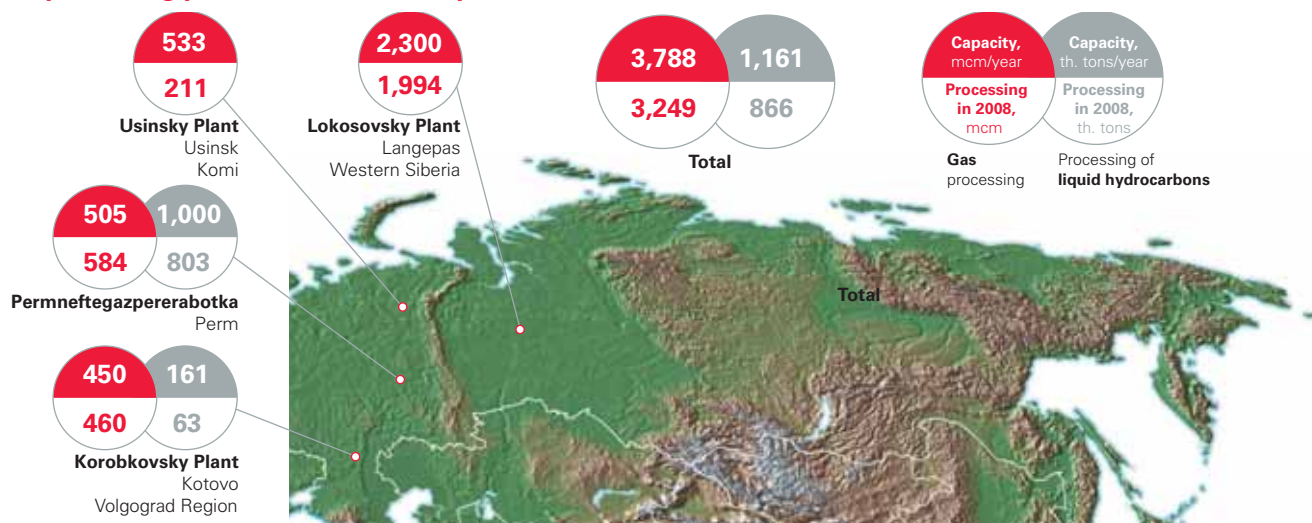


## »»» GAS PROCESSING

### Gas-processing plants of LUKOIL Group



The Company's gas-processing plants process associated petroleum gas and natural gas liquids from fields in Russia. The plants produce marketable gas, which is fed into the Gazprom gas transport system, as well as liquid hydrocarbons. Gas processing ensures efficient use of associated petroleum gas by transforming it into marketable product, offering extra profit

without considerable extra raw material costs. Volumes of processing at Company plants have increased by almost 1.5 times in the last 5 years thanks to increase in capacity of the Lokosovsky Gas-processing Plant (which was completed in 2006) and increased volumes of associated petroleum gas production.

### Korobkovsky Gas-processing Plant

#### History and description

- Processes gas from oil fields of LUKOIL-Nizhnevolzhskneft and NGL
- Capacity – **450 mcm** per year of gas, **161,000 tons** per year of NGL
- Marketable products – stripped gas, stable gas naphta and LPG
- Consumers – petrochemical enterprises, foreign marketing units of LUKOIL Group and local consumers
- Put into operation in **1966**. **Entered LUKOIL Group in 1996**
- In **1999** a unit for sulphur purification of associated petroleum gas was launched. In **2001–2003** external energy supply was overhauled and a steam unit was launched. In **2005** an associated gas compressor and dryer unit was put into operation. In **2007–2008** construction of a propane refrigeration unit was carried out.

### Permneftegazpererabotka

#### History and description

- Processes gas from oil fields of LUKOIL-Perm, wet gas from Perm refinery and NGL from Lokosovsky Gas-processing Plant and Perm refinery
- Capacity – **505 mcm** per year of gas, **1 mln tons** per year of NGL
- Marketable products – stripped gas, stable gas naphta, isopentane, LPG, sodium bisulfite
- Consumers – Perm refinery, Stavrolen, foreign marketing units of LUKOIL Group and local consumers
- Put into operation in **1969**. **Entered LUKOIL Group in 1998**
- In **2000** a new desulfurization unit was launched. In **2003** the gas fractionation unit was rebuilt to increase NGL processing capacity. A sodium bisulfite unit was put into operation in **2005**. Reconstruction in **2006** increased capacity from 550,000 tons to 700,000 tons per year of NGL. A new railway rack for loading of liquefied hydrocarbon gases and discharging of feedstock was commissioned in **2007**. NGL processing capacities increased to 900,000 tons. In **2008** the Plant carried out optimization of its output structure, NGL processing capacities increased to 1 mln tons per year.

