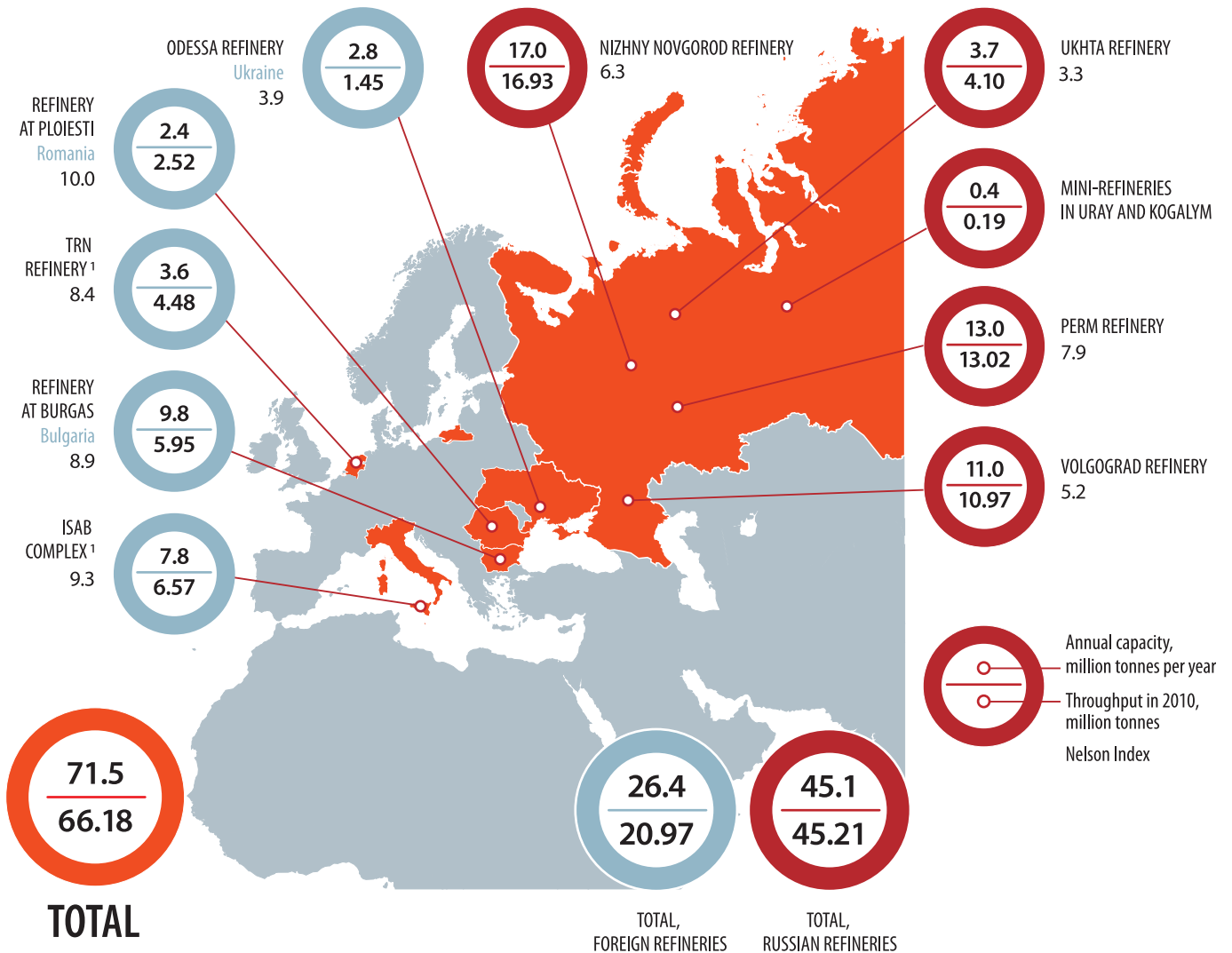


# OIL REFINING

## LUKOIL GROUP REFINERIES



<sup>1</sup> Capacities of the ISAB and TRN refineries are shown as the Company share (49% and 45%, respectively).

