion as well as new and more effective technologies to overcome many years of neglect and the market inefficiencies of a centrally planned economy.

Poland set a record for foreign investment in 2000 with an estimated US\$9.3 billion entering the country. Much of this foreign investment was due to the country's privatization efforts; almost 78% of the shares of Poland's largest oil and refining conglomerate is available for purchase on the London and Warsaw exchanges and the four largest fertilizer producers are scheduled for privatization in 2001 and 2002.

GDP (in US\$ Billion)	166.2
GDP Growth (est.)	4.1%
GDP Per Capita (US\$)	4,191
Population (Million)	38.7
Credit Rating	BBB+

Source: European Bank for Reconstruction and Development and the World Bank

Political and Economic Climate

The general elections of September 2001 have brought a new coalition of parties to power in the Parliament, but this change in government is not expected to affect Poland's central policy aim of joining the EU. There is a broad political consensus for reform that has driven the nation's move towards privatization, facilitating foreign direct investment, maintaining economic growth, good export performance, and sustaining macro-economic stability. Poland is already a member of the WTO, the OECD, NATO and has shown active support for the Stability Pact for southeastern Europe. Poland is also a member of the Central European Free Trade Agreement (CEFTA) (other current members of CEFTA include Bulgaria, the Czech Republic, Hungary, Romania, Slovakia, and Slovenia).

Executive Summary

One of the most advanced transition economies, Poland has kept up its record of uninterrupted growth for nine years. By continuing to encourage growth, privatization, and foreign investment, Poland has sustained macro-economic stability and continues on its course for membership in the European Union (EU). Poland is a member of the WTO, NATO, CEFTA, and is currently in EU accession negotiations.

As Poland prepares for full entry into the EU, Poland's chemical, petrochemical and refining industry faces the major issues of

The EBRD reports that Poland has achieved impressive economic performance over the last several years. The economy grew 4.1% in



2000 due to strong output growth, an increase in both domestic and foreign demand, and a significant inflow of foreign direct investment. Economic growth is projected to be 4.5% in 2001 due to the slowdown in EU economies, the real appreciation of the Zloty, and depressed domestic demand.

The inflation rate increased from 7.3% in 1999 to 10.1% in 2000 and is forecast to decrease to 6.8% in 2001.

Investment Climate

Poland has become a leader in recent years among Central and Eastern European countries in terms of foreign investment. Poland is attractive to foreign investors because of factors such as the strong growth perspective of the economy, relatively a low labor costs, large labor pool, size of the domestic market, prospects for EU accession, and a generally good business climate. Poland attracted a record amount of foreign investment in 2000, estimated at US\$9.3 billion.

Foreign-owned companies enjoy national treatment in Poland and operate under general business legislation. Foreign companies operate under the same tax and labor codes as domestic companies and are free to repatriate capital.

In 2000, a major tax reform was launched. Corporate income tax will be steadily lowered – from 34% in 1999 to 30% in 2000, to 28% in 2001-2002, to 24% in 2003, and to 22% in 2004. January 1, 2001 saw several significant legal changes that came into effect that further enhanced the attractiveness of the Polish market and cleared some of the legal barriers that had hindered foreign investors for the past few years.

Poland has 17 Special Economic Zones (SEZs), of which 15 are active. Foreign investors located in SEZs receive preferential treatment and tax breaks, including partial or total exemption from income tax for a defined period of time, treating certain parts of investment outlays as revenue expenditure, and exemption from certain local taxes.

In recent years, most foreign investment has been due to the privatization process. The largest deal in 2000 was the sale of a 35% stake in telecom operator Telekomunikacja Polska (TPSA) to a consortium led by France Telecom. Net FDI was over US\$35.5 billion in 1991-2000, with the financial sector accounting for almost 24% of the overall inflow of direct investment by the end of June. Other sectors attracting and expected to attract foreign investment due to privatization are: telecommunications, transportation, energy, power, food processing, automotive, wood processing, printing and publishing, and non-metal goods sub-sectors. The U.S. replaced Germany in 2000 as the leader in foreign investment to Poland; Germany, the U.S., the Netherlands, and France jointly account for 70% of the total FDI stock invested in Poland.

Poland is a member of the World Trade Organization (WTO). Poland is in EU accession negotiations, and is bringing its tax system into harmony with the EU as well as preparing its markets for the pressures of full market integration by continuing market reforms in the agriculture and heavy manufacturing sectors. Poland is also a member of the Central European Free Trade Agreement (CEFTA).

Poland's largest trading partners are Germany, followed by Italy, France, the Netherlands, and the UK. Although a member of CEFTA, the majority of Poland's trade is with EU nations. Poland also holds free trade



agreements with Turkey, Estonia, Latvia, Lithuania, the EFTA countries, and Israel.

The main Polish exports are cars and car parts, wood and timber products, machinery and equipment. The imports include capital goods, machinery, transportation equipment, mineral fuels, lubricants, and agricultural products.

Sector Overview

The largest player in the oil refining and petrol retail sector is PKN Orlen, which holds 70% of the market. PKN Orlen includes the Petrochemia Plock refinery and the petrol retail chain CPN, which has 30% of the market. With a market value of US\$1.9 billion and a refining capacity of 13.5 million tons of crude per year, being expanded to 20 million MTY, PKN Orlen is Poland's largest listed company, with 71.5% of its stock on the Warsaw and London stock exchanges and the remaining 28.5% held by the Polish State Treasury. PKN Orlen has plans to expand in the region, and it is reported that it is interested in purchasing Rafineria Gdanska, Poland's second largest oil refinery. PKN Orlen is also seeking a strategic alliance and is in talks with the Hungarian oil and gas group MOL and Austrian petrochemical conglomerate OMV about possible cooperation in the Polish fuels market or even creating a large regional company in Central Europe.

Poland's four largest fertilizer producers are being privatized. They are: Nitrogen Works Pulawy, Nitrogen Company Police S.A., Nitrogen Company Kedzierzyn S.A., and Nitrogen Company Tarnów S.A. Pulawy is planned to be privatized in 2001, is the leading producer of fertilizers in Poland with a 50% share of the domestic market, and is in the best economic condition because it is the largest domestic producer of melamine, used

in the manufacturing of paints, synthetic resins, and varnishes. In 2001, the Treasury Ministry solicited bids for a 10% to 85% stake in Kedzierzyn, which produces fertilizers, organic chemicals, Oxo alcohol and adhesives. Kedzierzyn also has innovative processes, modern facilities, ISO-9000 certification and produces fertilizers to European quality specifications. The government also accepted bids in February 2001 for a 10% to 85% share of Police, which produces chemical products and semi-products. The privatization of Police, which produces nitrogenous fertilizers and titanium dioxide, was delayed due to insufficient bidders.

In general, the Polish chemical sector has inherited old and inefficient plants from the communist era that show an excessive use of raw materials, poor energy efficiency, and low utilization of existing capacity. The Polish chemical producers are eager to modernize their plants and replace existing technology and equipment with modern, efficient, and environmentally friendly technologies and plant equipment. They realize they must do this if they are to be competitive in the global marketplace and meet European Union standards.

U.S. Presence

The U.S. is Poland's 7th largest trading partner and surpassed Germany in 2000 as the country with the most amount of foreign investment in Poland. Polish chemical producers prefer U.S. process control technology and U.S. equipment and products. However, their knowledge of U.S. products and processes is limited because they are constantly exposed to German, Austrian, French, Belgian, Dutch and Scandinavian products. Producers from these countries are opening offices in Poland and are making their products generally known to the Polish market.



Planned Additions/Expansions

- Increase plant capacity from 40,000 MTY to 120,000 MTY.
- Substitute hydrochloric acid for brine in the chlorine manufacturing process to produce 50,000 MTY of chlorine.
- Modernize the existing 40,000 MTY chlorine production and cells and expand to 70,000 MTY.
- Improve overall product yield and minimize waste.

Project Summary

Sector	Chemicals
Location	Bydgoszcz, Poland
Capital Required	\$70 million
Export Potential	\$35 million
Project Sponsor	Zachem
Project Status	TDA grant approved

Project Discussion

Project Background

With over \$208 million in revenues, 400 products and 2,200 employees, Zachem is one of the largest chemical companies in the northwestern region of Poland. Zachem began operations in 1948 as a state-owned company and continues to be state-owned.

Representatives from the State Treasury Ministry serve on its Board of Directors. The General Manager operates the company under a management contract. Zachem is ready for privatization, which will take place within one to two years.

Zachem's manufacturing complex is located in the City of Bydgoszcz, where it produces the following chemicals: Dyestuffs, epichlorohydrin, polyurethane foam, PVC compounds, chlorine, caustic soda, hydrochloric acid, sodium hydroxide, sodium hypochloride and liquid phosgene. Zachem is an important producer of toluene diisocyanate (TDI) used in the production of polyurethane foams for soft cushions and seats in the furniture and automotive industries.

Zachem products are used in the following industries:

- Textiles, fibers, paper, detergents
- Chemicals
- Furniture
- Plastics
- Household chemicals

Zachem's most important objectives are to increase its chlorine production by 80,000 MTY (from 40,000 MTY to 120,000 MTY), replace brine with hydrochloric acid in the new chlorine production, modernize the cells



in the existing 40,000 MTY chlorine plant and improve the efficiency of its operations while increasing capacity.

The capacity expansion is needed to maintain Zachem's market share in TDI production and its profitability. Zachem is expanding its TDI capacity to keep pace with the growing demand for soft cushions in the furniture and automotive industries. By recycling hydrochloric acid in its new chlorine plant, Zachem will increase efficiency, lower environmental emissions, and increase production safety.

Chlorine Plant Capacity	
Current	40,000 MTY
Planned	120,000 MTY

Modernization Plan

Zachem plans to use hydrochloric acid as its raw material for chlorine production rather than brine, which is used in conventional chlorine plants. By recycling hydrochloric acid, Zachem expects to use less electricity, avoid storage and transportation costs, and increase productivity and safety.

Zachem's management seeks a U.S. licensor for hydrochloric acid based chlorine production.

Zachem desires to complete the feasibility study by the first quarter of 2002. During 2002, it plans to finalize the financing and start construction.

Project Guidance Parameters

Project Costs

The plant capacity expansions and modernization is estimated to cost US\$70

million, of which \$35 million is anticipated to be U.S. exports.

Known Initiatives

Zachem has previously conducted an internal study of the TDI expansion and is implementing it. Based on the TDI expansion currently underway, Zachem requested that TDA fund a feasibility study to evaluate the technical and economic viability of the process change and plant capacity expansion. TDA has approved the grant for Zachem's feasibility study. Currently, preparations are underway for a public tender to select the consulting firm that will execute this study.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	QTR	Year
Feasibility study	1 st	2002
Financing		2002
Construction		2003

Project Financing

The capital cost of the capacity addition is expected to reach \$70 million. Zachem is willing to contribute 20% (\$14 million) from its internal sources. The balance will have to come from a partner and lenders like Ex-Im Bank, OPIC, EBRD and commercial lenders. The Polish National Fund for the Protection of the Environment and the Water Ways is likely to participate in a consortium to finance this project.

Preliminary discussions have been held with Ex-Im Bank and OPIC. These discussions have been encouraging.

**U.S. Competitiveness**

Several U.S. chemical companies are using hydrochloric acid instead of brine in the production of chlorine. Therefore, U.S. engineering companies having the licensing right to this technology are expected to be very competitive. In addition, U.S. suppliers of modern cells, DCS control systems and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This project has a high priority for Zachem because of its important contribution to the continued competitiveness of the company in Poland and the region, as well as its contribution to the local economy in the Bydgoszcz area.

The project also allows Zachem to maintain its leading market share in the TDI and polyurethane foam industries.

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Zachem Phosgene, Epichlorohydrin and Allyl Chloride Derivatives

ZACHEM



Planned Additions/Expansions

- Construct:
 - 4,000 MTY Chlorides
 - 10,000 MTY Epichlorohydrin derivative plant
 - 4,000 MTY Allyl Chloride derivatives
 - Improve overall product yield

Project Summary

Sector	Chemicals
Location	Bydgoszcz, Poland
Capital Required	\$30 million
Export Potential	\$15 million
Project Sponsor	Zachem
Project Status	Preliminary Planning

Project Discussion

Project Background

With over \$208 million in revenues, 400 products and 2,200 employees, Zachem is one

of the largest chemical companies in the northwestern region of Poland. Zachem began operations in 1948 as a state-owned company and continues to be state-owned.

Representatives from the State Treasury Ministry serve on its Board of Directors. The General Manager operates the company under a management contract. Zachem is ready for privatization that will take place within one to two years.

Zachem's manufacturing complex is located in the city of Bydgoszcz, where it produces the following chemicals: Dyestuffs, epichlorohydrin, polyurethane foam, PVC compounds, chlorine, caustic soda, hydrochloric acid, sodium hydroxide, sodium hypochloride and liquid phosgene. Zachem is an important producer of toluene diisocyanate (TDI), which is used in the production of polyurethane foams for soft cushions and seats in the furniture and automotive industries.

Zachem products are used in the following industries:

- Textiles, fibers, paper, detergents
- Chemicals
- Furniture
- Plastics
- Household chemicals

Zachem is the only producer of phosgene, epichlorohydrin and allyl chloride in Poland. One of Zachem's most important objectives is to start-up production of derivatives from these products.

Modernization Plan

Zachem would like to produce 4,000 MTY of chlorides from phosgene, using its own

**Zachem Phosgene, Epichlorohydrin and Allyl Chloride Derivatives****ZACHEM**

manufacturing process. Chlorides are used in the production of alkyl ketene dimer, used in the paper industry. From epichlorohydrin it would like to produce 10,000 MTY of epipolyamines, dimethylamines, polyamide-epichlorohydrin resins, and possibly epichlorohydrin elastomers using licensed U.S. technology. Most of these products are used in the paper industry, and to a smaller degree in the textile industry.

From allyl chloride, using licensed U.S. technology, it would like to produce DADMAC (diallyldimethylammonium), sodium allylsulfonate and trimethylolpropane diallyl ether.

New Derivative Plant Capacity		
	Current	Future
Phosgene	0	4,000 MTY
Epichlorohydrin	0	10,000 MTY
Allyl Chloride	0	4,000 MTY

Zachem plans to use the phosgene, epichlorohydrin and allyl chloride derivatives to penetrate markets closer to the users and consumers, improving its profit margins and creating outlets for its own production. By using its own products as feedstocks, it will also reduce the cyclical nature of its production, improve transportation costs, and increase productivity and safety.

Zachem's management seeks a U.S. licensor for the epichlorohydrin and allyl chloride derivatives production.

Zachem desires to complete the feasibility study in 2002. During 2002 it plans to finalize the financing and start construction.

Project Guidance Parameters**Project Costs**

The plant capacity expansion and modernization is estimated to cost \$30 million, of which \$15 million is potential U.S. exports.

Known Initiatives

Zachem has previously conducted an internal study of the phosgene, epichlorohydrin and allyl chloride expansion and plans to implement it, subject to the findings of a more detailed feasibility study. Zachem plans to request that TDA fund this more detailed feasibility study to evaluate the technical and economic viability of the processes and plant capacity expansion. TDA previously extended a grant to Zachem to conduct a study to assess the feasibility of expanding its chlorine production from 40,000 MTY to 1200,000 MTY.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	QTR	Year
Feasibility study	1st	2002
Financing		2002
Construction		2002-2003

Project Financing

The capital cost of the capacity addition is expected to reach \$30 million. Zachem is willing to contribute 20% (\$6 million) from its internal sources. The balance will have to come from a partner and lenders like Ex-Im Bank, OPIC, EBRD and commercial lenders. The Polish National Fund for the Protection of the Environment and the Water Ways is likely

**Zachem Phosgene, Epichlorohydrin and Allyl Chloride Derivatives****ZACHEM**

to participate in a consortium to finance this project.

Preliminary discussions have been held with the Ex-Im Bank and OPIC. These discussions have been encouraging.

U.S. Competitiveness

Several U.S. chemical companies are producing phosgene, epichlorohydrin and allyl chloride derivatives and own the technology. Therefore, U.S. engineering companies having the licensing rights to this technology are expected to be very competitive. In addition, U.S. suppliers of modern cells, DCS control systems, and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

The project has a high priority for Zachem because of its important contribution to the continued competitiveness of the company in Poland and in the region as well as its contribution to the local economy in the Bydgoszcz area.

The project also allows Zachem to maintain its leading market share in the phosgene, epichlorohydrin and allyl chloride industries.