## Lokosovsky Gas-processing Plant

### History and description

- Processes gas from oil fields in Western Siberia
- Marketable products – stripped gas, NGL, stable gas naphta, propane
- Consumers – Permneftegazpererabotka (NGL) and local consumers
- Capacity – **2,300 mcm** per year
- Put into operation in **1983. Entered LUKOIL Group in 2002**
- In **2005** construction of storage tanks with a trestle for lading of NGL was completed. In **2006** reconstruction of the plant was completed increasing its annual capacity from 1.0 to 1.9 bcm per year of associated gas, and thanks to further works the capacity increased to 2.3 bcm per year. The work included connection of the plant to the Urengoi–Surgut–Chelyabinsk trunk gas pipeline

## Usinsky Gas-processing Plant

### History and description

- Processes gas from oilfields of LUKOIL-Komi
- Marketable products – dry and stripped gas, stable gas naphta and LPG
- Consumers – oil producing enterprises of LUKOIL Group and local consumers
- Capacity – **533 mcm** per year
- Put into operation in **1980. Entered LUKOIL Group in 2000**
- In **2004** the plant launched a gas preparation and processing block, and a gas input station. This enabled the plant to produce LPG and stable gas naphta

## ▶▶▶ PETROCHEMICALS

**LUKOIL is now the leading producer of petrochemicals in Russia, the CIS and Eastern Europe.**

**In particular, LUKOIL is:**

- \* the **largest** East European producer of olefins (total annual capacity – 830,000 tons)
- \* **2nd largest** East European producer of polyethylene (total annual capacity – 400,000 tons)
- \* the **largest** East European producer, the **only** Russian producer of acrylonitrile, a raw material for production of synthetic fibers (**4th** place by capacity in Europe)
- \* owner of Europe's **largest** vinyl chloride-monomer plant (annual capacity – 370,000 tons)

LUKOIL has carried out extensive development of its petrochemical business since 1997 in order to increase the share of high value-added products in overall output and reduce dependence on the volatile international crude market. These efforts create further potential for growth of the Company shareholder value.

Petrochemicals are the most complex end of the processing business. LUKOIL owns petrochemical capacities in Russia (Saratovorgsintez and Stavrolen), Ukraine (Karpatneftekhim), and Bulgaria (LUKOIL Neftokhim Burgas, a refinery with its own petrochemical facilities).

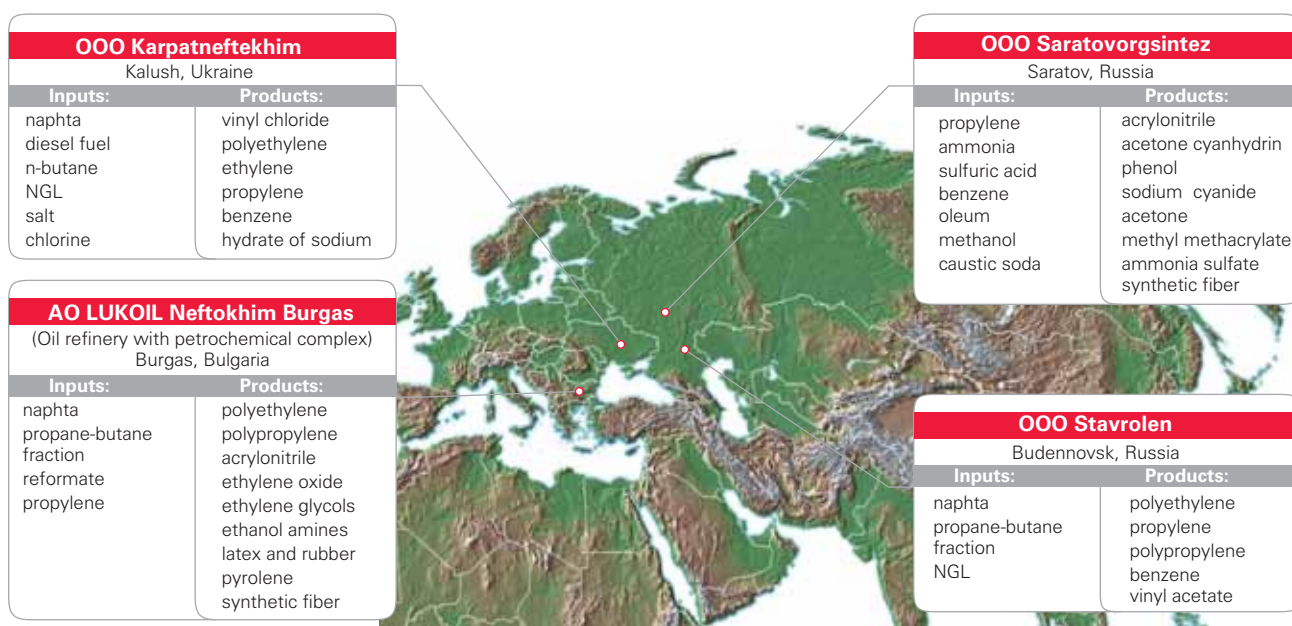
LUKOIL's petrochemical business is one of the biggest in Russia and Eastern Europe. The Company makes pyrolysis and organic synthesis products, fuel fractions and polymers, and meets a large part of Russian domestic demand for several important chemicals as well as being a large-scale chemicals exporter to more than 30 countries.