## NEW CATALYTIC CRACKING COMPLEX AT THE NIZHNY NOVGOROD REFINERY

### REFINERY DESCRIPTION:

- The Refinery produces fuels and lubricants
- Located in the town of Kstovo in Nizhny Novgorod region
- Refines a blend of West Siberian oils and Tatarstan oils
- Crude oil is supplied to the Refinery via the Almeteyevsk — Nizhny Novgorod and Surgut — Polotsk pipelines
- Petroleum products are shipped by rail, road and river transport and by pipeline
- Capacity — 17.0 mln tons per year
- Nelson index — 6.3
- Main conversion process is visbreaking (42,200 barrels per day)

A new catalytic cracking complex was brought into operation at the Nizhny Novgorod refinery in 2010, and it is already producing Euro-4 gasoline. It is the largest catalytic cracking complex built in Russian for the last 25 years. Due to conversion of vacuum gas oil into light products the complex substantially increases the production of gasoline in the Central region. Project investments were about \$1 billion.

The new complex will increase total annual gasoline output at the Refinery from 1.8 to 3.2 million tonnes, and output of diesel fuel will be raised from 4.2 to 4.6 million tonnes. The complex can also produce 150,000 tonnes of propylene each year.

The new complex consists of five main units, as follows (figures are annual capacity):

- a vacuum gasoil hydrotreatment unit (2.5 million tonnes)
- a catalytic cracking unit (2 million tonnes) with a propylene concentration unit (150,000 tonnes of propylene)
- alkylation with blocks for isomerization of normal butanes and selective hydration of diene hydrocarbons. Alkylate capacity is 360,000 tonnes
- hydrogen production (40,000 tonnes)
- elemental sulphur production (130,000 tonnes)

The complex also comprises five infrastructure facilities: a sulphur granulation and shipment shop, a boiler water preparation unit, a water circulation block, flaring equipment, and inter-unit communications.

The production chain begins from the hydro-treatment unit, which is fed with vacuum gasoil from the primary refining facilities. Nitrogen and sulphur compounds are removed from the straight-run vacuum gasoil by application of hydrogen.

The output from this process — gasoil low in sulphur compounds — is sent to the catalytic cracking unit, where it is passed through a reactor, which converts heavy hydrocarbons into lighter ones at a high temperature in the presence of a catalyst.

The main outputs from catalytic cracking are gasoline fractions (53% of total outputs, with octane number of 92 or above), and propylene and butane-butylene fractions, which are sent to the alkylation unit to produce another gasoline alkylate component, with octane number of 95, free of sulphur compounds and aromatics. Sulphur is processed in the elemental sulphur unit.

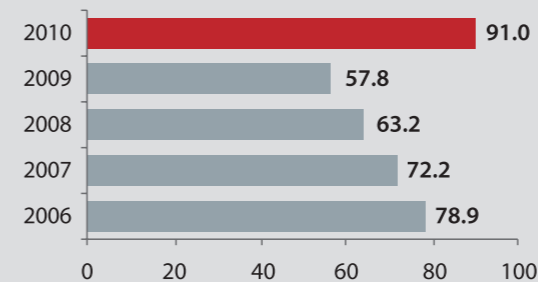
Marketable gasoline is produced in a constant flow at a blending facility, after which it is quality-tested and given a product passport, ready for delivery to customers.

An alkylation unit will be brought into operation at the Nizhny Novgorod Refinery in 2011, which will enable production of automotive gasoline to Euro-5 standards. Aromatic content in gasoline produced on the new equipment is no higher than 35%, maximum content of sulphur in class-4 fuel is 50 mg per kg, and 10 mg per kg in class-5 fuel. This gasoline ensures 'clean exhaust', minimizing sulphur oxide and products of incomplete aromatics combustion, including the highly carcinogenic and mutagenic benzopyrene.

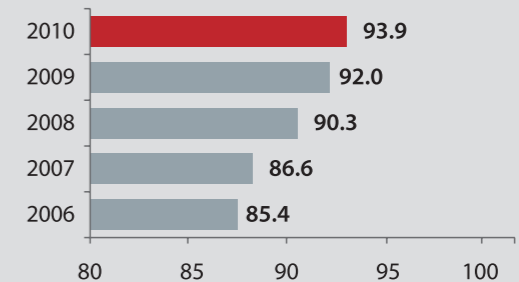
### European Standards on Nizhny Novgorod Refinery

	2005	2006	2007	2008	2009	2010	2011
Gasoline		Euro-3	Euro-3	Euro-3	Euro-4	Euro-4	Euro-5
Diesel fuel	Euro-4	Euro-5	Euro-5	Euro-5	Euro-5	Euro-5	Euro-5

### SHARE OF CLEAN DIESEL IN TOTAL OUTPUT OF DIESEL FUEL, %



### SHARE OF HIGH-OCTANE GASOLINE IN TOTAL OUTPUT OF MOTOR GASOLINE, %



LUKOIL GROUP CONTINUED RAPID DEVELOPMENT OF ITS OIL REFINING BUSINESS IN 2010 THROUGH MODERNIZATION AND EXPANSION OF REFINING CAPACITIES.