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Kedzierzyn Nitric Acid and Neutralization Plant Project



It operates a manufacturing complex located in Kedzierzyn-Kozle, in southwestern Poland. Its main products are nitrogen fertilizers, phthalates, Oxo alcohols and maleic anhydride.

About 53% of Kedzierzyn's products are exported mainly to Western European countries.

Kedzierzyn products are used in the following industries:

- Chemicals
- Agriculture
- Plastics

Planned Additions/Expansions

- A 300,000 MTY nitric acid plant
- A 100,000 MTY neutralization plant

Project Summary

Sector	Chemicals
Location	Kedzierzyn-Kozle
Capital Required	\$80 million
Export Potential	\$40 million
Project Sponsor	Kedzierzyn
Project Status	Preliminary planning

Project Discussion

Project Background

With some \$240 million in revenues, 60 products and 2,200 employees, Kedzierzyn is a leading nitrogen fertilizer producer in Poland. It began operations as a government-owned facility and is now being privatized.

Project Description

Kedzierzyn is producing about 700,000 MTY of nitrogen fertilizers per year from Russian imported natural gas. Its gas synthesis and ammonia plants are modern facilities. However, the ammonia production is limited by the capacity of a 40 year old nitric acid plant and an equally old neutralization plant. Both plants are inefficient, technically obsolete, and cause pollution. Kedzierzyn's most important objective is to replace the old nitric acid and neutralization plants with modern facilities. This will allow the company to increase ammonia production to its designed capacity of 1500 MTD, considerably increasing nitrogen fertilizer production. It will also eliminate pollution, lower production costs, and increase profitability. Demand for fertilizers is expected to grow by about 60% once Poland joins the European Union and its farmers gain access to western European food markets and EU farm subsidies.



Kedzierzyn Nitric Acid and Neutralization Plant Project

Nitric Acid Plant Capacity	
Current	264,000 MTY
Planned	300,000 MTY
Neutralization plant	100,000 MTY

Kedzierzyn's front-end fertilizer production line consists of synthesis gas and ammonia synthesis are technically quite acceptable. However, the tail end fertilizer production requires modernization. Ammonia is converted in two nitric acid plants. One of them is a modern plant with almost no impact on the environment, while the second is more than 40 years old, with a high level of NO_x emissions. This plant has to be replaced with a modern nitric acid plant. The next stage of the fertilizer production line is the neutralization plant. In this facility, a neutralization reaction between ammonia and nitric acid takes place and ammonium nitrate is produced. The neutralization plant is also old and is not capable of operating with nitric acid of more than 50% concentration. Modern plants integrate both facilities into one plant.

Kedzierzyn's objective is to maintain and increase nitrogen fertilizer production above its current level of 700,000 MTY. With the existing old plants it will be difficult to maintain a nitrogen fertilizer production at 700,000 MTY. Kedzierzyn is considering the following options: a) to build a new nitric acid and neutralization complex, or b) find a modern used nitric acid – neutralization plant.

Kedzierzyn's management seeks a U.S. licensor for the nitric acid-neutralization technology.

Kedzierzyn's management desires to complete the feasibility study in early 2002. During 2002, it plans to finalize the financing and start construction.

Project Guidance Parameters

Project Costs

The estimated cost of a new nitric acid and neutralization plant is about \$80 million. A used nitric acid plant may be acquired for \$40 million.

Known Initiatives

Kedzierzyn previously conducted an internal technical study, and management has placed a high priority on implementing this project. Based on the findings of its own study, Kedzierzyn will request that TDA fund a feasibility study to evaluate the technical and economic viability of the required process changes and capacity additions. TDA has recently approved a grant to Kedzierzyn for conducting a study to assess the technical and economic viability of constructing a 150,000 MTY methanol plant.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility study	1st	2002
Financing and construction		2002

Project Financing

Kedzierzyn is considering two alternatives for financing this project. First, they are looking at project financing of the nitric acid and neutralization plants as an integral part of the existing operations. Second, they are looking at attracting a joint-venture partner and configuring the nitric acid-neutralization plants as a separate stand-alone joint venture.



Kedzierzyn Nitric Acid and Neutralization Plant Project

U.S. Competitiveness

Modern nitric acid and neutralization process technology is available in the U.S. Firms having the licensing rights to the technology are expected to be very competitive. In addition, DCS control systems and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This project is a high priority for Kedzierzyn because of its important contribution to the continued competitiveness of the company in Poland and the region as well as its contribution to the local economy, particularly the Kedzierzyn-Kozle area.

This project also allows Kedzierzyn to improve its return on equity, on capital, and on assets.

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Kedzierzyn Oxo Aldehyde and Oxo Alcohol Derivatives Project



Planned Additions/Expansions

- Complex A using Oxo aldehydes as feedstock:
 - A 25,000 MTY neopentyl glycol (NPG) plant
 - A 10,000 MTY trimethylolpropane (TMP) plant,
 - A 1,000 MTY triolate
- Complex 8 using Oxo alcohols as feedstock:
 - A 35,000 MTY acrylic esters (butyl acrylate and 2-EH acrylate) + optionally 50,000 MTY of acrylic acid
 - A 10,000 MTY butylamine

Project Summary

Sector	Chemicals
Location	Kedzierzyn-Kozle Poland
Capital Required	\$60 million, for both projects
Export Potential	\$30 million
Project Sponsor	Kedzierzyn
Project Status	Preliminary planning, seeking technology licensors

Project Background

With some US\$240 million in revenues, 60 products and 2,200 employees, Kedzierzyn is a leading nitrogen fertilizer producer in Poland. It began operations as a government-owned facility and is now being privatized.

It operates one manufacturing complex located in Kedzierzyn-Kozle, in southwestern Poland. Its main products are nitrogen fertilizers, phthalates, Oxo alcohols and maleic anhydride.

About 53% of Kedzierzyn's products are exported mainly to Western European countries.

Kedzierzyn products are used in the following industries:

- Chemicals
- Agriculture
- Plastics

Kedzierzyn's Oxo plant is currently producing 205,000 MTY of alcohols or aldehydes, using Union Carbide's low pressure Oxo process. The feedstock is 140,000 MTY of propylene. In 2000, Kedzierzyn produced 163,000 MTY of Oxo products compared to 2001, when it



Kedzierzyn Oxo Aldehyde and Oxo Alcohol Derivatives Project

produced 90,000 MTY during the first 8 months. Of the 163,000 MTY produced in 2000 some 120,000 MTY were sold abroad, generating export proceeds of US\$70 million. However, of the 90,000 MTY produced in the first 8 months of 2001, 60,000 MTY were sold abroad, producing only US\$30 million in export revenues.

Kedzierzyn consumes some Oxo alcohols in its own production of phthalates, with most of it going abroad. New Oxo alcohol capacity has come on stream worldwide, causing overcapacity and lower prices. A shortage of propylene is also developing in Poland. In response, Kedzierzyn is considering a two-pronged strategy: a) New products using Oxo intermediates as raw material and b) feedstocks that are different than propylene.

Project Description

Kedzierzyn is motivated to evaluate the production of: 1) Neopenyl glycol, trimethylolpropane and trioleate, from Oxo aldehydes, 2) acrylic esters, acrylic acid and butylamine from Oxo alcohols and replacing propylene with butylenes for the production of C-10 alcohols. None of these products are made in Poland and are currently imported.

Kedzierzyn's Oxo plant consists of 3 parts: aldehyde production, butanol production and 2-ethylhexanol production. In the aldehyde unit, a chemical reaction between propylene and synthesis gas is taking place with Oxo aldehydes, producing n- and iso-butyraldehydes. In the butanol unit, hydrogenation of Oxo aldehydes produces n-butanol as well as iso-butanol. In the 2-ethylhexanol unit, the n-butyraldehyde is primarily aldolized and then hydrogenated to 2-ethylhexanol.

Kedzierzyn's objective is to regain its prominent market position in Oxo alcohols by entering the production of derivatives and switching feedstock away from propylene.

Kedzierzyn's management seeks a U.S. licensor for the Oxo alcohol derivative production technology.

Kedzierzyn's management desires to complete the feasibility study in 2002. During 2002, it plans to finalize the financing and start construction.

Project Guidance Parameters

Project Costs

The estimated cost for complex A, consisting of 25,000 MTY of NPG, 10,000 MTY of TMP and 1,000 MTY of trioleate is US\$15 million. Complex B, consisting of 35,000 MTY of acrylic esters and 10,000 MTY of butylamine will cost US\$13 million. The optional 50,000 MTY acrylic acid plant will add US\$42 million. The total cost of the project is estimated at about US\$60 million.

Known Initiatives

Kedzierzyn previously conducted an internal technical study and management has placed a high priority on implementing this project. Based on the finding of its own study Kedzierzyn will request that TDA fund a feasibility study to evaluate the technical and economic viability of the required process changes and capacity additions.



Kedzierzyn Oxo Aldehyde and Oxo Alcohol Derivatives Project

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing & Construction		2002

Project Financing

Kedzierzyn is considering two alternatives for financing this project. First, they are looking at project financing as an integral part of the existing operations. Second, they are looking at attracting a joint-venture partner and configuring the Oxo derivative plants as a separate stand-alone joint venture.

U.S. Competitiveness

Modern Oxo aldehyde and Oxo alcohol derivatives technology is available in the U.S. Firms having the licensing rights to the technology are expected to be very competitive. In addition, DCS control systems and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This project has a high priority for Kedzierzyn because of its important contribution to the continued competitiveness of the company in Poland and the region, as well as its contribution to the local economy, particularly the Kedzierzyn-Kozle area. This project also allows Kedzierzyn to improve its return on equity, on capital and on assets.

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Kedzierzyn Methanol Plant Project



Planned Additions/Expansions

- Construct a new 150,000 MTY methanol plant.
- Modernize an existing syn-gas plant to serve as front-end of the new methanol plant.

Project Summary

Sector	Chemicals
Location	Kedzierzyn-Kozle Poland
Capital Required	\$27.5 million
Export Potential	\$13.25 million
Project Sponsor	Kedzierzyn
Project Status	Feasibility study underway

Project Discussion

Project Background

With some \$240 million in revenues, 60 products and 2,200 employees, Kedzierzyn is a leading nitrogen fertilizer producer in

Poland. It began operations as a government-owned facility and is now being privatized.

It operates a manufacturing complex located at Kedzierzyn-Kozle, in southwestern Poland. Its main products are nitrogen fertilizers, phthalates, Oxo alcohols and maleic anhydride.

About 53% of Kedzierzyn's products are exported mainly to Western European countries.

Kedzierzyn's products are used in the following industries:

- Chemicals
- Agriculture
- Plastics

Methanol is not currently produced in Poland, resulting in imports of 300,000 metric tons of methanol annually at a cost of US\$60 million – excluding transportation costs. Kedzierzyn alone imports about 75,000 MTY.

Kedzierzyn's most important objective is to produce 150,000 MTY of methanol, using its under-utilized syn-gas capacity. Currently, Kedzierzyn produces syn-gas from imported natural gas as an intermediate product for production of nitrogen fertilizer. Demand for fertilizers is high in the spring and fall and low in summer and winter. Thus, the syn-gas plant is under-utilized during the summer and winter. This spare capacity can be used to produce 150,000 MTY of methanol, by adding the tail end of a methanol plant to the existing syn-gas plant.

A grassroots methanol plant of this size would cost about \$67.5 million. By utilizing the existing syn-gas plant, Kedzierzyn will only have to invest \$27.5 million.



Kedzierzyn Methanol Plant Project

Methanol Plant Capacity

Current	0
Planned	150,000 MTY

Kedzierzyn's objective is to replace 150,000 MTY (50% of imports) of methanol by producing it at its own plant. The new methanol production should increase Kedzierzyn's revenues by some \$30 million, while reducing costs.

Kedzierzyn's management seeks a U.S. licensor for the methanol technology.

Kedzierzyn's management desires to complete the feasibility study in 2001. During 2002, it plans to finalize the financing and start construction.

Project Guidance Parameters

Project Costs

The methanol plant is estimated to have an initial cost of US\$27.5 million, of which about US\$13.75 of equipment and services could be imported from U.S. sources.

Known Initiatives

Kedzierzyn previously conducted an internal technical study and management has placed a high priority on implementing this project. Based on the finding of its own study, Kedzierzyn requested that TDA fund a feasibility study to evaluate the technical and economic viability of the required process changes and capacity additions. TDA has approved Kedzierzyn's request for funding. Currently a public tender is under preparation to select the consulting firm that will execute the feasibility study.

Plant Expansion/Modernization Schedule

Planned Completion Schedule

Activity	Qtr	Year
Feasibility Study	4 th	2001
Financing & Construction		2002

Project Financing

Kedzierzyn is considering two alternative strategies for the financing of this project. First, they are looking at project financing of the methanol plant as an integral part of the existing operations. Alternatively, they are looking at attracting a joint-venture partner and configuring the methanol plant as a separate stand-alone joint-venture entity.

U.S. Competitiveness

Methanol process technology is available in the U.S. Firms having the licensing rights to the technology are expected to be very competitive. In addition, DCS control systems and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This project has a high priority for Kedzierzyn because of its important contribution to the continued competitiveness of the company in Poland and the region, as well as its contribution to the local economy, particularly the Kedzierzyn-Kozle area.

This project also allows Kedzierzyn to improve its return on equity, on capital and on assets.



Kedzierzyn Methanol Plant Project

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Rokita Propylene Oxide Capacity Expansion Project



Planned Additions / Expansions

- Increasing plant capacity from 25,000 MTY to 50,000 MTY
- Substituting sodium hydroxide for calcium hydroxide in saponification process
- Modernize equipment and machinery
- Improve overall product yield (i.e., minimize waste)

Project Summary

Sector	Chemicals
Location	Wrocław, Poland
Capital Required	\$40 million
Export Potential	\$20 million
Project Sponsor	Rokita
Project Status	TDA funded feasibility study underway

Project Discussion

Project Background

With over \$100 million in annual revenue, 400 products, and 1,900 employees, Rokita is a leading chemical producer in Poland. Rokita began operation in 1946 as a government owned facility and was privatized in 1995. Rokita operates two chemical complexes. The main complex is located at Brzeg Dolny, about 30 km from Wrocław, and the second complex is located in Gdańsk, near the Baltic Sea.

The complex at Brzeg Dolny produces Chlorine, Polyols, Pesticides, Herbicides, and Surface Active and Auxiliary Agents. The complex in Gdańsk produces raw materials for cosmetics and household chemistry. Approximately 25% of Rokita's products are exported primarily to Germany, Austria, Italy, France, Sweden and The Netherlands.

Rokita products are used in the following industries:

- Chemical
- Metallurgical
- Power
- Cellulose – paper
- Household chemical
- Textile
- Plastics
- Dyestuffs manufacturing
- Waste and drinking water purification

One of Rokita's most important objectives is to double its production of propylene oxide from 25,000 MTY to 50,000 MTY and to



Rokita Propylene Oxide Capacity Expansion Project



improve the efficiency of its operations while increasing capacity.

The production capacity expansion and upgrades are needed to maintain Rokita's market share in supply to the flexible polyurethane industry, and to maintain profitability. Rokita is one of the primary suppliers of polyols (polyester polyols used in flexible foam). Propylene oxide is an intermediate chemical used in the manufacturing of the polyols. Polyols are the most important products made by Rokita, representing about 30% of the company's annual income. In addition, a British polyurethane manufacturer has recently invested in a production facility adjacent to the Rokita plant in Brzeg Dolny, so that it can receive feedstock polyols across the fence.

Propylene Oxide Plant Capacity	
Current	25,000 MTY
Planned	50,000 MTY

Modernization Plan

Currently, Rokita produces propylene oxide by means of the chlorohydrin process. This process involves reacting propylene, chlorine and water to form propylene chlorohydrin. This chlorohydrin is then saponified with calcium hydroxide in solution to yield propylene oxide. This reaction produces a waste product, calcium chloride, which currently does not have any market use or value in Poland and has to be discharged to "salt pits."

Rokita is evaluating the technical and economic viability of an alternative chlorohydrin saponification process that substitutes sodium hydroxide for calcium hydroxide while doubling production capacity. The by-product of this alternative process is

sodium chloride, which can be recycled to the mercury cells with the virgin brine feedstock, reducing the waste by-products in the production of polyols considerably. The feasibility study is being carried out by CDI Engineering Group, Inc.

Rokita management seeks a U.S. licensor for the sodium hydroxide based chlorohydrin saponification processes.