The Company is continuing to increase capacity levels. A key project for coming years is construction of the Caspian gas-chemical complex, which will use natural gas and condensate produced by LUKOIL Group in the Caspian region and will have annual capacity of at least 600,000 tons of ethylene. The purpose of the project is to increase value added through deeper processing of gas feedstock (ethane and natural gas liquids). The Caspian Complex will carry out refining of ethylene and its derivatives into polyethylene, polypropylene and other petrochemical products.

A pre-feasibility study for construction of the Complex was completed in 2007, including selection of the configuration and structure of marketable output.

Conceptual engineering for the Complex was completed in 2008 and a general plan has been drawn up for positioning of production units and infrastructure facilities. The plan ensures full integration of the new production with the existing Stavrolen petrochemical complex.

## LUKOIL Group petrochemical plants



## Main products of LUKOIL petrochemical plants

### › Acetone

Used in the paint, food and pharmaceutical industries, and for production of acetyl cellulose and nitrocellulose, film, plexiglass, etc. Produced at Saratovorgsintez.

### › Acetone cyanhydrin

Used for production of methyl methacrylate, resins and in the pharmaceutical industry. Produced at Saratovorgsintez.

### › Acetonitrile

Used as a solvent in liquid chromatography, spectroscopy, analytical chemistry, and in the medical, microbiology and chemical industries. Produced at the Burgas Refinery and Saratovorgsintez.

### › Acrylic fibre

Raw material for the knitwear industry. Produced at the Burgas Refinery and Saratovorgsintez.

### › Acrylonitrile

One of the most important monomers for production of acrylic fibres, butadiene-nitrile rubbers, alkyl- and polyamides, ABS plastics. Produced at the Burgas Refinery and at Saratovorgsintez.

### › Alphamethylstyrene

Used as a monomer for production of synthetic rubber, latex and various waterproof mastics. Produced at Saratovorgsintez.

### › Ammonium sulfate

A nitrogen fertilizer widely used in agriculture. Produced at Saratovorgsintez.

### › Anti-freeze

Liquid with a low freezing point used to cool internal-combustion engines and various equipment, which operates in temperatures below zero Celsius. Produced at the Burgas and Perm Refineries.

### › Benzene

Raw material for production of caprolactam, phenol, nitrobenzene, and isopropyl benzene. An essential organic synthesis input for production of pharmaceuticals, plastics (styrenes and ABS plastics), synthetic rubber and toxic chemicals. Produced at the Burgas Refinery, Perm Refinery, Stavrolen and Karpatneftekhim.

### › Butylene-butadiene fractions and divinyl

Raw material for production of synthetic rubber. Produced at the Burgas Refinery and Stavrolen.

### › C<sub>5</sub>-C<sub>9</sub> and C<sub>6</sub>-C<sub>8</sub> fractions

Raw materials for production of motor fuel, solvents and aromatics. Produced at the Burgas Refinery, Stavrolen and Karpatneftekhim.

### › Caustic soda

More than 95% of soda output is used in the synthetic fibre and threads industry, as well as for production of ammonia, caprolactam, base chemicals and for chlorine processing. Caustic soda is also used in electricity generating industry, the cellulose and paper industry, the food industry and in medicine. Produced by Karpatneftekhim.