THE VOLUME OF REFINERY THROUGHPUTS, INCLUDING PROCESSING AT THIRD-PARTY REFINERIES, WAS 66.29 MILLION TONNES IN 2010, OF WHICH 66.18 MILLION TONNES WERE REFINED AT GROUP REFINERIES (INCLUDING COMPANY SHARES OF REFINING AT THE ISAB AND TRN COMPLEXES), REPRESENTING AN INCREASE OF 5.6% OVER 2009.

Capital expenditures by LUKOIL on its refinery business in Russia and abroad were \$702 million in 2010 (the figure in 2009 was \$828 million).

The Group raised operating efficiency of its refineries in 2010 through measures to optimize production capacities, increase capacity load of refining units, raise energy efficiency and reliability of equipment (increasing the period in operation between overhauls), as well as to optimize personnel numbers and rotation. Financial impact from these measures was about \$208 million. The largest positive effect was at the Perm, Nizhny Novgorod, and Ukhta refineries (\$85 million).

## Russian refineries

Crude oil throughput at Russian refineries in ownership of LUKOIL Group was 45.21 million tonnes in 2010, which is 1.7% more than in 2009. The share of high-octane gasoline in total output of gasoline at Group refineries in Russia (not including mini-refineries) rose to 91.5% in 2010 (from 89.7% in 2009). Light-product yield was 48.5%, down slightly from the previous year due to reduction in the amount of light fractions in refined oil and unscheduled downtime of hydrocracking facilities at the Perm Refinery.

Measures were implemented during the reporting year to reduce operating costs and raise production efficiency at Russian refineries. This enabled reduction of irretrievable losses at refineries from 0.51% to 0.47%. Average personnel numbers at Russian refineries were reduced by 2.0%. Capital expenditures at Company refineries in Russia were \$542 million in the reporting year (against \$520 million in 2010).

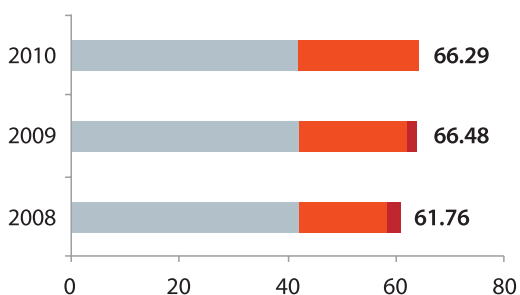
At the **Ukhta Refinery** test operation of the AT-1 distillation unit confirmed increase of light-oil refining by 10%. The rectification tube on the vacuum column of the atmospheric-vacuum distillation unit was replaced, and test operation confirmed 6% increase in production of diesel fraction from heavy crude oil supplied from the Yaregskoye field.

The new catalytic cracking complex at the **Nizhny Novgorod Refinery** was commissioned in 2010. The complex will increase annual output of high-octane automotive gasoline at the Refinery by 1.4 million tonnes and of diesel fuel by 400,000 tonnes, raising light product output by 12%. All of the gasoline produced will meet the standards of Euro-4 and Euro-5. The new complex raises the Nelson Complexity Index score at Nizhny Novgorod by 2.3 points. Reconstruction of the diesel hydrotreatment unit (completed in December 2009) has substantially increased output of diesel fuel that meets Euro-5 standards.

A new absorption and gas fractionation unit has been commissioned at the Refinery, which enables production of propane-butane fractions, providing inputs for the alkylation unit and for production of hydrogen in the catalytic cracking complex.

The **Volgograd Refinery** completed construction of a short-cycle absorption unit in 2010 to produce concentrated hydrogen for the needs of fuel hydrotreatment

## REFINERY THROUGHPUTS BY LUKOIL, million tonnes



	2010	2009	2008
At third-party refineries	5.48	3.78	0.11
At the Company's foreign refineries	12.10	18.24	20.97
At the Company's refineries in Russia	44.18	44.46	45.21
<b>Total</b>	<b>61.76</b>	<b>66.48</b>	<b>66.29</b>

units. The heat exchanger on the diesel hydrotreatment units was modernized, increasing unit capacity by 8%. A production system was created for low-sulphur bunker fuel, providing supplies for development of LUKOIL's bunkering business.

Construction of a second section of the diesel hydrotreatment unit and modernization of coke production are currently in progress at the Refinery.

The **Perm Refinery** continued upgrading work on existing coke production facilities in 2010. The upgrade will reduce energy needs in coke production and enable launch of a new product: a coking additive for the metallurgy industry.