Rokita management desires to complete the feasibility study in 2001 and finalize financing and project agreements and begin construction in 2002.

Project Guidance Parameters

Project Costs

The plant capacity expansion and equipment replacement/additions is estimated to have an initial cost of \$40 million – of which about \$20 million is U.S. exports.

Known Initiatives

Rokita has previously conducted an internal technical study of changes required, and management placed a high priority on implementing this project. Based on the study, Rokita requested TDA to fund a feasibility study to evaluate technical and economic viability of required process changes and plant capacity expansion. The feasibility study is being carried out by CDI Engineering Group, Inc.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	4 th	2001



Rokita Propylene Oxide Capacity Expansion Project



Project Financing

Rokita plans to commit up to \$8 million of its own internal resources to finance the project. The balance is expected to come from U.S. Ex-Im, OPIC, EBRD, and commercial banks. The Polish National Fund for the Environment and the National Bank for the Environment may also participate in a consortium to finance this project.

Preliminary discussions have been held with Ex-Im Bank and OPIC. These discussions have been encouraging.

U.S. Competitiveness

The alternative process technology being considered by Rokita has been developed in the U.S. Therefore, U.S. firms having the licensing right to the technology are expected to be very competitive. In addition, U.S. suppliers of rotating equipment, DCS control systems, catalysts, and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This project is a high priority for Rokita because of its important contribution to the continued competitiveness of the company in Poland and the region, as well as its contribution to the local economy, particularly in the Brzeg Dolny area.

This project also allows Rokita to meet projected continued growth (5% annually) for polyols.

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Dwory Polystyrene Conversion Equipment



Planned Additions/Expansions

- Equipment for the conversion of 35,000 MTY of polystyrene into premixes and compounds of special grades for RTV boards, extruded film for thermoforming, co-extruded multi-layer film and plates, extruded rigid boards and plates for thermoforming, XPS, etc.

Project Summary

Sector	Chemicals
Location	Oswiecim, Poland
Capital Required	\$20 million
Export Potential	\$10 million
Project Sponsor	Dwory
Project Status	Preliminary planning

Project Discussion

Project Background

With \$215 million in revenues and 2,200 employees, Dwory is the third largest rubber

and one of the largest polystyrene producers in Europe. In addition, it produces latex, vinyl dispersion and chlorine. Dwory began operations in 1948 as a state-owned company and was privatized 1995. It is privately held, with about 60% of its equity in the hands of the National Investment Funds and 15% in individual ownership.

During the last 4 years, Dwory rejuvenated itself. It invested \$100 million into new projects aimed at increasing production and improving its environmental performance. During 1998, it replaced its old styrene plant with a new 100,000 MTY plant. Also during 1998 and 1999, it increased polystyrene production by 30,000 MTY by de-bottlenecking and intensifying production. In December 1999, it started-up a new 50,000 MTY block polystyrene plant. On the environmental side, Dwory installed, jointly with the City of Oswiecim, a modern sewage treatment plant, using PURAC's technology. It installed REGENOX, a plant for the catalytic after-burning of exhaust gases from synthetic rubber production. As a result, Dwory meets all environmental standards and regulations, obtaining the quality certificates series ISO 9001 and 14001.

Dwory has a strong market position in Poland, as indicated by its market share per product:

Synthetic rubber	60%
Latexes	82%
Polystyrene	15%
Expandable polystyrene	41%
Vinyl dispersions	50%

Export sales accounted for 33% of sales during 2000. Synthetic rubber accounted for 56% of exports, polystyrene for 29%, expandable polystyrene for 3%, latex for 4%, sodium hydroxide for 2% and others for 4%.



Dwory Polystyrene Conversion Equipment



Germany accounted for 37% of exports, Italy for 15%, Sweden for 6%, the Czech Republic for 5%, France with 4%, and many other countries for the remaining 33%.

Dwory's products include film, extruded polystyrene boards with foaming agents and other intermediate products, which are used in the following industries:

- Tire and rubber
- Housing and office construction
- Automotive
- Packaging
- Household chemicals
- Chemical
- Plastics

One of Dwory's primary objectives is to convert about one-third, or 35,000 MTY out of 120,000 MTY polystyrene production, into various fabricated products.

The new conversion capacity is needed to maintain Dwory's profitability and market share in polystyrene production. Dwory recently expanded its polystyrene capacity to keep pace with the growing demand for polystyrene in the packaging, construction, and household appliance industry. By converting polystyrene into fabricated products, Dwory will produce higher profit margin products and stabilize its production of polystyrene, becoming less cyclical. It will also improve its efficiency, lower environmental emissions and increase production safety.

Fabricated Product Plant Capacity	
Current	0
Planned	35,000 – 40,000 MTY

Modernization Plan

Dwory plans to use its own in-house made polystyrene as raw material for the fabrication of various premixes and compounds of special grades. It will need the following equipment:

Equipment	Capacity MTY
XPS line	5,000
Compounding lines	10,000
Multi-layer film lines	5,000
2 Extruded film 2 X lines	5,000
Extruded boards/plates	3,000
Other injection equipment	2,000

Dwory's management seeks U.S. suppliers for polystyrene conversion equipment.

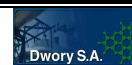
Project Guidance Parameters

Project Costs

The conversion plant is estimated to cost US\$20 million, of which US\$10 million is expected to be imported.

Known Initiatives

Dwory previously conducted an internal study of the polystyrene conversion business and is implementing it. Based on the findings, Dwory is planning to request that TDA fund a feasibility study to evaluate the technical and economic viability of the polystyrene conversion and fabrication plant to be built at Dwory.

**Dwory Polystyrene Conversion Equipment****Plant Expansion/Modernization Schedule**

Planned Completion Schedule		
Activity	QTR	Year
Feasibility study	1 st	2002
Financing		2002
Construction		2003

Dwory desires to complete the feasibility study in 2002. During 2002, it plans to finalize financing and start construction.

Project Financing

Out of the total project cost of \$20 million, Dwory is considering to contribute 20%, or \$4 million, as its investment into the polystyrene conversion plant. It is their expectation that any additional equity will be provided by a partner. They also expect that debt financing will be arranged through financial institutions and commercial lenders.

U.S. Competitiveness

There are many manufacturers of equipment for the conversion of polystyrene into fabricated products in the U.S. Companies with experience in exports and attractive payment terms will enjoy a competitive position.

Conclusion

This project is a high priority for Dwory because of its important contribution to the continued competitiveness of the company in Poland, in the region, as well as in the local economy, particularly the Oswiecim area.

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Dwory Solution SBR and Latex Capacity Expansion Project



Planned Additions / Expansions

- Increasing plant capacity from 80,000 MTY to 120,000 MTY Solution SBR
- Increase production of SBR lattices from 10,000 MTY to 20,000 MTY
- Modernize equipment and machinery
- Improve overall product yield (i.e., minimize waste)

Project Summary

Sector	Chemicals
Location	Oświęcim, Poland
Capital Required	\$70 – 100 million
Export Potential	\$35 – 50 million
Project Sponsor	Dwory
Project Status	TDA grant approved

Project Discussion

Project Background

With \$215 million in revenues and 2,200 employees, Dwory is the third largest synthetic rubber and one of the largest polystyrene producer in Europe. In addition, it produces latex, vinyl dispersions and chlorine. Dwory began operations in 1948 as a government owned facility and was privatized in 1995. It is privately held, with about 75% of its equity in the hands of the National Investment Funds.

During the last 4 years, Dwory rejuvenated itself. It invested \$100 million into a new project aimed at increasing production and improving its environmental performance. During 1998, it replaced its old styrene plant with a new 1000,000 MTY plant. Also during 1998 and 1999, it increased styrene production by 30,000 MTY by de-bottlenecking and intensifying production. In December 1999, it started-up a new 50,000 MTY block polystyrene plant. On the environmental side, Dwory installed, jointly with the City of Oświęcim, a modern sewage treatment plant, using PURAC's technology. They also installed a REGENOX plant for the catalytic after-burning of exhaust gases from synthetic rubber production. As a result, Dwory meets environmental standards and regulations, obtaining the quality certificates series ISO 9001 and 14001.

Dwory has a strong market position, with its market share for individual products being as follows:

Synthetic rubber	60%
Latexes	82%
Polystyrene	15%
Expandable polystyrene	41%
Vinyl dispersions	50%



Dwory Solution SBR and Latex Capacity Expansion Project



Export sales accounted for 33% of sales during 2000. Synthetic rubber accounted for 56% of exports, polystyrene for 29%, expandable polystyrene for 3%, latex for 4%, sodium hydroxide for 2% and others for 4%.

Germany accounted for 37% of exports, Italy for 15%, Sweden for 6%, the Czech Republic for 5%, and France for 4%.

Dwory's products are used in the following areas:

- Tire and Rubber
- Housing and office construction
- Automotive
- Packaging
- Household chemical
- Chemical
- Plastics

One of Dwory's primary objectives is to increase its synthetic rubber production from 80,000 MTY to 120,000 MTY and its latex production from 10,000 MTY to 20,000 MTY, improving operating efficiency while increasing capacity.

The synthetic rubber capacity expansion is needed to maintain Dwory's market share in the tire and rubber industry by adding solution SBR capacity. The latter will complement its product range and maintain profitability.

The expansion of the latex capacity is aimed specifically at the paper industry. Dwory is the only supplier of synthetic rubber and polystyrene in Poland. Demand for both products is growing in Poland and Central Europe due to strong demand from the construction and automotive sectors.

SBR Plant Capacity	
Current	80,000 MTY
Planned	120,000 MTY

Latex Plant capacity	
Current	10,000 MTY
Planned	20,000 MTY

Modernization Plan

Currently Dwory produces styrene butadiene rubber using butadiene it purchases from the Plock refinery and from imports. To produce solution SBR, it has to build a polybutadiene plant and a solution SBR plant, each with a 40,000 MTY capacity. Since the Plock refinery is expanding, more butadiene feedstock will be available in the future.

Project Guidance Parameters

Dwory purchases feedstock from PKN Orlen's refinery in Plock, Poland and from imports. The Plock refinery is expanding to refine 20 million MTY, of which 13 million MTY will be used as fuel and 7 million MTY as feedstock for petrochemical production.

Project Costs

The estimated construction cost of the 40,000 MTY polybutadiene plant and of the 40,000 MTY solution SBR plant are US\$35 million each, for a total of US\$70 million, of which US\$35 million is expected to be imported.

The estimated cost of expanding the latex production from 10,000 MTY to 20,000 MTY is not known yet.

Dwory has previously conducted an internal technical study of the solution SBR and latex capacity expansions. Dwory has placed a high priority on implementing both projects. Based on this study, Dwory has requested that TDA



Dwory Solution SBR and Latex Capacity Expansion Project



fund a feasibility study to evaluate the technical and economic viability of both plant capacity expansions.

TDA has approved Dwory's request. A public tender to select the consulting firm that will execute the feasibility study is being prepared.

Project Schedule

Dwory's management desires to complete the feasibility study in 2002, finalize the financing and start construction during 2003.

Project Financing

Once the feasibility study is completed in 3 – 6 months, Dwory's management will seek a license for the solution SBR plant.

Dwory is contemplating various schemes for the project implementation, including creating a stand alone joint venture company manufacturing synthetic rubber and is willing to contribute the existing SBR and latex plants to the joint venture. Any additional equity requirement is expected to be met by the new joint venture partner. The debt and financing will be arranged through financial institutions and commercial banks.

U.S. Competitiveness

The solution SBR/BR plants process technology being considered by Dwory is very well known in the U.S., Europe and Japan. U.S. firms having the licensing right to the technology are expected to be very competitive. In addition, U.S. suppliers of equipment, DCS control systems and engineering services are well positioned to provide equipment and services required for this project.

Conclusion

This project is a high priority for Dwory because of its important contribution to revenues, net income, and cash flow. It has importance for maintaining Dwory's position as the leading synthetic rubber supplier in Poland and Central Europe. The implementation of this project will improve Dwory's return on equity, capital and assets.

The future solution SBR/BR plants will contribute to the improvement of Poland's tire industry, where Goodyear, Michelin and Bridgestone own large tire manufacturing plants. It will also contribute to the economic well being of the Silesian region.

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natural gas monopoly, are still state-owned, although, the privatization of small and medium size enterprises, retail businesses and small farms has progressed relatively well. Romania is in need of major investment and restructuring, but foreign investment in the country has been very slow, attracting only about US\$6.5 billion in the last decade.

Romania is a member of CEFTA, Central European Initiative (CEI), and the Stability Pact for South-East Europe and a founding member of the WTO. The EU began accession talks with Romania in 2000 and joining EU and NATO are two of the major priorities of Romania's foreign policy.

Romania has a significant domestic reserve of oil and gas and a highly developed oil refining and petrochemical industry. U.S. technologies appear to be preferred and U.S. firms such as UOP appear to have a prominent position in the sector. With a population of about 22 million, Romania is the second largest market in Central Europe and a prime target for foreign investment, particularly in the oil exploration sector.

GDP (in US\$ billion)	36.7
GDP Growth (est.)	1.6%
GDP Per Capita (US\$)	1,639
Population (Million)	22.4
Credit Rating	B-

Source: European Bank for Reconstruction and Development & the World Bank

Executive Summary

The Romanian transition from a centrally controlled economy to a free market economy has proven to be more difficult and complex than many had imagined in the early 1990s. In less than 10 years, the country has faced two major transition recessions and economic reforms have not delivered the desired results. In 2000, after three years of recession, Romania returned to economic growth, driven largely by exports and growth in industrial output. The privatization process has been slow. Large enterprises, including Petrom, the national oil company, and Gazprom, the

Political and Economic Climate

Romania's transition to democracy and a market economy started in 1989. From 1989 to 1996, Romania initiated a number of programs aimed at a gradual reform of the economy and establishment of democratic institutions. These efforts were accelerated in 1996 and 1997 and the government achieved some success in accelerating large-scale industry and bank privatization and in the closing of a number of non-profitable, state-owned enterprises. However, from 1997 to 2000, Romania experienced a second major recession in its transition period, further slowing down the privatization process. In 2000, Romania experienced economic growth



but inflation remained high and the government is under strong pressure from international institutions, including the IMF, the World Bank, and the EU, to further advance economic reform and privatization. A newly elected government took office in December of 2000 and has pledged to improve the economy by offering tax cuts to businesses, fight corruption, reduce government size, and increase social protections. The new government has also restated its commitment to joining the EU and NATO. The EU began accession talks with Romania in 2000 and today Romania benefits from three pre-accession instruments financed by the EU. From 2000 through 2002, total financial assistance to Romania will amount to at least US\$240 million from PHARE, US\$150 million from SAPARD, and US\$200 million from ISPA.

The Romanian economy grew by 1.6% in 2000 driven primarily by industrial output growth and strong foreign exports. Year-end inflation was 40.7% in 2000, down from 54.8% a year earlier.

Investment Climate

Since 1990, Romania has attracted roughly US\$6.5 billion in foreign direct investment (FDI). The inflow of FDI peaked in 1998 to US\$2 billion as the result of the privatization of ROMtelecom and Romanian auto manufacturer, Dacia. The U.S., with about a US\$6.5 million investment since 1990, ranks sixth in FDI in Romania after the Netherlands (US\$13.3 million), Germany (US\$12.7 million), France (US\$7.9 million), and Italy (US\$7.2 million).

The private sector accounts for about 62% of Romania's GDP and about half of employment. The privatization process continued in 2000, with the sale of 19 large

companies, 908 small and medium size enterprises and 348 companies where the state held a less than 33% share. The government has also committed to transparent privatization of a number of large companies including Petrom, the national oil company.

In 1999 and 2000, the government enacted a package of legislation to improve the legal framework and to reform corporate and personal income tax laws. Romanian legislation provides for foreign investors to have free access to domestic markets, to participate in privatization process, to repatriate profits and dividends or proceeds from the sale of shares and bonds. However, there are still some restrictions on capital import and export. This legislation also provides the same incentives for both foreign and Romanian investors. The main changes in the tax laws included:

- Reducing corporate income tax rate from 38% to 25%.
- Reducing tax rate to 5% for corporate income stemming from export.
- Applying a uniform VAT rate of 19%.

There are also six free trade zones in Romania. These free trade zones provide a number of additional incentives including: unrestricted entry and export of goods, exemption from custom duties, VAT, and income taxes for the duration of company's operation in a free trade zone. There are also a number of concessions available for companies located in regions with high unemployment known as "disadvantage zones."