### › Ethanolamines

Used for industrial gas purification, for production of detergents, wood preservers, and agricultural herbicides. Produced at the Burgas Refinery.

### › Ethylene

Used for production of ethylene oxides, styrene, ethanol, ethyl chloride, vinyl chloride, vinyl acetate, ethylbenzene and polyethylene. Produced at Stavrolen, Karpatneftekhim and the Burgas Refinery.

#### › Ethylene glycol

Used in anti-freeze, production of synthetic fibres, resins, and solvents. Produced at the Burgas Refinery.

#### › Ethylene oxide

Used in the chemical and petrochemical industries for production of brake fluids, surfactants, ethylene glycols, anti-freeze, solvents, plasticizers, monomers for synthetic fibres, polyester resins and foam rubber. Produced at the Burgas Refinery.

#### › Heavy pyrolysis resin

Used in carbon black production and as a fuel. Produced at the Burgas Refinery, Stavrolen and Karpatneftekhim.

#### › Latex

Used in production of a number of materials: paints, putties, contoured surfaces and supports. Produced at the Burgas Refinery.

#### › Methyl acrylate

Used in production of polymers. Produced at Saratovorgsintez.

#### › Methyl methacrylate

Used in production of plexiglass, synthetic resins, latex, emulsions, ashfree oil additives, shock resistance modifiers, paints and varnishes. Produced at Saratovorgsintez.

#### › Phenol

Used in production of phenol formaldehyde resins, caprolactam, diphenylolpropane, oils and oil additives, paints, pesticides, pharmaceuticals and thermoplastics. Produced at Saratovorgsintez.

#### › Carbon fibre precursor

Used in production of carbon fibres and carbon plastic, which is a light and tough material, used in the aerospace, ballistics and nuclear industries. Produced at Saratovorgsintez.

#### › Polyethylene

A polymer widely used in production of water and gas pipes, tape for packaging of food products, insulating membranes, thin-walled containers, fuel tanks, car parts, articles for the home and technical fibres. Polyethylene is produced at Stavrolen, Karpatneftekhim and the Burgas Refinery.

#### › Polypropylene

One of the most universal polymers, used for production of plumbing and drainage tubes with high-resistance qualities, in the automotive industry, in domestic appliances, and for production of packaging tapes and containers. Produced at the Burgas Refinery and Stavrolen.

#### › Propylene

Raw material for production of polypropylene, propylene oxide, isopropyl and butyl alcohols, acrylonitrile, etc. Marketable propylene is produced at Stavrolen and Karpatneftekhim.

#### › Pyrolene

Used as a softener in the tire and rubber industries, as an adhesive agent in production of chipboard, as well as in the cellulose and paper, and paint and varnish industries. Produced at the Burgas Refinery.

#### › Rubber

Used for production of tires and various rubber goods. Produced at the Burgas Refinery.

#### › Sodium cyanide

Used in gold mining for separation of precious metals from ore material. Produced at Saratovorgsintez.

#### › Styrene

Mainly used for production of polystyrene and various copolymers, including styrene-butadiene rubber and polyester resins. Produced at the Burgas Refinery.

#### › Toluene

Used in production of various paints and varnishes (including for the cosmetics industry), pharmaceuticals and explosives. Produced at the Burgas and Perm Refineries.

#### › Vinyl acetate

Raw material for production of water emulsion paints, paints for the automotive industry, various adhesives, polyvinyl acetate, polyvinyl spirit, polyvinyl acetal, copolymers with vinyl chloride, ethylene, etc. Produced at Stavrolen.