### Foreign refineries

Refinery throughputs in 2010 at LUKOIL Group's international refineries, including the Group share of refining at the ISAB and TRN complexes, were 20.97 million tonnes, which is 14.9% more than in 2009, and met the Company's business targets based on levels of market demand. Production at Group own and third-party refineries increased by 16.9 compared to 2009 as a result of acquisition of the TRN refinery in September 2009. The production at our Bulgarian and Ukrainian refineries was lower due to performed overhauls.

Light product yield (not including ISAB and TRN) was 66.0% (up from 65.3% in 2009). Irretrievable losses at refineries outside Russia fell from 0.85% in 2009 to 0.64% in 2010.

Capital expenditures in modernization of the Group's foreign refineries were \$160 million in 2010 (\$308 million in 2009).

During the reporting year the **Burgas Refinery** started to operate a hydrotreatment unit for diesel and gasoline produced by catalytic cracking, enabling 100% output of diesel fuel and gasoline that meets Euro-5 standards.

The vacuum generating system for primary refining facilities at Burgas was also upgraded in 2010, which substantially improved quality of dark-product separation and improved the output balance between vacuum gasoil and boil fuel oil in favour of the former. A waste-heat boiler was installed on the primary refining unit, which will significantly reduce energy use in primary refining and create energy for refinery processes.

Design work on a heavy-residue processing complex was begun in 2010. Construction of the complex should be completed in 2015.

The **Ploiesti Refinery (Romania)** installed two coke chambers on the delayed coking facility in 2010 as part



of a program to improve reliability, and also completed work on a system to heat buildings at the Refinery using heat generated from refining processes, which will raise energy efficiency and lower operating costs.

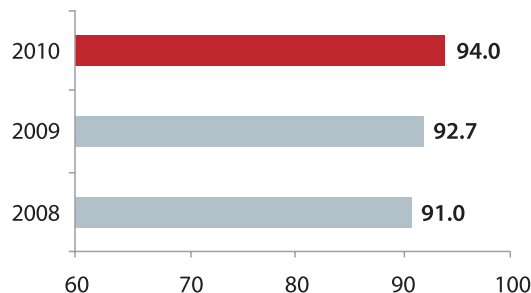
The **Odessa Refinery** completed construction of a gasoline blending facility, which will raise efficiency in production of marketable gasoline. The Refinery was stopped in the fourth quarter of 2010 due to unfavourable economic conditions in Ukraine.

The LUKOIL share in refinery throughput at the **ISAB Refining Complex** (Sicily, Italy), in which the Group bought a 49% stake in 2008, was 6.57 million tonnes in 2010.

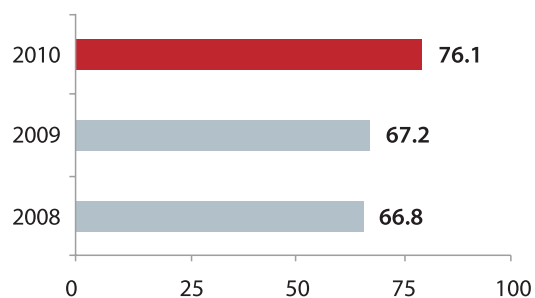
In September 2009 the Group began refining of oil at the **TRN Refinery** in the Netherlands after completing a transaction for acquisition of a 45% stake. The Group share in refining of oil and petroleum products at TRN was 4.48 million tonnes in 2010.



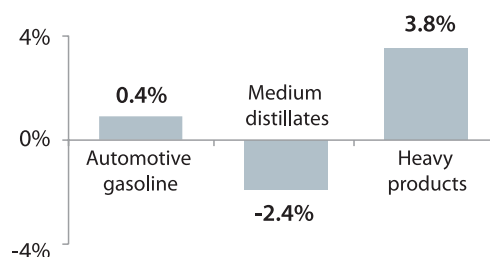
### ■ SHARE OF HIGH-OCTANE GASOLINE IN TOTAL GASOLINE PRODUCTION, %<sup>1</sup>



### ■ SHARE OF DIESEL FUEL WITH SULPHUR CONTENT BELOW 50 PPM IN TOTAL DIESEL PRODUCTION, %<sup>1</sup>



### ■ CHANGE IN OUTPUT LEVELS OF PETROLEUM PRODUCTS AT COMPANY REFINERIES IN 2010 COMPARED WITH 2009, %<sup>1</sup>



<sup>1</sup> Excluding mini-refineries and the ISAB and TRN complexes.