Romania is a founding member of the WTO and has adopted trade policies consistent with the Uruguay round. Romania is also a member of CEFTA and EFTA, a party to the EU



Association Agreement, and has agreed to establish a free-trade area in manufactured goods with Turkey and Bulgaria. In accordance with these trade agreements, Romania reduced import tariffs by 80% on most products and tariffs will be lifted completely on all industrial products for CEFTA, EFTA, and EU member countries. The EU has already lifted all tariffs and ceilings on manufactured goods from Romania. The EU is Romania's most important trading partner accounting for more than 75% of all imports and exports. Trade with CEFTA members has improved in recent years. Romania imports a significant amount of raw materials, oil and gas from Russia, but exports to Russia are insignificant.

Sector Overview

The oil processing and chemical industries have a long tradition in Romania, as the first refinery in Europe was commissioned in Ploiesti in 1857. There are about 15 refineries, combined refinery and petrochemical complexes, and petrochemical complexes in Romania. Five are the most modern and complex refining and petrochemical facilities in Romania and are designed to process domestic and imported heavy and light crude to produce motor fuels, industrial fuels, and raw petrochemicals. They include Arpechim and Petrobrazi, owned by Petrom; Petromidia owned by Rompetrol; Petrotel owned by LUKOIL; and Rafo, which is government-owned. The average capacity of these facilities is reported to be about 100,000 bpd each. Five others are small refineries designed to process domestic non-sulfurous crude to produce specialty products such as naphthenic oils, solvents, acicular coke, etc. They include four (Astra, VEGA, Steaua Romana, and Petrolsub) privately held and one (Darmanesti) government-owned refinery. The remaining facilities are petrochemical

complexes specialized in chemical treatment of oil products and methane gas. Most facilities operate below their capacity and are in need of up-grading and major investment to meet EU product and environmental standards. Government sets the fuel prices. The government owned entities are also responsible for the transport of crude oil and refined products, and operation of the oil terminal facility in Constanta. One privately held refinery is reported to have suspended operations recently and one of the government owned facilities is reported to be on the verge of bankruptcy.

Fertilizer plants are operating at very low capacity due to low demand and increased natural gas prices, although Petrom is rehabilitating one or two plants.

Today, Petrom, a vertically integrated national oil company, appears to dominate the Romanian oil and petrochemical market. It extracts the entire Romanian crude oil output (about 6.2 million MTY) and 40% of natural gas (about 6 billion cubic meters per year), operates two refinery and petrochemical complexes (Arpechim and Petrobrazi) with a combined capacity of 8 million MTY, and maintains a network of 600 service stations (40% to 50% of the market). The Romanian government is contemplating privatizing Petrom and is considering a strategic investor or a golden-share approach (where the government will keep 1% share and veto power over critical issues).

U.S. Presence

From 1990 to 2000, U.S. investment in Romania amounted to about US\$6.5 million. Although U.S. firms have not made a major contribution to investments in the chemical, petrochemical or refining sectors, U.S. technologies are applied in these sectors.



Some of the U.S. firms having historical presence in the Romanian refining and petrochemical sector include UOP, Philips, Stone & Webster, Honeywell, and Foster Wheeler. It is reported that U.S firms have been able to provide superior export packages, including financing, compared with their European competitors even though Romanian import duty regulations are more advantageous for European firms.



Romp petrol VEGA Refinery's Soil and Groundwater Remediation Projects



Anticipated Project Implementation Activities

- Removal of approximately 150,000 m³ of contaminated soil.
- Treatment of contaminated soil for safe disposal.
- Treatment of contaminated groundwater and its safe disposal.

Project Summary

Sector	Refining/ Environmental
Location	Ploiesti
Capital Required	\$15 - \$18 million
Export Potential	\$6 - \$8 million
Project Sponsor	Romp petrol
Project Status	TDA grant agreement signed and contractor solicitation underway

Project Discussion

Project Background

CONCORDIA, a private company, established the VEGA Refinery in northern Ploiesti in 1904. From 1948 to 1999, VEGA was operated as a state owned refinery. In 1999, VEGA was acquired by Romp petrol Group B.V., a provider of services to the oil and gas industry in Romania and abroad. The Romp petrol Group, headquartered in Rotterdam, The Netherlands, is the largest private company operating in the Romanian petroleum industry. The Group is a vertically integrated petroleum company with substantial upstream, downstream and refining assets, principally in Romania but also in other countries. It is also an oilfield service company with global operations.

Since 1904, VEGA Refinery has processed crude oil to obtain naphtha, gas oil, lubricants, bitumens, gasoline, and hexane, and has manufactured catalysts for petroleum and petrochemical operations. Some of these operations have produced an acidic waste sludge, which have been disposed of in 13 lagoons at the refinery's 70 hectares site. The refinery's current capacity is about 500,000 MTY.

The VEGA Refinery purchase agreement obliged Romp petrol to assume the Romanian Government's Minimum Acceptable Environmental Goals for private facilities. These goals address environmental compliance for soils and groundwater, wastewater discharge, air pollution, solid waste management, and environmental permits. Romp petrol was required to invest about \$10 million in the refinery to meet these goals.



Romp petrol VEGA Refinery's Soil and Groundwater Remediation Projects



Upon purchase of the VEGA Refinery, Rompetrol took certain measures towards meeting its environmental goals. The first step was obtaining the Environmental Permit (first refinery in the region). This is how the general MAEGs were defined in a very thorough and specific manner. In particular with regard to soil and groundwater compliance, Rompetrol has:

- Discontinued all of the processes generating acidic waste sludge.
- Selected the most appropriate technology to remove the content of the lagoons and to dispose the waste sludge off site. This remedial activity is scheduled to begin late 2001 and continue through mid 2004.
- Installed a network of wells to monitor the quality and movement of groundwater at the site.
- Conducted, with assistance from COLT International, Inc., tests for recovering oil from ground water.
- Signed a feasibility study grant agreement with TDA to assess the viability of various options for the treatment of contaminated lagoon soils and groundwater.

Project Scope

Approximately 150,000 m³ of contaminated soil may have to be removed and treated. The subsurface soils at the site have been reported to include layers of clay, which could have helped to keep most of the contaminants within the facility. The volume of the groundwater that must be treated is not yet estimated.

Feasibility Study Scope

Romp petrol received a grant of \$161,000 as part of a \$230,000 feasibility study from TDA to assess the viability of various options available for decontaminating lagoon soils and groundwater at the refinery. The study is expected to include:

- A detailed review of available site data.
- Sampling and analysis of soil and groundwater to develop new data.
- Discussions with regulatory authorities to establish permitting and other requirements.
- An environmental audit and risk assessment associated with emptying the lagoons and drilling new wells for monitoring groundwater at the site.
- Establishing improved estimates of the volume and characteristics of contaminated soils and groundwater.
- Assessing the technical and economic viability of the most promising options for the treatment of soils and groundwater (at least three options each).
- Recommending the most viable option for soil and groundwater treatment.
- Preparing a report addressing all major technical, economic, and financial issues including cost and benefit analysis and the strength, weaknesses, opportunities and threats associated with the treatment option.

The feasibility study is expected to be carried out in two phases. The first phase will include the screening of available data and treatment options, and recommending treatment options



Rompotrol VEGA Refinery's Soil and Groundwater Remediation Projects



for further considerations. The second phase will include site data collection and analysis, site characterization, selection of remediation technologies, and developing an implementation plan including costs and schedule.

Project Location

The VEGA Refinery site encompasses about 70 hectares on the northeast of the city of Ploiesti, between the rivers of Dimbu and Teleajen. Three other refineries are also located in the surrounding area. The Petrotel-LUKOIL Refinery is located southeast of the VEGA Refinery between the same two rivers. Astra and Petrobrazi are located east of Prahova River, fed by Dimbu and Teleajen. The city of Ploiesti and its neighboring area are heavily industrialized and, in addition to the refineries, houses a power station and other industrial complexes.

Project Guidance Parameters

Project Costs

The feasibility study is estimated to cost approximately \$230,000. The project implementation costs are estimated to be \$20-\$23 million subject to the outcome of the feasibility study. The potential export of U.S. goods and services is estimated to be \$6-\$8 million.

Known Initiatives

As noted earlier, Rompetrol has already discontinued certain refining operations in order to stop the generation of acidic waste; has commenced work to remove sludge waste from the lagoons; and has begun monitoring groundwater contamination and movement. Rompetrol has also conducted an environmental risk assessment of the site and

is the first refinery in the Prahova region to obtain an environmental permit.

Remediation Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study Award	4 th	2001
Feasibility Study	4 th	2003

Project Financing

Several sources of funds may be available for financing this project. The refinery capital investment program for environmental projects appears to provide over \$7 million for the remediation of contaminated soils and groundwater. In addition, some of Rompetrol's initial \$20 million commitment for the environmental and development projects at VEGA Refinery may also be available for the soil and groundwater remediation projects. Furthermore, the additional funding can become available if the rehabilitation of the contaminated soil is necessary for construction of new facilities at the lagoon site(s). Recent changes in environmental laws could also make some public funds available for the proposed projects, especially the groundwater remediation project. Availability of bilateral and multilateral funds in Romania is also expected to increase for environmental projects.

Two financing alternatives they are considering include: sharing project costs and revenues with a contractor; and leasing arrangements. These options will be addressed as a part of the proposed feasibility study.



Rompetrol VEGA Refinery's Soil and Groundwater Remediation Projects



U.S. Competitiveness

U.S. firms could provide the services needed to implement these projects. U.S. firms are, however, expected to face strong competition from Danish, Canadian, French and other European countries. The Danish Environmental Protection Agency (DEPA) has been the lending foreign government agency providing technical and financial assistance to environmental projects in Romania. The European Union is expected to provide about \$100 million annually to support environmental projects in Romania under the Instrument for Structural Policies for Pre-Accession (ISPA). According to Rompetrol, Canadian and French firms have expressed interest in these and other environmental projects at VEGA and other refineries.

Conclusion

These environmental projects have a high priority not only for Rompetrol but also for the government of Romania. Romania has to increase its pollution control and remediation standards in order to join the European Union.

The VEGA refinery is one of the few privatized industries in the region. For this reason, the local government and environmental regulators actively seek conformity with the compliance schedule negotiated between Rompetrol and the local EPA.

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Rompetrol VEGA Refinery Upgrading Project



Planned Additions

- Revamp and capacity increase for the vacuum distillation and Bitumen unit
- Add new continuous bitumen oxidizer

Project Summary

Sector	Refining
Location	VEGA Refinery, Ploiesti, Romania
Capital Required	\$9 million
Export Potential	\$2.7 million
Project Sponsor	Rompetrol
Project Status	Preliminary Planning

Project Discussion

Project Background

CONCORDIA, a private company, established the VEGA Refinery in northern Ploiesti in 1904. From 1948 to 1999, VEGA was operated as a state owned refinery. In 1999, VEGA was acquired by Rompetrol

Group B.V., a provider of services to the oil and gas industry in Romania and abroad. The Rompetrol Group, headquartered in Rotterdam, The Netherlands, is the largest private company operating in the Romanian petroleum industry. The Group is both a vertically integrated petroleum company with substantial upstream, downstream and refining assets, principally in Romania but also in other countries, and an oil-field service company with global operations. Rompetrol operates two refineries, Petromidia and VEGA, and a network of retail stations in Romania.

The Petromidia refinery at Constanta (on the Black Sea) is a 3 million MTY deep conversion plant (TRCC) with an associated petrochemical plant.

The VEGA refinery is a small capacity (0.5 million MTY) plant designed to produce specialty products, such as solvents and bitumen. The refinery can also take intermediate products from Petromidia.

Project Description

The upgrading project includes revamps of the vacuum tower and replacing the existing batch-bitumen oxidizer unit with a 150,000 MTY continuous unit. In addition, the capacity of the vacuum distillation unit will be doubled to 300,000 MTY.

The new unit would manufacture a wider range of asphalt products, while reducing emissions, decreasing utilities consumption and improving heaters efficiency to 85-87%.

Domestic asphalt demand is expected to increase over the next 5 years due to a government infrastructure development program.

**Rompetrol VEGA Refinery Upgrading Project**

Equipment for the project would include fractionation tower internals for the vacuum unit, heat exchangers, furnaces, towers, drums and process control systems.

viable technologies for remediating contaminated soils and groundwater.

Plant Addition Schedule**Project Guidance Parameters****Project Costs**

Modifications at VEGA Refinery are estimated to cost about US\$9 million of which about US\$2.7 million is expected to be imported.

Known Initiatives

Rompetrol is studying the installation of crude and product mono-buoys to create a lower cost alternative to the State-owned terminal at Constanta, which presently holds a monopolistic position in the area. Current tariffs are US\$4.5/MT for crude imports plus \$1/MT for storage. This represents a significant cost for Rompetrol, which imports 3 million MTY crude through the Constanta Terminal. Product exports pay a tariff of US\$2.5 per ton. The mono-buoys would be located 12 km offshore crude oil and 7 km for products. The crude mono-buoy is designed for 150,000 MT vessels and the product facility for 35,000 MT vessels. TDA has provided a grant for conducting a feasibility study for this project. The company also needs additional storage for crude and oil products to allow an increase of throughput to 4.8 million MTY (current maximum throughput). They are investigating the idea of using floating storage for crude.

The VEGA refinery is an old site with waste lagoons filled with oil/water/sludge mixes. Rompetrol has recently commenced removal of the material from these lagoons and has received a TDA grant to determine the best

Planned Completion Schedule

Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing & Construction		2002-2003
Plant re-startup		2003

Project Financing

Project financing has not yet been addressed. However, Rompetrol is committed to diversify their product slate and maximize utilization of the available facilities while responding to market needs.

Rompetrol also has committed to invest US\$10 million for environmental projects and would provide funds from internal sources toward financing the modernization of the VEGA Refinery.

U.S. Competitiveness

U.S. suppliers of technology, equipment, DCS control systems, catalysts, engineering and construction services are well positioned to provide equipment and services required for this project.

Conclusion

Rompetrol views diversification of their product line as a crucial requirement for their business. This project makes maximum use of existing assets to produce a wide range of bitumen for domestic consumption.



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Rompetrol Petromidia Petrochemical Upgrading Project



Planned Additions and Modifications

- Modify HDPE plant to produce Medium Density Polyethylene
- Add New Ethylene Oxide Derivatives plant
- Restart and increase capacity of Dimethyl terephthalate plant
- Add new bottle-grade Polyethylene terephthalate turn-key plant
- Polypropylene compounds plant

Project Summary

Sector	Petrochemicals
Location	Constanta, Romania
Capital Required	\$85 - 100 million
Export Potential	\$50 million
Project Sponsor	Rompetrol
Project Status	Preliminary Planning

Project Discussion

Project Background

Rompetrol Group B.V., a provider of services to the oil and gas industry in Romania and abroad, acquired majority stock in Petromidia Refinery in 2000. The Rompetrol Group, headquartered in Rotterdam, The Netherlands, is one of the largest private companies and Petromidia is one of the most modern refineries operating in Romania. Rompetrol Group is both a vertically integrated petroleum company with substantial upstream, downstream and refining assets, principally in Romania but also in other countries, and an oilfield service company with global operation. The company was originally founded as the international arm of the Romanian oil and gas industry and it was privatized in 1997.

Built in 1975 through 1977, Petromidia is a 4.8 million MTY refinery producing a variety of fuels and petrochemical feedstocks. It consists of a deep conversion plant (TRCC) with an associated petrochemical plant. The refinery is currently processing about 3 million MTY of crude oil. The petrochemical plant is undergoing a revamp in preparation for its re-start.

Rompetrol also owns VEGA refinery, a small capacity (0.5 million MTY) plant in Ploiesti, Romania.

Project Description

Rompetrol is looking to diversify their product slate. In particular, they are considering a project to upgrade the Petromidia Complex while taking advantage of significant, but idle, petrochemical capacity to produce a new slate of products. The project scope is described below.