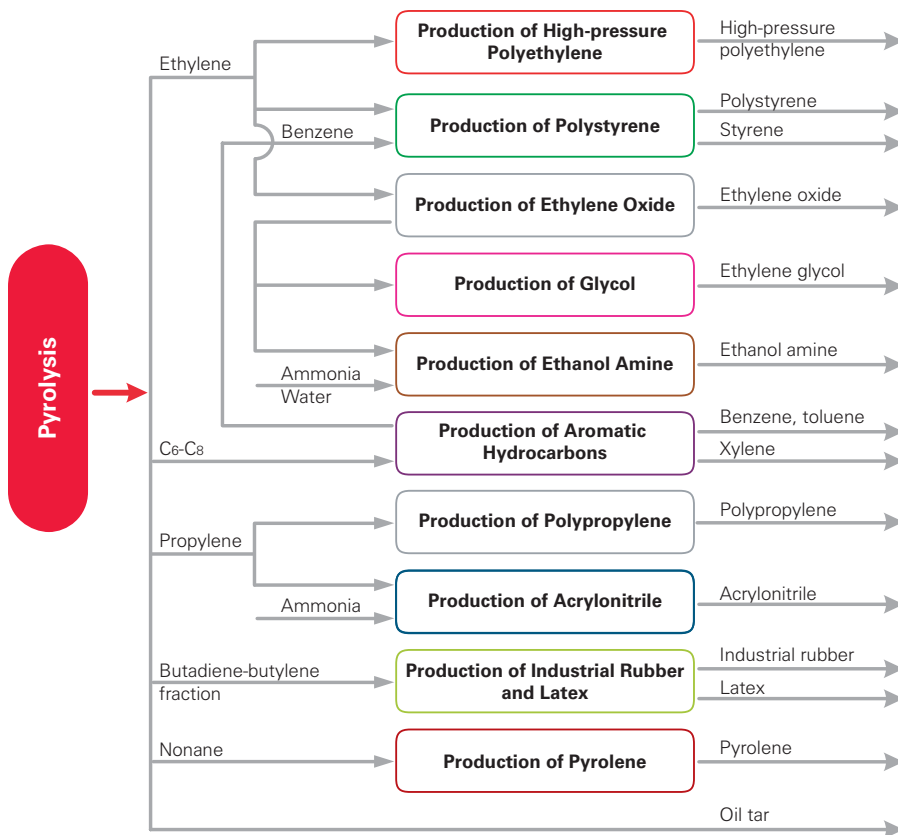
#### › Vinyl chloride

Raw material for production of polyvinyl chloride, which is widely used in the construction industry, in production of cables, synthetic leather, as well as in agriculture, the packaging industry and consumer goods manufacture. Produced at Karpatneftekhim.

#### › Xylene

Used as a solvent for paints and varnishes and as an organic synthesis input for many organic compounds. Produced at the Burgas Refinery.

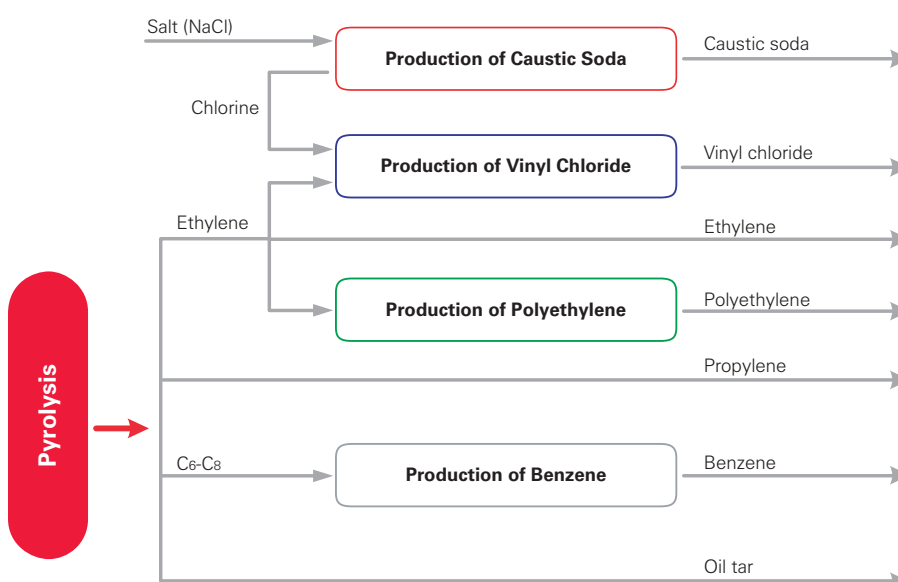
## REFINERY WITH PETROCHEMICAL COMPLEX IN BURGAS



### AO LUKOIL Neftokhim Burgas, Bulgaria

- The petrochemical complex was put into operation in **1968**
- Entered LUKOIL Group at the end of **1999**
- Hydrocarbon feedstocks (naphta, reformate, propane-butane fraction, propylene) from the Burgas refining complex
- The petrochemical complex includes production of ethylene-propylene, ethylene oxide, ethylene glycols, and ethanol amines. Pyrolysis capacity of ethylene production – **135,000 tons per year**
- The complex also produces polymers: polyethylene (unit annual capacity – 88,000 tons), polypropylene, acrylonitrile, rubber, latex, pyrolyene