Rompetro Petromidia Petrochemical Upgrading Project



1. Modify the existing high-density polyethylene plant to produce 6 million MTY of MDPE and HMWPE. There are no current domestic producers of this product. However, the market is already well established and supported by imports. Rompetro owns a piping company and expects to manufacture plastic pipes in support of a nationwide effort to replace old metal gas pipes. The capital required for modifying the existing HDPE plant is estimated to be about US\$1 million.
 2. Build a new plant to produce derivatives (dyes, detergents, cosmetics etc.) from ethylene oxide. The refinery has a 14,000 MTY ETOX plant, but Rompetro is unable to transport ETOX by rail or truck, due to State regulations. Therefore, Rompetro has concluded that to utilize their existing ETOX plant they must manufacture the derivatives onsite. The new equipment would match the ETOX size, and is estimated to cost US\$6-\$7 million.
 3. Upgrade the existing DMT plant and installing a new bottle-grade PET plant. Polyethylene terephthalate (PET - polyester) is produced from dimethylterephthalate (DMT) co-polymerized with ethylene glycol. Petromidia already has facilities to produce DMT and ethylene glycol. The DMT plant is not currently in operation and needs to be upgraded and reactivated. A new PET plant also need to be installed to produce chips and pre-forms which are currently imported into the country from Hungary by rail and truck. The proposed facility would be the only domestic producer. Capacity is expected to be 80,000-90,000 MTY, and the project cost is estimated at US\$60 to US\$70 million (for revamp of DMT plant and new PET plant).
 4. Use the polypropylene produced to obtain compounded polymers with increased properties for injection and rafia grades. The capital cost is estimated at approximately US\$1.5-US\$2 million.
 5. Build a LLDPE plant with a capacity of 60,000-80,000 MTY whose products can be used unblended or compounded in injection molding, roto-molding and cables. There is only one such capacity in the region located in Uzbekistan. Estimated cost is approximately US\$6-US\$7 million.
 6. Unit producing through a relatively simple process dichlorethane, vinyl chloride, polyvinyl chloride – well quoted on the market. Estimated cost is approximately US\$12 million.
- Equipment required for these projects includes reactors, towers, vessels, pumps, compressors, furnaces, piping, process control systems and electrical distribution equipment.

Project Guidance Parameters

Project Costs

The proposed additions and modifications at Petromidia refinery are estimated to cost a total of US\$85 to US\$100 million of which up to US\$50 million U.S. exports is expected to be imported.

Known Initiatives

Rompetro recently received a TDA grant to conduct a study to assess the feasibility of installing crude and produce mono-buoys on



Rompetrol Petromidia Petrochemical Upgrading Project



the Black Sea to lower their current loading/unloading costs. Rompetrol is currently using the only available loading/unloading facility terminal at Constanta, which currently holds a monopolistic position in the area. Current tariffs are: \$4.5/MT for crude imports plus \$1/MT for storage; and \$2.5/MT for product exports. This represents a significant cost for Rompetrol, which imports a significant amount of products through the Constanta Terminal. The mono-buoys would be located 12 KM offshore for crude and 7 KM for products. The crude mono-buoy will be designed for 150,000 MT vessels and the products facility for 35,000 MT vessels. The company also needs additional storage for crude and products to allow an increase of throughput to 4.8 million MTY. They are investigating the potential for using floating storage for crude. (The storage facility study is not a part of the TDA funded study.)

Rompetrol has also received a grant from TDA to evaluate the feasibility of installing an in-line fuels blending facility at Petromidia refinery for gasoline and distillate products. The facility would allow the meeting of product specification while reducing “give-away” amounts. Capital costs are estimated at US\$6-US\$7 million.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2001

Project Financing

Project financing has not yet been addressed. However, Rompetrol is committed to diversify their product slate and maximize utilization of

the available facilities while responding to the market needs.

Rompetrol has committed to invest \$200 million, including \$20 million for environmental projects, to modernize Petromidia Refinery.

U.S. Competitiveness

U.S. suppliers have well-established, internationally dominant technologies that could be competitively supplied. In addition, U.S. firms could competitively provide engineering services, and specialized equipment.

Conclusion

Product diversification is a crucial component of Rompetrol’s future business plan. The proposed program utilizes significant idle petrochemical manufacturing capacity, and the products largely replace costly imports.

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Romp petrol Petromidia Refinery In-Line Blending Project



abroad, acquired majority stock in Petromidia Refinery in 2000. The Rompetrol Group, headquartered in Rotterdam, The Netherlands, is one of the largest private companies and Petromidia is one of the most modern refineries operating in Romania. Rompetrol Group is both a vertically integrated petroleum company with substantial upstream, downstream and refining assets, principally in Romania but also in other countries, and an oil field service company with global operation. The company was originally founded as the international arm of the Romanian oil and gas industry and it was privatized in 1997. Currently, Rompetrol operates two refineries (Petromidia and VEGA) and a network of retail stations in Romania.

Planned Additions

- New In-line Blending Facility for Gasolines and distillates
- Quality monitor and control systems
- Additive injection systems
- Computer Control Systems
- Pumps, piping & control hardware

Built in 1975 to 1977, Petromidia is a 4.8 million MTY refinery producing a variety of fuels and petrochemical feedstocks. It consists of a deep conversion plant (TRCC) with an associated petrochemical plant. The petrochemical plant is undergoing a revamp. The refinery is currently processing about 3 million MTY of crude.

Romp petrol also owns the VEGA Refinery, a small capacity (0.5 million MTY) plant in Ploiesti, Romania.

Project Summary

Sector	Refining
Location	Constanta, Romania
Capital Required	\$6-7 million
Export Potential	\$3-4 million
Project Sponsor	Romp petrol
Project Status	TDA grant agreement signed

Project Description

Romp petrol has embarked on a program to improve the competitiveness of their facilities. The in-line fuels blending project is a component of this strategy.

The project will construct an in-line blending facility at the Petromidia refinery that would be used for gasoline and distillate products. The facility would reduce product specification “give-away” (i.e. the additional product quality that has to be produced to

Project Discussion

Project Background

Romp petrol Group B.V., a provider of services to the oil and gas industry in Romania and



Rompetrol Petromidia Refinery In-Line Blending Project



assure that the final product always meets final specifications).

Typical payout for in-line blending facilities is about 18 months. Capital costs are estimated at US\$6-US\$7 million.

Equipment required for this project includes pumps, piping, additive injection systems, quality monitor and control systems, process control systems, and electrical distribution equipment.

Project Guidance Parameters

Project Costs

The capital cost of the in-line blending facility at Petromidia Refinery is estimated to range from US\$6-US\$7 million.

Known Initiatives

Rompetrol is studying the installation of crude and product mono-buoys to create a lower cost alternative to the state-owned terminal, which currently detains a monopolistic position in the area. Current tariffs are \$4.5/MT for crude imports plus \$1/MT for storage. This represents a significant cost for Rompetrol, which import 3 million MTY crude through the Terminal. Product exports pay a tariff of \$2.5/MT. The mono-buoys would be located 12 km offshore crude and 7 km for products. The crude mono-buoy is designed for 150,000 MT vessels and the products facility for 35,000 MT vessels. TDA has provided a grant for conducting a study to assess the feasibility of constructing the mono-buoys. The company also needs additional storage for crude and products to allow increase of throughput to 4.8 million MTY (current maximum throughput). Rompetrol is investigating the idea of using floating storage for crude.

The VEGA Refinery is an old site with waste lagoons filled with oil/water/sludge mixes. Rompetrol has recently commenced removal of the material. TDA has also provided a grant for conducting a feasibility study to determine the best way to remediate contaminated soils and groundwater. The remediation is expected to cost about US\$20 million.

Project Financing

Project financing has not yet been addressed. However, Rompetrol is committed to maximizing profitability and utilization of available facilities. Rompetrol has also committed to invest about US\$200 million to modernize the Petromidia Refinery.

U.S. Competitiveness

U.S. suppliers of the in-line blending specialized equipment such as quality monitoring and control systems and optimization hardware and software are well positioned to meet the requirements of this project.

Conclusion

The in-line blending project is part of Rompetrol's program to improve competitiveness. This project is a well-proven method to maximize the use of existing assets by matching the severity of operations closely to the product qualities required.



Rompetrol Petromidia Refinery In-Line Blending Project



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Petrom Petrochemical Plant Expansion



capacity, is the largest refinery in the country. Arpechim and Petrobrazi have a total capacity of 8 million MTY and in 2000, processed 5.7 million tonnes of crude, 53.3% of the total crude processed in Romania. These refineries can produce a wide range of products including LPG, gasoline, jet fuel, diesel, light and heavy fuel, coke, bitumen, lube oils, and aromatic hydrocarbons.

Arpechim and Petrobrazi are located on the domestic crude oil fields operated by Petrom. Both refineries are capable of processing domestic and imported crude and are connected to the State owned crude pipelines, Conpet, connecting the refineries to Petrom's production fields and the crude import terminal at Constanta, on the Black Sea.

Planned Expansions and Additions

- Expansion of ethylene production capacity by 100,000 MTY
- Addition of a new polyethylene unit

Project Summary

Sector	Petrochemical
Location	Arpechim Refinery, Piteşti, Romania
Capital Required	\$115 million
Export Potential	\$35 million
Project Sponsor	Petrom
Project Status	Preliminary planning

Project Discussion

Project Background

Petrom, the State Oil Company of Romania, is a vertically integrated petroleum company with upstream and downstream assets including two (2) refineries -- Arpechim and Petrobrazi -- and a network of 700 service stations in Romania. Petrom, with about 35.4% of the country's active refinery

Both Arpechim and Petrobrazi are integrated refinery and petrochemical plants and have significant on-site storage facilities for crude oil and products. The petrochemical facilities produce a wide range of products including ethylene, propylene, polyethylene, acrylonitrile, carbon black, ethylene oxide, phenol, acetone, and maleic anhydride. Each refinery tends to produce the products that cannot be produced at the other refinery. The two complexes are also connected to Petrotrans, a Petrom owned petroleum product pipeline infrastructure. Petrotrans is the only product pipeline network in the country serving all major domestic consumers and connects all Romanian refineries to petroleum product export terminals at Constanta, on the Black Sea, and Giurgiu, on the Danube river.

Most of the technology at Arpechim and Petrobrazi was supplied by UOP, and UOP (working with Solomon Associates) is providing long-term assistance to Petrom in order to develop a master plan for upgrading and modernizing these refinery and



Petrom Petrochemical Plant Expansion



petrochemical plants. The plan is envisaged in four (4) phases:

1. **Cost Reduction and Profitability Improvement Program**

This program included low or no-cost projects for yield improvement and energy reduction. To maintain its competitive position, Petrom has identified a series of projects to reduce oil loss, energy consumption, maintenance costs, and utility costs. They also plan to improve capacity utilization.

2. **EU Fuel Specifications Program**

About 50% of the gasoline and gas oil produced by Petrom meet the EU specification. Additional alkylation capacity will be needed to allow production of 100% gasoline and gas oil products meeting the EU product standards. Petrom has exported some products to the EU.

3. **Re-instrumentation and Implementation of Advanced Process Control Program**

This program includes a project to be developed in the next 2-3 years based on offers from leading suppliers in this field (Honeywell, Emerson, Invensys, Aspen Tech).

4. **Environmental Program**

Refineries need significant investment for environmental work. Petrom prefers to utilize financial assistance for environmental projects (e.g. EBRD).

Project Description

Petrom operates a 200,000 MTY steam cracker, built by Lurgi, at the Arpechim Refinery. The Petrom modernization plan includes expanding the capacity of this unit by 100,000 MTY to 300,000 MTY.

The project involves some modifications to the compressors, the addition of furnaces, upgrading of the separation and purification systems, and expansion of the coldbox capacity. The estimated cost is US\$50 million. The project would allow Petrom to gain from economies of scale for the ethylene operation, and to also expand their polyethylene production capability.

Petrom also plans to increase polyethylene capacity at Arpechim with the addition of a new unit, largely to produce medium-density polyethylene. The product would be used for producing plastic pipes to replace pig-iron pipes in the gas distribution system throughout the entire country. Estimated cost for this facility is US\$65 million.

American and European firms have been approached by Arpechim for technical information regarding these projects. However, a detailed feasibility study is required to evaluate the technical and economic viability of the proposed expansions and assess market size. It must consider potential domestic and foreign competition in a free market economy as Romania progresses towards becoming a full member of the EU.

Project Guidance Parameters

Project Costs

Based on the available, preliminary information, the petrochemical expansion



Petrom Petrochemical Plant Expansion



project is estimated to cost about US\$115 million.

Known Initiatives

Petrom has developed a series of projects to improve the competitiveness of their two refineries. The projects include the upgrading and revamping of many refinery units to improve product yields and energy usage, as well as reducing oil losses.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	1 st	2002
Financing & Construction		2002-2003
Plant Start-up	4 th	2003

Project Financing

Project financing has not yet been addressed. Petrom plans to use a mix of internal resources, supplier's credit, and loans from institutions and commercial banks for financing this project. A detailed financing plan will be developed as a part of the feasibility study.

U.S. Competitiveness

U.S. suppliers of technology, equipment, catalysts, engineering and construction services are well positioned to provide equipment and services required for this project. U.S. firms such as UOP, Kellogg, Stone & Webster, ABB Lummus Global, could be very competitive in supplying technology and/or engineering services.

Conclusion

Petrom is undertaking a significant program to improve the competitiveness of its two refineries. Expansion of the petrochemical facilities is predicated to satisfy domestic demands for medium density polyethylene.

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Petrom Delayed Coker and Calciner Project



Project Discussion

Project Background

Petrom, the State Oil Company of Romania, is a vertically integrated petroleum company with upstream and downstream assets including two (2) refineries -- Arpechim and Petrobrazi -- and a network of 700 service stations in Romania. Petrom, with about 35.4% of the country's active refinery capacity, is the largest refiner in the country. Arpechim and Petrobrazi have a total capacity of 8 million MTY and in 2000, processed 5.7 million tonnes of crude, 53.3% of the total crude processed in Romania. These refineries can produce a wide range of products including LPG, gasoline, jet fuel, diesel, light and heavy fuel, coke, bitumen, lube oils, and aromatic hydrocarbons.

Arpechim and Petrobrazi are located on the domestic crude oil fields operated by Petrom. Both refineries are capable of processing domestic and imported crude and are connected to the State owned crude pipelines, Conpet, connecting the refineries to Petrom's production fields and the crude import terminal at Constanta, on the Black Sea.

Both Arpechim and Petrobrazi are integrated refinery and petrochemical plants and have significant on-site storage facilities for crude oil and products. The petrochemical facilities produce a wide range of products including ethylene, propylene, polyethylene, acrylonitrile, carbon black, ethylene oxide, phenol, acetone, and maleic anhydride. Each refinery tends to produce the products that cannot be produced at the other refinery. The two complexes are also connected to Petrotrans, a Petrom owned petroleum product pipeline infrastructure. Petrotrans is the only product pipeline network in the country serving all major domestic consumers and

Planned Additions and Modifications

- New Coke Calcining Module
- Eliminating an intermediate quench column
- Coker automatic drum unheading systems
- Coke Cutting System
- Furnace refurbishing
- Heat exchanger revamps

Project Summary

Sector	Refining
Location	Petrobrazi Refinery, Ploiesti, Romania
Capital Required	\$31 million
Export Potential	\$10 million
Project Sponsor	Petrom
Project Status	Technical Feasibility Study Completed



Petrom Delayed Coker and Calciner Project



connects all Romanian refineries to petroleum product export terminals at Constanta, on the Black Sea, and Giurgiu, on the Danube river.

Most of the technology at Arpechim and Petrobrazi was supplied by UOP, and UOP (working with Solomon Associates) is providing long-term assistance to Petrom in order to develop a master plan for upgrading and modernizing these refinery and petrochemical plants. The plan is envisaged in four (4) phases:

1. Cost Reduction and Profitability Improvement Program

This program included low or no-cost projects for yield improvement and energy reduction. To maintain its competitive position, Petrom has identified a series of projects to reduce oil loss, energy consumption, maintenance costs, and utility costs. They also plan to improve capacity utilization.

2. EU Fuel Specifications Program

About 50% of the gasoline and gas oil produced by Petrom meet the EU specification. Additional alkylation capacity will be needed to allow production of 100% gasoline and gas oil products meeting the EU product standards. Petrom has exported some products to the EU.

3. Re-instrumentation and Implementation of Advanced Process Control Program

This program includes a project to be developed in the next 2-3 years based on offers from leading suppliers in this field (Honeywell, Emerson, Invensys, Aspen Tech).

4. Environmental Program

Refineries need significant investment for environmental work. Petrom prefers to utilize financial assistance for environmental projects (e.g. EBRD).

Project Description

The Petrobrazi refinery plans to modify an existing 800,000 MTY delayed coker and to build a new Calciner for improving coke quality. The current operation has 4 drums. The Petrom plan includes eliminating a quench column, installing a new coke cutting system, re-piping of furnace outlets directly to the coke drums, and adding an automatic drum de-heading system. The calcined coke would be used in the metallurgy industry and for electrodes manufacturing.

The project would include the implementation of a new petroleum coke calcining module.

Project Guidance Parameters

Project Costs

The delayed coker revamping and new calcining unit is estimated to cost about US\$31 million, of which US\$20 million is for the calciner.

Known Initiatives

Petrom has developed a series of projects to improve the competitiveness of their two refineries. The projects include the upgrading and revamping of many refinery units to improve product yields and quality, reduce energy consumption, reduce emissions, improve safety and reliability, and reduce oil losses.



Petrom Delayed Coker and Calciner Project



Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	3 rd	2001
Financing & Construction		2001 & 2002
Plant Start-up	4 th	2002

Project Financing

Project financing has not yet been addressed. Petrom would like to use a mix of internal resources, supplier's credits, and loans from international financial institutions and commercial banks.

U.S. Competitiveness

U.S. suppliers of technology, equipment, DCS control systems, engineering, coke cutting, automatic drum un-heading and construction services are well positioned to provide equipment and services required for this project. It is reported that U.S. companies often manage to provide a superior overall package of technology, services, and financing even though EU companies benefit from the Romanian import regulation and do not pay any import duties.

Conclusion

The delayed coker and calcining project will help Petrom improve product quality and yields, operation safety, and economic efficiency while reducing plant emissions.

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Petrom New Alkylation Unit



Planned Additions

- New Alkylation Unit

Project Summary

Sector	Refining
Location	Petrobrazi Refinery, Ploiesti, Romania
Capital Required	\$22 million
Export Potential	\$7 million
Project Sponsor	Petrom
Project Status	Preliminary Planning

Project Discussion

Project Background

Petrom, the State Oil Company of Romania, is a vertically integrated petroleum company with upstream and downstream assets including two (2) refineries -- Arpechim and Petrobrazi -- and a network of 700 service stations in Romania. Petrom, with about 35.4% of the country's active refinery capacity, is the largest refiner in the country. Arpechim and Petrobrazi have a total capacity

of 8 million MTY and in 2000, processed 5.7 million tonnes of crude, 53.3% of the total crude processed in Romania. These refineries can produce a wide range of products including LPG, gasoline, jet fuel, diesel, light and heavy fuel, coke, bitumen, lube oils, and aromatic hydrocarbons.

Arpechim and Petrobrazi are located on the domestic crude oil fields operated by Petrom. Both refineries are capable of processing domestic and imported crude and are connected to the State owned crude pipelines, Conpet, connecting the refineries to Petrom's production fields and the crude import terminal at Constanta, on the Black Sea.

Both Arpechim and Petrobrazi are integrated refinery and petrochemical plants and have significant on-site storage facilities for crude oil and products. The petrochemical facilities produce a wide range of products including ethylene, propylene, polyethylene, acrylonitrile, carbon black, ethylene oxide, phenol, acetone, and maleic anhydride. Each refinery tends to produce the products that cannot be produced at the other refinery. The two complexes are also connected to Petrotrans, a Petrom owned petroleum product pipeline infrastructure. Petrotrans is the only product pipeline network in the country serving all major domestic consumers and connects all Romanian refineries to petroleum product export terminals at Constanta, on the Black Sea, and Giurgiu, on the Danube river.

Most of the technology at Arpechim and Petrobrazi was supplied by UOP, and UOP (working with Solomon Associates) is providing long-term assistance to Petrom in order to develop a master plan for upgrading and modernizing these refinery and petrochemical plants. The plan is envisaged in four (4) phases:



Petrom New Alkylation Unit



1. Cost Reduction and Profitability Improvement Program

This program included low or no-cost projects for yield improvement and energy reduction. To maintain its competitive position, Petrom has identified a series of projects to reduce oil loss, energy consumption, maintenance costs, and utility costs. They also plan to improve capacity utilization.

2. EU Fuel Specifications Program

About 50% of the gasoline and gas oil produced by Petrom meet the EU specification. Additional alkylation capacity will be needed to allow production of 100% gasoline and gas oil products meeting the EU product standards. Petrom has exported some products to the EU.

3. Re-instrumentation and Implementation of Advanced Process Control Program

This program includes a project to be developed in the next 2-3 years based on offers from leading suppliers in this field (Honeywell, Emerson, Invensys, Aspen Tech).

4. Environmental Program

Refineries need significant investment for environmental work. Petrom prefers to utilize financial assistance for environmental projects (e.g. EBRD).

Project Description

Petrom plans to build a new 120,000 MTY Alkylation unit at Petrobrazi Refinery to improve the gasoline pool quality and to meet

EU gasoline specifications. Feed to the unit will be butylenes from the FCC unit and isobutanes from the FCC and reforming units.

The project would include all the facilities required for a new plant. These include reactors, columns, vessels, heat exchangers, and furnaces, along with piping, process controls and power supply.

The company has not yet selected a technology for this plant. Under consideration are hydrofluoric acid, sulfuric acid and solid catalyst technologies.

Project Guidance Parameters

Project Costs

The alkylation unit is estimated to cost US\$22 million.

Known Initiatives

Petrom has developed a series of projects to improve the competitiveness of their two refineries. The projects include the upgrading and revamping of many refinery units to improve product yields and quality, reduce energy consumption, improve safety, reduce emission and oil loss, and improve economic efficiency.

Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Technical Feasibility Study	3 rd	2001
Financing & Construction		2001-2003
Plant Start-up	4 th	2003



Petrom New Alkylation Unit



Project Financing

Project financing has not yet been addressed. Petrom would likely utilize a mix of internal resources, supplier's credits, and loans from multinational/international financial institutions and commercial banks to finance this project. A detailed financial plan will be developed as a part of a feasibility study.

U.S. Competitiveness

U.S. suppliers of technology, equipment, DCS control systems, catalysts, engineering and construction services are well positioned to provide equipment and services required for this project. It is reported that U.S. companies often manage to provide a superior overall package of technology, services, and financing, even though EU companies benefit from the Romanian import regulation and do not pay any import duties.

Conclusion

The Alkylation unit is required to enable Petrom to meet EU gasoline specifications efficiently.

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Petrom Acrylonitrile Unit Upgrading Project



Planned Additions and Modifications

- Revamp Acrylonitrile Unit
- Add chemical and biological waste water treatment
- Add thermal oxidizer

Project Summary

Sector	Petrochemical
Location	Arpechim Refinery, Piteşti, Romania
Capital Required	\$24 million
Export Potential	\$7 million
Project Sponsor	Petrom
Project Status	Technical Feasibility Completed

Project Discussion

Project Background

Petrom, the State Oil Company of Romania, is a vertically integrated petroleum company with upstream and downstream assets including two (2) refineries -- Arpechim and Petrobrazi -- and a network of 700 service

stations in Romania. Petrom, with about 35.4% of the country's active refinery capacity, is the largest refiner in the country. Arpechim and Petrobrazi have a total capacity of 8 million MTY and in 2000, processed 5.7 million tonnes of crude, 53.3% of the total crude processed in Romania. These refineries can produce a wide range of products including LPG, gasoline, jet fuel, diesel, light and heavy fuel, coke, bitumen, lube oils, and aromatic hydrocarbons.

Arpechim and Petrobrazi are located on the domestic crude oil fields operated by Petrom. Both refineries are capable of processing domestic and imported crude and are connected to the State owned crude pipelines, Conpet, connecting the refineries to Petrom's production fields and the crude import terminal at Constanta, on the Black Sea.

Both Arpechim and Petrobrazi are integrated refinery and petrochemical plants and have significant on-site storage facilities for crude oil and products. The petrochemical facilities produce a wide range of products including ethylene, propylene, polyethylene, acrylonitrile, carbon black, ethylene oxide, phenol, acetone, and maleic anhydride. Each refinery tends to produce the products that cannot be produced at the other refinery. The two complexes are also connected to Petrotrans, a Petrom owned petroleum product pipeline infrastructure. Petrotrans is the only product pipeline network in the country serving all major domestic consumers and connects all Romanian refineries to petroleum product export terminals at Constanta, on the Black Sea, and Giurgiu, on the Danube river.

Most of the technology at Arpechim and Petrobrazi was supplied by UOP, and UOP (working with Solomon Associates) is providing long-term assistance to Petrom in order to develop a master plan for upgrading



Petrom Acrylonitrile Unit Upgrading Project



and modernizing these refinery and petrochemical plants. The plan is envisaged in four (4) phases:

1. **Cost Reduction and Profitability Improvement Program**

This program included low or no-cost projects for yield improvement and energy reduction. To maintain its competitive position, Petrom has identified a series of projects to reduce oil loss, energy consumption, maintenance costs, and utility costs. They also plan to improve capacity utilization.

2. **EU Fuel Specifications Program**

About 50% of the gasoline and gas oil produced by Petrom meet the EU specification. Additional alkylation capacity will be needed to allow production of 100% gasoline and gas oil products meeting the EU product standards. Petrom has exported some products to the EU.

3. **Re-instrumentation and Implementation of Advanced Process Control Program**

This program includes a project to be developed in the next 2-3 years based on offers from leading suppliers in this field (Honeywell, Emerson, Invensys, Aspen Tech).

4. **Environmental Program**

Refineries need significant investment for environmental work. Petrom prefers to utilize financial assistance for environmental projects (e.g. EBRD).

Project Description

The Arpechim Refinery plans to upgrade their acrylonitrile unit to improve yields, and reduce both emissions and energy consumption. The project includes revamping the recovery towers to avoid polymer blocking, improving wastewater treatment by adding further chemical and biological processes, and the addition of a thermal oxidation unit to process contaminants.

Equipment needed include a thermal oxidizer, boilers, electrical generator and transformers, new fractionation tower internals, and a new wastewater treatment facility.

Project Guidance Parameters

Project Costs

The acrylonitrile plant revamp is estimated to cost about US\$24 million.

Known Initiatives

Petrom has developed a series of projects to improve the competitiveness of their two refineries. The projects include the upgrading and revamping of many refinery units to improve product yields and quality, reduce energy consumption, reduce emissions, improve safety and reliability, and reduce oil losses.



Petrom Acrylonitrile Unit Upgrading Project



Plant Addition Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Technical Feasibility Study	3 rd	2001
Financing & Construction		2001-2003
Plant Start-up	4 th	2003

Project Financing

Project financing has not yet been addressed. Petrom has sufficient cash flow to fund its projects, but would likely utilize financing for some of the projects. Potential financing sources include internal resources, suppliers credits, Ex-Im, OPIC, EBRD, and commercial banks

U.S. Competitiveness

U.S. suppliers of technology, equipment, DCS control systems, catalysts, engineering, and construction services are well positioned to provide equipment and services required for this project. It is reported that U.S. companies often manage to provide a superior overall package of technology, services, and financing even though EU companies benefit from Romanian import regulations and do not pay any import duties.

Conclusion

The acrylonitrile project will help Petrom reduce emissions from the refinery and improve energy efficiency.

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GDP (in US\$ Billion)	19.3
GDP Growth (est.)	2.1%
GDP Per Capita (US\$)	3,537
Population (Million)	5.4
Credit Rating	BB+

Source: European Bank for Reconstruction and Development & The World Bank

Executive Summary

Improving rapidly since the 1998 elections, Slovakia has benefited from the government's commitment to become a member of the EU. By encouraging privatization and foreign investment, Slovakia has improved its macro-economic stability and continues on its course for membership in the European Union (EU). Slovakia is a member of the WTO, CEFTA, and OECD and also hopes to join NATO in 2002.

As Slovakia prepares for full entry into the EU, the country's chemical, petrochemical and refining industry face environmental cleanup, modernization, and energy and operational efficiency improvements. Major chemical producers are seeking foreign investors and partners in order to fund the acquisition of new and more effective technologies to improve quality of their products and to position themselves for the EU's competitive and free market.

Since 1998, Foreign Investment in Slovakia has been skyrocketing, increasing from about US\$400 million in 1998 to a projected US\$ 2 billion in 2001. Much of this foreign investment is due to the privatization of enterprises and businesses in Slovakia. The U.S. is the 4th ranked private investor in Slovakia, with companies such as U.S. Steel buying part of Slovakia's largest steel producer.

Political and Economic Climate

Slovakia became a sovereign country following the dissolution of Czechoslovakia in January 1993. Over the next five years, the restructuring and privatization process was much slower in Slovakia than in other Central European countries. Since the elections of 1998, a broad coalition government in Slovakia revitalized the process of the consolidation of democratic institutions, started to rebuild ties with the international community, and has taken important steps to further economic progress. Current government policies have reduced macroeconomic imbalances, significantly reduced both government size and account deficits, eliminated price distortions, made large inroads in restructuring and privatization, and created incentives for foreign investment. The country's international standing has also been regained, as reflected in Slovakia's accession to the OECD in 2000. Accession to NATO and to the EU have been and remain a government priority. Slovakia is currently engaged in accession negotiations with the EU, and to date has provisionally closed 20 out of the 31 total chapters. Slovakia has also been contributing actively to regional stability through a policy of good neighborly relations and regional economic cooperation. Slovakia is a member of the Central European Free Trade Association (CEFTA). Slovakia also



operates a customs union with the Czech Republic and is a member of the WTO.

The EBRD reports that the Slovak government has taken important steps to reduce macroeconomic imbalances. The economy grew by about 2.2% in 2000, an increase largely fueled by excellent export performance. Economic growth in 2001 is expected to be about 3.2% as domestic consumption recovers and increases.

The inflation rate decreased from 14.2% in 1999 to 8.4% in 2000 and is forecasted to further decrease to 7.8% in 2001 as a result of fiscal consolidation and moderate wage settlements.

Investment Climate

In 1999, the Slovak government adopted its Strategy for the Support of Foreign Direct Investment Inflow, which sets out measures to increase the level of FDI in Slovakia. As of January 1, 2001 several investment incentives exist in Slovakia. These incentives include a five year corporate tax break to companies that are 60% foreign owned, lower investment thresholds, 50% corporate tax relief for the subsequent five years for companies that further invest in districts with high unemployment, zero tariffs on imports of new machinery and equipment for manufacturing, and a state contribution for every job created.

In the January-September 2000 period, net FDI inflows of US\$1 billion were registered; this is double the figure for 1998, previously the most successful year. In 2000, a large portion of foreign investment was related to the privatization of state assets and around half of all investment was in the manufacturing sector. Within the manufacturing sector, automotive components, consumer electronics and

precision engineering accounted for the largest share of FDI. Further important sectors for FDI are financial services and trade, real estate, and communications. As of September 2000, Germany leads foreign investment in Slovakia with 42.4%, followed by Austria, the Netherlands, and the U.S. with respective shares of 14.3%, 11.1%, and 10.2%. To date, the largest privatization deal was the sale of a 51% stake in Slovak Telekom (ST), to Deutsche Telekom AG in 2000. Other important deals took place when US Steel bought into VSZ, the country's largest steel maker, and Hungarian MOL acquired 36.25% of the oil refinery Slovnaft, the dominant player in the Slovak oil and gas market.

Slovakia is a member of the WTO and is bound by the GATT Agreement on Implementation of Article VII. Customs valuation is based on this agreement and the rules appear to provide a uniform and neutral system of valuation. In addition, documentation standards are harmonized with EU standards. In 1998 and 1999, the average tariff reached 1.03% and 0.75%, respectively, with new machinery and equipment for manufacturing being exempt from customs duty.

Slovakia's trade is heavily oriented towards EU member states. [With 59.3% of total exports to and 49.3% of total imports from Germany, Germany is Slovakia's most important trading partner.] The Czech Republic is also an important trade partner because the two countries are part of a customs union and pursue a common trade policy.

The main Slovakian exports are manufactured goods such as automotive components. The main Slovakian imports are fuel and energy, food, and capital goods for use in manufacturing.



Sector Overview

The principal player in the oil refining and petrochemical sector is Slovnaft. Slovnaft owns the country's only refinery, with a capacity of 330,000 barrels per day. Slovnaft, with 333 gas stations, controls approximately 40% of the fuel retail market in Slovakia. Slovnaft was privatized in two stages in 1990's. The Hungarian oil and gas company, MOL, purchased more than one third of the refinery in April 2000, with the right to increase its stake to above 50% in 2002. Currently, Slovnaft is in the process of upgrading the refinery, making it one of the most modern refineries in Europe.