## OOO KARPATNEFTEKHIM



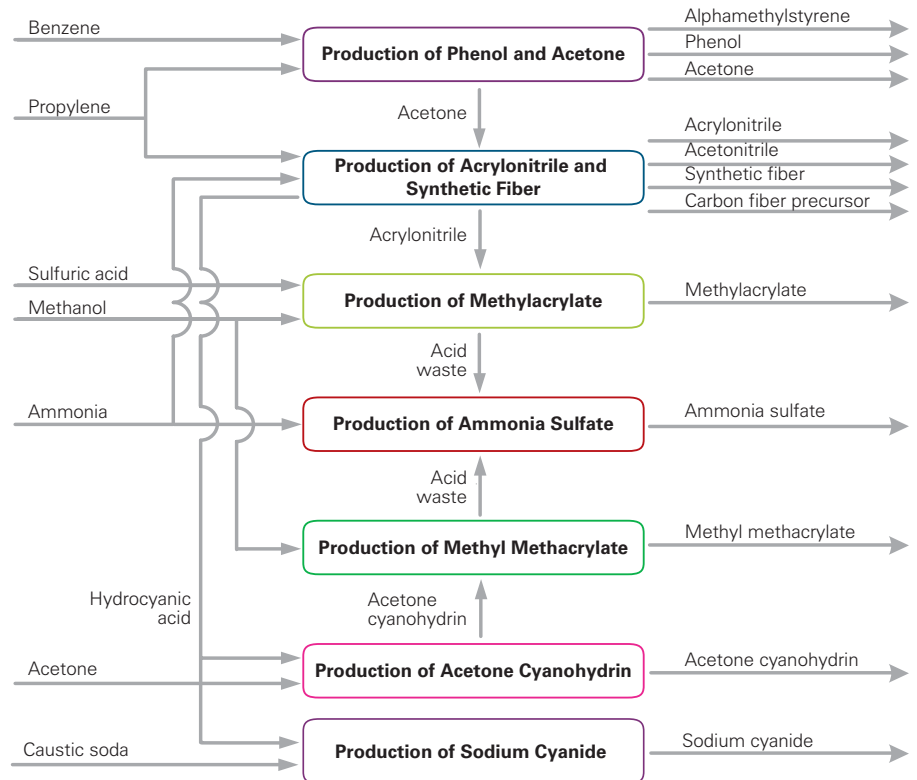
### OOO Karpatneftekhim, Ukraine

- Put into operation in the early **1970s**
- A joint venture established in **2000** between LUKOIL and the company **Oriana**
- Pyrolysis capacity of ethylene production – **250,000 tons per year**
- Main feedstocks – diesel fuel, LPG and straight-run gasoline, sodium chloride
- In **2001–2003** capacities for production of olefins and polyethylene were rebuilt and modernized. In **2005** a unit for C<sub>4</sub>-C<sub>5</sub> fractions with **90,000 tons** annual capacity was commissioned
- In **2007–2008** work was carried out on construction of chlorine and caustic soda production facilities with annual capacity of **182,000 tons** of gaseous chlorine and **200,000 tons** of caustic soda. Work was also continued on construction of a unit to produce suspended polyvinylchloride with annual capacity of **300,000 tons**.

## OOO SARATOVORGSINTEZ

### OOO Saratovorgsintez

- Put into operation in **1957**
- Entered LUKOIL Group in **1999**
- The plant has four production facilities:
  - acrylonitrile (capacity – **150,000 tons**)
  - synthetic nitrone fiber (capacity – **25,000 tons**)
  - sodium cyanide (capacity – **15,000 tons**)
  - organic synthesis
- From **2000** the Company has been rebuilding main production units
- In **2008** a sodium cyanide unit with **15,000 tons** annual capacity was commissioned



## OOO STAVROLEN

### OOO Stavrolen

- Put into operation in **1981**
- Entered LUKOIL Group in **1998**
- Pyrolysis capacity of ethylene production – **350,000 tons per year**
- The plant owns one of the largest pyrolysis units in Russia which uses a wide range of feedstocks – naphtha, propane-butane fraction, NGL
- As a result of modernization, the share of gas in total volume of feedstock was raised to 40%. The change in feedstock structure and in construction of furnaces improved efficiency of production and increased basic olefins yield
- In **2008** the Plant nearly completed work on installation of a new polyethylene compounding line with annual capacity of **120,000 tons**. Modernization work on the polypropylene unit was carried out, increasing its annual capacity to **120,000 tons**