Slovnaft, Duslo, Plastika Nitra, and Chemolak are the significant producers of chemical products in Slovakia. Slovnaft's chemical products include car engine oils (under the brand name of Madit), industrial oils (bearing, turbine, compressor, hydraulic, shaping, gear and other oils), lubricants, vaseline, heating oils, asphalts, polyethylenes (Bralen), polypropylenes (Tatren) and other petrochemical products. Plastika Nitra is a large, private manufacturer of plastics. They seek a joint-venture investor to help them modernize production, introduce new technologies, and generally make them more competitive in the European market. They are especially interested in offering corrugated plastic tubes/piping and also hope to purchase technology licenses in order to improve production. Chemolak has a 118-year history and is Slovakia's leading manufacturer of paints and coatings. They seek a joint venture investor with the hopes to modernize and acquire new technologies.

U.S. Presence

The U.S. has the 4th largest amount of foreign investment in Slovakia as of 2000. While Slovaks have no prejudices against American products, they prefer to buy Slovakian made products unless there is a significant price advantage in not doing so. Therefore, pricing is a very important factor when dealing with Slovakia.



About Slovnaft

Slovnaft, a.s., is a joint stock company located in Slovakia. Slovnaft is the major downstream oil and petrochemical company in Slovakia. Slovnaft processes crude oil into a range of petroleum and petrochemical products, is the largest marketer of petroleum products in Slovakia, enjoys a significant wholesale presence in the Czech Republic, Austria and Poland, and also has retail operations in the Czech Republic, Poland and Ukraine. Last year, MOL Hungarian Oil and Gas Co., became a strategic investor in Slovnaft.

The Slovnaft Group implemented a significant project of Heavy Petroleum Residue Upgrade (EFPA) in the Bratislava Refinery. The project became fully operational in March 2000, and resulted in a significant increase in the volume of lighter products (gasoline and diesel) from the Bratislava Refinery. The Bratislava Refinery is now one of the most complex refineries in Europe.

Slovnaft Products

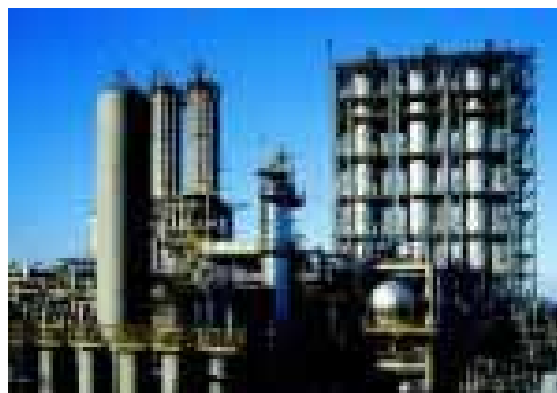
In 2000, Slovnaft processed 5,682 kt of raw materials, of which 5,320 kt was crude oil. Crude oil was imported exclusively from Russia.

* Prepared by Slovnaft.

Main Products (thousands tons)

Gasoline	1,372.9
Diesel	2,023.9
Kerosene	46.8
Aromatics	95.2
Heavy fuel oil	414.7
Lubes	39.2
Bitumen and oxidizing mixture	78.9
Sulfur	51.4
Petrochemical products	263.2
Plastics	234.0

Cooperation between Slovnaft and TDA in EFPA



LC Finer reactors

Slovnaft began cooperation with the U.S. Trade Development Agency (U.S. TDA) in 1993, when the agency provided it with a grant to conduct a feasibility study aimed at the Heavy Residue Upgrading Project. The American company Bechtel carried-out the study and, based-on its recommendations, a project called EFPA (Environmental Fuel Project Apollo) budgeting \$526 million has been undertaken. Several American companies took part in the implementation of the project. Slovnaft has signed license contracts regarding individual production processes with American companies including ABB Lummus Global, UOP and STRATCO, as well as EPC (Engineering, Procurement, Construction) contracts with the three



American companies Fluor Daniel, Raytheon and Honeywell.

The following processing units have been constructed:

LC Finer	1200 kt/y
HDS VGO	1000 kt/y
FCC	850 kt/y
Alkylation	155 kt/y
SHU C4	40 kt/y
MTBE	55 kt/y
Hydrogen	27 kt/y
Sulfur	2x45 kt/y

Thanks to the implementation of the project, Slovnaft has become one of the most advanced refineries in Europe with a high level of conversion.

In the late 1990s, Slovnaft was awarded additional grants by TDA to finance feasibility studies of the New Polypropylene Unit and Revamp and Modernization of Ethylene Plant. These studies were carried-out by American companies Raytheon and MW Kellogg and now, based also on these studies, Slovnaft is preparing to undertake a project of petrochemical production development.

Planned Petrochemical Projects

Presently, three projects are being prepared:

- A new polypropylene unit – 250kt/year
- A revamp of a steam cracker – up to 300kt/year
- A new polyethylene unit – 200-300 kt/year of polyethylene

Moreover, Slovnaft, in cooperation with MOL and TVK in Hungary, is evaluating various possibilities for further benzene processing

that is anticipated to become available in 2006.

The feasibility studies for the new polypropylene unit and the revamp of steam cracker, were funded by TDA. In addition, Slovnaft and TDA have cooperated in conducting another important feasibility study named “Decrease in Cooling Water Consumption and Water Discharge.”

The Polypropylene Project

Raytheon Engineers & Constructors was retained by Slovnaft, under a grant from the U.S. Trade and Development Agency, to investigate the feasibility of adding new polypropylene production facilities to the existing Bratislava plant complex.

The feasibility study addressed the following important items:

- Evaluation of Central and West European polypropylene markets
- Comparison and evaluation of technical and economic aspects of modern polypropylene technologies
- Selection of one polypropylene technology for use as a basis for the feasibility study
- Analysis of a project for Slovnaft that is based upon the selected technology

The feasibility study was based on the following:

- Erection of a new polypropylene plant with ultimate capacity of 170,000 t/y
- Operation at 130,000 t/y until December 2004 when the full 170,000 t/y of propylene will be available



- Use of gas phase technology
- Initial installation of facilities for production of homopolymer and random copolymers but with provision for ease of upgrading to production of impact copolymers
- Partial or complete use of existing facilities such as pellet storage, railcar loading, packaging, warehousing and utilities.

The feasibility study was updated this year because Slovnaft was able to obtain additional propylene from MOL Duna refinery and from TVK. The capacity of the new polypropylene unit will be increased to 205 kt/y by the end of 2004 and further increased to 255 kt/y in 2007.

Investment and operation costs were calculated and inputted into a financial model consisting of annual cash flows beginning from the start of engineering and ending after 20 years of plant production. The model was utilized to review cash flow, NPV, IRR and payback period. Sensitivity analysis regarding changes in product sales price, propylene feed cost and fixed capital investment was made. Based on this economic and financial analysis, Slovnaft plans to undertake the project.

The estimated investment cost for the New Polypropylene Unit is about US\$130-US\$180 million.

Revamp and Modernization of Steam Cracker

M.W. Kellogg Co. (MWK) was selected by Slovnaft a.s. to perform a feasibility study to expand the ethylene plant in Bratislava, Slovakia.

Present situation

The existing ethylene plant has a design capacity of 200,000 mt/y of polymer grade ethylene, and has operated at up to 215,000 mt/y after some modifications in the furnace area. Basically, no other modification has been made to increase the capacity of the plant.

MWK visited the Ethylene Plant to evaluate plant capacity with the current feed stocks and determined the potential bottlenecks in the plant. The plant is capable of meeting and exceeding the original design capacity despite some equipment limitations.

Slovnaft set the maximum target capacity, after expansion, of 300,000 mt/y of polymer grade ethylene. This was expected to be the maximum capacity that can be achieved without adding major towers. The feasibility study then analyzed several alternatives of the plant's expansion – to 220,000 mt/y, 240,000 mt/y, 260,000 mt/y, 280,000 mt/y and 300,000 mt/y. The study showed that the Slovnaft Ethylene Plant can be expanded to the target capacity of 300,000 mt/y without adding a major tower and this alternative proved to be the most beneficial based-on the financial analyses. However, to achieve this expansion capacity, substantial modifications to the existing ethylene plant are required.

Last year, Stone & Webster performed a similar feasibility study for expansion of an ethylene plant in Slovnaft.

The estimated investment cost for the Revamp and Modernization of Steam Cracker is about US\$90-US\$125 million.

Slovnaft is planning this expansion for 2005-6.



New Polyethylene Unit

With production of 168 kt/y of LDPE in 2000, Slovnaft ranks among middle size companies in the region of the Central Europe, but within Europe as a whole, this capacity does not allow Slovnaft to play an important role on the market. It is expected that, after the revamp of the steam cracker in 2006, Slovnaft will produce 300 kt/y of ethylene.

Based on a market analysis, several alternative processes are being analyzed currently.

The final decision regarding which alternative will be implemented has not been made yet. First, Slovnaft wants to deal with the polypropylene project.

The estimated investment costs are within range US\$135 to US\$200 million and depend on final capacity and selected process.

Slovnaft is planning this New Polyethylene plant for 2005-6.

Aromatics Project

This project will follow the planned expansion of steam crackers at TVK, Hungary and Slovnaft and after the shutdown of a small production unit processing benzene, the amount of available benzene will rise to about 250 kt/y by 2006.

At the present time, Slovnaft is gathering information about available processes, market demand for different derivatives of benzene and performing market analysis for various options of benzene processing

Slovnaft is still at the very early stages of this project.

Decrease in Cooling Water Consumption and Water Discharge



The staff at the Slovnaft Bratislava Refinery has expressed interest in working with an experienced U.S. environmental team in developing and implementing a discharge flow and load reduction program. This program shows promise of investment exceeding US\$ 50 million with good prospects for U.S. supplier participation. The proposed Slovnaft project team, led by Millennium Science & Engineering, Inc. (MSE) and financially supported by TDA funding, has to deal with a large, complex project involving process water use reduction, pollution prevention considerations, and end-of-pipe wastewater treatment, all of which have significant potential for equipment requirements. At least three U.S. equipment suppliers, probably more, will participate in this feasibility study, providing technical input on processes, equipment and estimated costs. They are Smith & Loveless, WaterLink, and U.S. Filter. This will facilitate their bidding for the project in later stages of the development of the project.



Project Technical Description

On October 1st, 2002, strict wastewater discharge limits will take effect with regard to Slovnaft's effluent into Maly Dunaj River. The new limits concern both the volume and quality of discharged wastewater.

Slovnaft has to reduce the wastewater effluent into Maly Dunaj River below 50 million m³ / year and meet the hydrocarbons content limit of 0.4 mg/l. Last year's figures were 65 million m³ / year of wastewater effluent into Maly Dunaj River and the average hydrocarbons content was 0.68 mg/l.

Slovnaft is systematically shifting from a once through cooling system to closed re-circulation systems where possible, and to reduce cooling water consumption. Slovnaft has 6 re-circulation facilities. All new process units are connected to re-circulation systems. Nevertheless roughly 75% of wastewater still moves only once through cooling water.

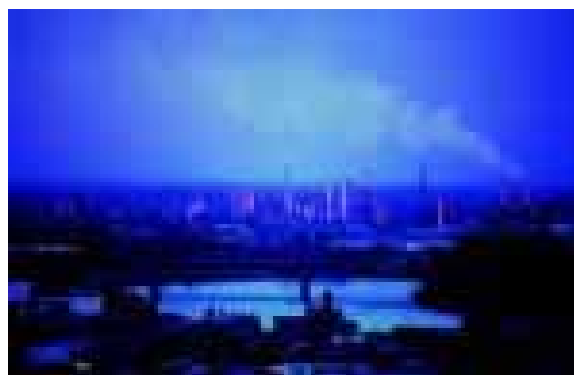
The use of process wastewater needs to be studied to determine what can be done to reduce water and pollutant flows from each source. New product processing equipment may be needed to achieve environmental goals and bring about economic efficiency. For example, better electro-mechanical controls may be needed in some cases; in others, centrifuges and other oil/water separation equipment may perhaps be appropriate. There will also be opportunities to recover materials that can be recycled back into product refining streams.

The ultimate objective will be to design a cost effective treatment plant, which will reduce wastewater discharge from the refinery as much as possible. The MSE team will work with Slovnaft representatives to develop a schedule of implementation and prepare bid

packages for construction of needed improvements.

Conclusion

The overall relationship between Slovnaft and TDA as well as American companies has been very fruitful. Based on this cooperation, several important projects have already been implemented and others are to be implemented in the next few years – all of which have a great potential to improve the economic performance of the petrochemical production at Slovnaft. Many American firms have taken part in Slovnaft's activities and the number is consistently growing. Slovnaft looks forward to the future cooperation between our firm and other countries.





Slovnaft Aromatics Project



Planned Additions / Expansions

- Expansion of Benzene production to 250,000 MTY
- Rationalization of current benzene production
- Construction of a new production unit for benzene derivative (ethylbenzene, styrene, phenol, etc.)

Project Summary

Sector	Chemicals
Location	Bratislava, Slovakia
Capital Required	\$ 75-150 million
Export Potential	\$ 50-75 million
Project Sponsor	Slovnaft
Project Status	Preliminary Stage

Project Discussion

Project Background

Slovnaft, a.s., is a joint stock company located in Slovakia. Slovnaft is the major downstream oil and petrochemical company in Slovakia. Slovnaft processes crude oil into a range of petroleum and petrochemical products and is the largest marketer of petroleum products in Slovakia, enjoys a significant wholesale presence in the Czech Republic, Austria and Poland, and also has retail operations in the Czech Republic, Poland and Ukraine. Last year, MOL, became the strategic investor in Slovnaft.

The Slovnaft Group implemented a significant project of Heavy Petroleum Residue Upgrade (EFPA) in the Bratislava Refinery. The project became fully operational by the end of March 2000, and resulted in a significant increase in the volume of lighter products (gasoline and diesel) from the Bratislava Refinery. The Bratislava Refinery is now one of the most complex refineries in Europe.

Project Description

The core complex, which provides petrochemical feedstocks is an ABB Lummus Global steam cracker originally constructed in 1976 with a design capacity of 200,000 MTY.

Plans are currently underway to expand the steam cracker's capacity to 300,000 MTY by 2005-6 at Slovnaft and further expansions are planned for the cracker at TVK Hungary which will collectively increase potential benzene production from Slovnaft, TVK and MOL Duna refinery up to 250,000 MTY.

Benzene capacity

Current	155,000 MTY
2007	250,000 MTY

Slovnaft is currently gathering information about available processes, market demand for the different benzene derivatives and performing market analysis and putting together various processing scenarios for preliminary evaluations. A detailed feasibility study will be needed to assess market potential for benzene derivatives, assessing viability of different processes, developing detail costs, conducting analysis and developing a financing plan.

U.S. Competitiveness

U.S. suppliers of benzene derivatives technology, DCS control systems, catalysts



Slovnaft Aromatics Project



and engineering services are well positioned to provide equipment and services for this project.

Conclusion

The Project is still in the early stages and dependant on integration with the expansion plans and strategy of its majority shareholder, MOL of Hungary.

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Slovnaft Steam Cracker Revamp



Planned Additions / Expansions

- Increasing plant capacity from 215,000 MTY to 300,000 MTY of ethylene

Project Summary

Sector	Chemicals
Location	Bratislava, Slovakia
Capital Required	\$95-125 million
Export Potential	\$70-85 million
Project Sponsor	Slovnaft
Project Status	Feasibility study completed

Project Discussion

Project Background

Slovnaft, a.s., is a joint stock company located in Slovakia. Slovnaft is the major downstream oil and petrochemical company in Slovakia. Slovnaft processes crude oil into a range of petroleum and petrochemical products, is the largest marketer of petroleum products in Slovakia, enjoys significant wholesale presence in the Czech Republic, Austria and Poland, and also has retail operations in the Czech Republic, Poland and Ukraine. Last year, MOL, became a strategic investor in Slovnaft.

The Slovnaft Group implemented a significant project of Heavy Petroleum Residue Upgrade (EFPA) in the Bratislava Refinery. The project became fully operational by the end of March

2000, and resulted in a significant increase in the volume of lighter products (gasoline and diesel) from the Bratislava Refinery. The Bratislava Refinery is now one of the most complex refineries in Europe.

The core complex providing petrochemical feedstocks is an ABB Lummus Global steam cracker originally constructed in 1976 with a design capacity of 200,000 MTY of ethylene.

In 1997, Slovnaft approached TDA for the funding of a feasibility study to determine the technical and economic feasibility of expanding the steam cracker's capacity to 300,000 MTY of ethylene to be then processed to polyethylene by Slovnaft itself. This feasibility study was carried out by the MW Kellogg Corporation and was completed in May 1998.

Steam Cracker capacity

Current	215,000 MTY
Planned	300,000 MTY

Modernization Plan

Slovnaft set the maximum target capacity after expansion to be 300,000 MTY of polymer grade ethylene. This was expected to be the maximum capacity that can be achieved without adding major towers. The feasibility study then analyzed several alternatives of the plant's expansion – to 220,000 MTY, 240,000 MTY, 260,000 MTY, 280,000 MTY and 300,000 MTY. The study has shown that the Slovnaft Ethylene Plant can be expanded to the target capacity of 300,000 MTY without adding a major tower and this alternative proved to be the most beneficial, based on the financial analyses. However, to achieve this expansion capacity, substantial modifications to the existing ethylene plant are required.



Slovnaft Steam Cracker Revamp



The necessary modifications are:

- An addition of one new furnace
- Compressors replacement
- Replacement of internals, packing in fractionators and strippers

Project Guidance Parameters

Project Costs

The plant capacity expansion and equipment replacement/additions are estimated to cost about US\$90-US\$125 million of which about US\$70-US\$85 million is anticipated to go towards imports.

Known Initiatives

A TDA funded feasibility study was carried out by MW Kellogg for Slovnaft in 1998.

The Stone and Webster Engineering Corporation performed a similar feasibility study for the expansion of the ethylene plant for Slovnaft in 2000.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	2 nd	1998
Plant Start-up		2006-2007

U.S. Competitiveness

The U.S. companies (ABB Lummus Global, Stone and Webster Engineering and MW Kellogg) are in the forefront of steam cracker technology and should be well positioned to provide technology and services for the expansion of this unit.

Conclusion

The final decision regarding the size and timing of implementation of the ethylene plant expansion is still under consideration. A final decision is expected to follow the Board of Directors anticipated approval of the polypropylene expansion project.

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Slovnaft Polyethylene Project



Planned Additions / Expansions

- Polyethylene plant expansion from current capacity of 168,000 MTY to a capacity of 300,000 MTY by 2006-7.

Project Summary

Sector	Chemicals
Location	Bratislava, Slovakia
Capital Required	\$150-230 million
Export Potential	\$120-140 million
Project Sponsor	Slovnaft
Project Status	Pre-feasibility Study on-going

Project Discussion

Project Background

Slovnaft, a.s., is a joint stock company located in Slovakia. Slovnaft is the major downstream oil and petrochemical company in Slovakia. Slovnaft processes crude oil into a range of petroleum and petrochemical products, is the largest marketer of petroleum products in Slovakia, enjoys significant wholesale presence in the Czech Republic, Austria and Poland, and also has retail operations in the Czech Republic, Poland and Ukraine. Last year, MOL (Hungarian Oil and Gas Co.), became a strategic investor in Slovnaft.

The Slovnaft Group implemented a significant project of Heavy Petroleum Residue Upgrade (EFPA) in the Bratislava Refinery. The project

became fully operational by the end of March 2000, and resulted in a significant increase in the volume of lighter products (gasoline and diesel) from the Bratislava Refinery. The Bratislava Refinery is now one of the most complex refineries in Europe.

The core complex providing petrochemical, feedstocks is an ABB Lummus Global steam cracker originally constructed in 1976 with a design capacity of 200,000 MTY of ethylene.

Plans are currently underway to expand the steam cracker's capacity to 300,000 MTY of ethylene by 2006-7.

Polyethylene capacity

Current	168,000 MTY LDPE
2006/7	300,000 MTY

Modernization Plan

With the capacity of 168,000 MTY of LDPE, Slovnaft ranks among middle size companies in the central European region, a factor which prohibits Slovnaft from playing an important role in the overall European market.

It is expected that after the revamp of the steam cracker in 2006, Slovnaft will produce 300,000 MTY of ethylene, which will allow it to increase polyethylene capacity.

Based on market analysis, several alternative processes are being analyzed at present time.

The final decision regarding which alternative will be implemented has not been made yet. These decisions will follow the implementation of the polypropylene plant currently underway.



Slovnaft Polyethylene Project



U.S. Competitiveness

U.S. suppliers of polyethylene technology, DCS control systems, catalysts and engineering services are well positioned to provide equipment and services for this project. Many of the U.S. companies currently involved in other Slovnaft projects are qualified to support this project

Conclusion

The final decision regarding the size and timing of the implementation of the polyethylene plant expansion is still under consideration and will follow after the polypropylene expansion that is waiting approval from the Board of Directors.

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Slovnaft Polypropylene Project



Planned Additions / Expansions

- New polypropylene plant with a capacity of 255,000 MTY.

Project Summary

Sector	Chemicals
Location	Bratislava, Slovakia
Capital Required	\$130-180 million
Export Potential	\$100-125 million
Project Sponsor	Slovnaft
Project Status	Feasibility study completed

Project Discussion

Project Background

Slovnaft, a.s., is a joint stock company located in Slovakia. Slovnaft is the major downstream oil and petrochemical company in Slovakia. Slovnaft processes crude oil into a range of petroleum and petrochemical products, is the largest marketer of petroleum products in Slovakia, enjoys significant wholesale presence in the Czech Republic, Austria and Poland, and also has retail operations in the Czech Republic, Poland and Ukraine. Last year, MOL, became a strategic investor in Slovnaft.

The Slovnaft Group implemented a significant project of Heavy Petroleum Residue Upgrade (EFPA) in the Bratislava Refinery. The project became fully operational by the end of March 2000, and resulted in a significant increase in

the volume of lighter products (gasoline and diesel) from the Bratislava Refinery. The Bratislava Refinery is now one of the most complex refineries in Europe.

The core complex, providing petrochemical feedstocks, is an ABB Lummus Global steam cracker originally constructed in 1976 with a design capacity of 90,000 MTY of propylene. In addition the new refinery FCC unit produces about 45,000 MTY of propylene.

In 1997, Slovnaft approached TDA for the funding of detailed feasibility study that would identify and evaluate the most economic means of achieving the desired expansion. This feasibility study was carried out by Raytheon Engineers & Constructors and was completed in July 1998.

Polypropylene capacity

Current	70,000 MTY
Dec. 2004	205,000 MTY
2007	255,000 MTY

Modernization Plan

Raytheon Engineers & Constructors was retained by Slovnaft in 1997, under a grant from TDA, to investigate the feasibility of adding new polypropylene production facilities to the existing Bratislava plant complex.

The feasibility study addressed the following important items:

- Evaluation of Central and Western European polypropylene markets.
- Comparison and evaluation of technical and economic aspects of modern polypropylene technologies.



Slovnaft Polypropylene Project



- Selection of one polypropylene technology for use as a basis for the feasibility study.
- Analysis of a project for Slovnaft that is based upon the selected technology.

The feasibility study was based on the following:

- Erection of a new polypropylene plant with ultimate capacity of 170,000 MTY.
- Operation at 130,000 MTY until December 2004 when the 170,000 MTY of propylene will be available.
- Use of gas phase technology.
- Initial installation of facilities for production of homopolymer and random copolymers, but with provision for ease of upgrading for production of impact copolymers.
- Partial or complete use of existing facilities such as pellet storage, railcar loading, packaging, warehousing and utilities.

In 2001, the feasibility study was updated to assess the viability of increasing the capacity of new polypropylene unit to 205 MTY by the end of 2004 and to 255 MTY in 2007.

Project Guidance Parameters

Project Costs

The plant capacity expansion and equipment replacement/additions are estimated to cost approximately US\$130-US\$180 million, of which about US\$100-US\$125 million could be imported.

Known Initiatives

A TDA funded feasibility study was carried out by Raytheon Engineers & Constructors for Slovnaft in 1998.

The feasibility study was updated in 2001. The project is now awaiting approval from Slovnaft's Board.

Plant Expansion/Modernization Schedule

Planned Completion Schedule		
Activity	Qtr	Year
Feasibility Study	2 nd	1998
Construction		2002-2004
Plant Start-up	4 th	2004

U.S. Competitiveness

There are two major technologies that could eventually be imported from the U.S., Univation technology and BP Technology.

U.S. suppliers of DCS control systems, catalysts and engineering services are well positioned to provide equipment and services for this project.

Conclusion

Based on the results of the feasibility studies, which show a positive economic and financial analysis, Slovnaft plans to proceed with this project. Nevertheless, an approval from the Board of Directors, which is scheduled to take place by the end of 2001, is still needed.



Slovnaft Polypropylene Project



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Plastika Nitra Expansion and Modernization



Planned Additions / Expansions

- Production capacity expansion
- Monofoil production line for packing
- Multilayer foil productions line
- HDPE corrugated tubes equipment

Project summary

Sector	Plastic Production
Location	Nitra, Slovakia
Capital Required	\$4 million
Export Potential	\$3 million
Project Sponsor	Plastika Nitra, j.s.c.
Project Status	Technical Assistance and Financing

Project Discussion

Plastika Nitra is a joint stock company (a.s.) that was founded on February 2, 1962 and has undergone many organizational changes during its history. Currently, 86.41% of this company is shared by legal entities owned by mutual and investment funds, while the remaining 13.59% is shared by individuals.

Located in Nitra, in the southwest of the country, Plastika has earned ISO 9001 certifications and warrants product quality in accordance with ISO 9001.

Plastika is one of the leading manufacturers of products from thermoplastic materials in Slovakia. The company produces plastic fabricated products for the industrial, construction, automotive and packaging industries. The major product lines are: PVC, PE and PP piping systems; Polyethylene foils and films; Injection molded parts; Roof and Window Parts; and expanded polystyrene parts.

Plastika sells its products through its own retail network and commercial partners. Plastika has 100% ownership of its subsidiary companies that supplement its production portfolio and provide services. Therefore, Plastika is able to respond very quickly to its customer requirements.

Total sales revenue in 2000 was SK 1.34 billion (US\$ 27 million). In 1999, approximately 45% of sales were due to export to the Czech Republic, the Netherlands, Germany, Denmark and other European Countries. The company's expectations for 2001 are for a 7% increase in total sales over 2000.

Design Capacity

Total	18,840 MTY
Foils	5,180 MTY
PVC pipes	8,580 MTY
PE pipes	2,340 MTY
EPS products	2,150 MTY
Others	590 MTY

Expansion Plan

Plastika's main products are technical foils and films for civil engineering, agriculture and piping systems.



Plastika Nitra Expansion and Modernization



Plastika intends to increase production of special multiplayer packing foils for group packaging of products and pallets.

Plastika is the major producer of 160-1000 mm double wall corrugated PVC tubes and is the largest producer of piping systems in the territory of the Slovak and Czech Republics.

New legislation and political and environmental pressures have placed restrictions on the production, processing, and use of PVC products. Plastika has successfully met these market challenges by increasing the production of polyolefin pipe for use in the electronic, building and automotive industries. Plastika also produces double-wall tubes in a new manner that meets required physical and mechanical properties while minimizing raw material consumption.

Plastika plans to double production volume of foil materials to final 10,000 MTY and of P.E. pipes to 4,000 MTY and intends to sell the additional volume in Europe including the EU countries, Ukraine, and Russia.

As part of its expansion plan, Plastika Nitra is planning to purchase several specific plastic fabricating machines. Total cost of these machines is estimated at approximately US\$ 4 million. The machines can be sourced out of the U.S., though the competition from European manufacturers, especially German and Italian companies, is very strong. The availability of financing could be a key factor.

Project Guidance Parameters

Project costs and financing

The total costs of the capacity expansion projects are about US\$4 million. Plastika

intends to contribute US\$1 million of its own funds and seeks US\$3 million in financing.

Modernization schedule

The expansion project will be implemented in two years.

Planned Completion Schedule		
Activity	Quarter	Year
Technical study	1 st	2002
Monolayer foil line	2 nd	2002
HDPE corrugated pipeline	2 nd	2002
Multilayer foil line	3 rd	2003

U.S. Competitiveness

U.S. sources produce complete blow molding and extrusion molding devices, dosing devices, automatic measurement and parameter check systems, cutting and socketing devices and laboratory equipment that could meet the project requirements package. Competition will be based on price and financing.

Conclusion

This project has a high priority for Plastika as it increases production capacity, processing efficiency and profitability.

The new products will meet EU and Slovak requirements and standards and would allow Plastika to improve its position as a producer of the plastics piping systems and package materials.



Plastika Nitra Expansion and Modernization



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Project Highlights

- Production /licensing of Coil Coatings, Electroforetic primer and Powder Coatings
- Looking for technical /production cooperation and strategic partnership with U.S. paint and coating company

Project Summary

Sector	Chemical
Location	Smolenice, Slovakia
Capital Required	US\$200,000
Export Potential	\$3.5 million /yr
Project Sponsor	Chemolak
Project Status	Planning stage, seeking partner

Project Discussion

Project Background

Chemolak, with a 118-year history, is Slovakia's major paint and coatings manufacturer with its main manufacturing facilities located in Smolenice some 60 km northwest of Bratislava. Since 1883, Chemolak has developed into the region's major producer of coatings resins, adhesives, thinners, and auxiliary materials. The Company was transformed into a joint stock company during the first wave of voucher privatization in 1992, and was listed on the Bratislava Stock Exchange in February 1993.

Total production at its peak in the communist days amounted to some 90,000 tons per annum. Since the opening of Slovakia to the west in the early 1990s, Chemolak has lost many of its markets in the East and has been subjected to further market erosion by competition from major western European companies. Total production in 1999 amounted to 22,962 tons. The company feels that the production decline has now bottomed out and intends to reverse the trend.

Coil Coating Project

An American company, U.S. Steel, recently acquired the steel mills located at Kosice Slovakia. One of their product lines is coated steel coil used for the manufacture of appliances, fabricated structures etc. Kosice's coil coating line currently produces approximately 70,000 tons per year of coated steel consuming about 1500 to 1800 tons of paint in about 120 different color nuances. The maximum output of the coil coating line is about 90,000 tons per year. Kosice currently purchases its coating requirement from Western European suppliers.

Chemolak would like to become a supplier to the Kosice steel mills, but recognizes that while they have been manufacturing and selling coil coatings for many years in the East, they do not have the prestige and recognition that the major Western European coating suppliers have. They are therefore looking to establish a licensing agreement and/or a joint venture with a U.S. company that has well-established coating technology.

Plant capacity

Plant Capacity	
Current	0
Planned	Up to 1,800 MTY



Project Guidance Parameters

Project Costs

Potential exports from the U.S. are estimated to be about US\$3.5 million per year for licensing fees and for the export of specialty chemicals (pigments, resins, etc) that would be needed on an ongoing basis.

Known Initiatives

Chemolak has initiated an initial screening process of potential U.S. partners through their consultants Deloitte & Touche, and expect to follow up on these and other potential sources during the New Orleans Chemicals conference.

Project Financing

The capital requirements for this project will be minimal, the main expense being for the import of supplies from the U.S. of approximately US\$3 million per year. This project should qualify for Ex-Im Bank financing or other supplier arranged credits, or through financing arranged by Chemolak's financial advisor, Citibank, in Bratislava.

U.S. Competitiveness

U.S. coil coating is highly competitive and has been well established in Western Europe. In Central and Eastern Europe, U.S. companies appear to be trailing their western European Competitors. This project could be an opportunity for U.S. companies to enter the C&E European market.

Conclusion

Chemolak recognizes that they will have to expand and improve their product line to

remain competitive in light of the increasing competition from Western European countries, which will only increase when Slovakia joins the EU. The move to supply the Kosice steel mill with high quality coil coating material is a high priority project in order to move toward this direction.

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**EU-SPECIFICATIONS FOR GASOLINE**

Parameter	Unit	Limits 2000	Limits 2005
Reid vapor pressure, summer period (2)	kPa max.	60	60
Distillation evaporated at 100 °C	Vol. % min.	46	51
Olefins	Vol. % max.	18	10
Aromatics	Vol. % max.	42	35
Benzene	Vol. % max.	1	1
Oxygen content	Weight % max.	2.3	2.7
Sulfur content	mg/kg max.	150	50
Lead content	g/l max.	0	0

**EU-SPECIFICATIONS FOR DIESEL FUEL**

Parameter	Unit	Limits 2000	Limits 2005
Cetane number	Min.	51	51
Density at 15 °C	kg/m ³ , max.	845	835
Distillation: 95% point	°C	360	350
Polycyclic aromatic hydrocarbons	Weight % max.	11	6
Sulfur content	ppm max.	350	50