LOTOS Group
Integrated Annual Report 2015

03

# Innovation is key to lasting success

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**Development and innovative projects are a core element of investment efforts undertaken by the LOTOS Group. Encoded in our corporate DNA, they allow us to maximize our profits and drive value for our shareholders and other stakeholders. Thanks to an innovative and flexible approach to our operations, we are equipped to tackle major challenges facing the oil industry and bolster our competitiveness in a difficult market.**

**Innovation is ingrained in all of our business segments. By being innovative, we are capable of ensuring the superior quality of our products and services. As an organization that embraces new technologies and is very active in research and development efforts, we are also an attractive partner for scientific institutions.**

THE GLOBAL GOALS
For Sustainable Development


## Our key initiatives designed to increase competitiveness in 2015 included:

### EFRA Project

Initiation of the EFRA Project, another important endeavour in the LOTOS Group's history. The project will improve our financial efficiency and product margins. After its completion, Grupa LOTOS will become one of the most advanced refinery in the European Union. With the new units within EFRA project, the plants will produce an additional 900,000 tonnes of top quality high-margin fuels and 300,000 tonnes of petrochemical coke, without increasing crude input volumes.

### B8 field

We also started production from the B8 field using the LOTOS Petrobaltic drilling rig. Thus, LOTOS Petrobaltic has doubled its production of hydrocarbons in the Baltic Sea, and the incremental output generated by the field has a positive effect on its financial standing. The B8 field is situated in Poland's Exclusive Economic Zone of the Baltic Sea. It is the third largest oil production facility in Poland and the oil field holding the largest recoverable oil reserves in the Polish part of the Baltic Sea.

### Sleipner area

LOTOS Norge finalized the purchase of a portfolio of Sleipner assets located in central part of the North Sea. Being the second largest gas hub in the North Sea, the Sleipner area is of strategic importance to gas exports from Norway to Continental Europe and the United Kingdom.

# How do we create value for investors?

## Key financial indicators

- EFRA Project: **PLN 2.3bn**
- Construction of the Hydrogen Recovery Unit: **PLN 44.4m**
- Eco-friendly projects: PLN 72m
- Capital expenditure, in the strategic period 2011–2015: **PLN 4.2bn**
- Refinery margin: **USD 7.77/bbl**
- Annual expenditure on training: **PLN 4.9m**

## Key non-financial indicators

- Record crude oil and gas production in the LOTOS Group (production volume includes the annual output of Sleipner assets, in line with the effective transaction date of January 1, 2015): **10.4m boe**
- Number of R&D projects: **31**
- Number of newly-introduced/significantly modernised products: **12**
- Number of cooperating R&D units and research centres: **14**
- 50% of water intake is reused or recycled
- CO2 emission intensity ratio for the refinery in Gdańsk: **29.8 kg $CO_2$/CWT**
- Yield of high-margin products in the refinery: **78.3%**
- Crude oil diversification rate: **23%**
- Refinery system availability: **99.4%**

The 10+ Programme triggered an intensification of our innovation efforts. Now, new advanced technologies are being rolled out under our key EFRA Project. By investing in state-of-the-art deep oil processing technologies, we will be in a position to increase output of high-quality fuels and eliminate the products with a negative margin from our production structure, reducing their adverse environmental impact. This is something we find very important, as when selecting and implementing modern solutions, we always consider synergies between the needs of the company and benefits to the environment, especially the natural environment. The technologies we use are ahead of increasingly stringent environmental protection standards and regulations.

We realize that improving and seeking ever better solutions is a continuous process. Hence, our plans assume investing in new technologies across all business areas, improving our efficiency by developing business processes, leveraging advanced technological process optimization techniques, including by promoting innovation among employees, as well as our trading and social partners.

# LOTOS Group's key projects in the exploration and production and refining segments

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Key projects of the LOTOS Group in the exploration and production segment are focused on diversifying sources of raw materials and expanding the production area. This approach offers opportunities to grow further and brings us closers to one of our goals – ensuring Poland's security in the energy sector.

The projects initiated in 2015 in the refining segment are intended to enhance its profitability and efficiency and, consequently, improve competitiveness of the entire LOTOS Group in the challenging macroeconomic environment. Furthermore, they will also help us address the challenges imposed on the energy sector, including the petrochemical industry, by the European Union and Polish government.

# EFRA Project – Effective Refining, i.e. innovation of the 21st century

Initiated in 2015, the EFRA Project is a groundbreaking endeavour in Grupa LOTOS' history. The project will improve our financial efficiency and product margins, as well as reduce our dependence on crude oil price fluctuations. After its completion, Grupa LOTOS will become the most advanced refinery in the European Union and one of **the most technologically advanced in the world**.

With the new units, our Gdańsk refinery will produce an additional 900,000 tonnes of high quality high-margin fuels and 300,000 tonnes of petrochemical coke, without increasing crude input volumes.

The EFRA Project will facilitate the pursuit of sustainable development goals, and the cutting-edge technologies it involves will greatly reduce our environmental footprint.

**PLN 2,3 bn**

amount to be invested by LOTOS in the EFRA Project that will make the Gdańsk plant the most advanced refinery in the world

to deliver an increase of

**2 USD per barrel**

in the processing margin

and produce

**900 thousand tonnes**

of additional high-margin products per year (mainly diesel oil and aviation fuel)

EFRA Project's main benefits for Grupa LOTOS include:

- More efficient use of heavy residue, which is the heavy end of crude oil used to make heavy fuel oil or bitumens;
- Shift in the production structure from low-margin products towards increased share of engine fuels, mainly diesel oil and aviation fuel;
- Increased flexibility of the refinery, which will allow the LOTOS Group to remain competitive also in the event of movements in the prices of feedstock and petroleum products.

## First results:

**7.7%**

**total progress of work under the EFRA Project as at the end of 2015, against the planned 3.6%.**

**31.3%**

**total progress of work under the EFRA Project as at the end of August 2016. The plan assumed 25.9%.**

**The EFRA Project was started on June 26th 2015 and is expected to be completed in the second quarter of 2018.**

### Key events in 2015

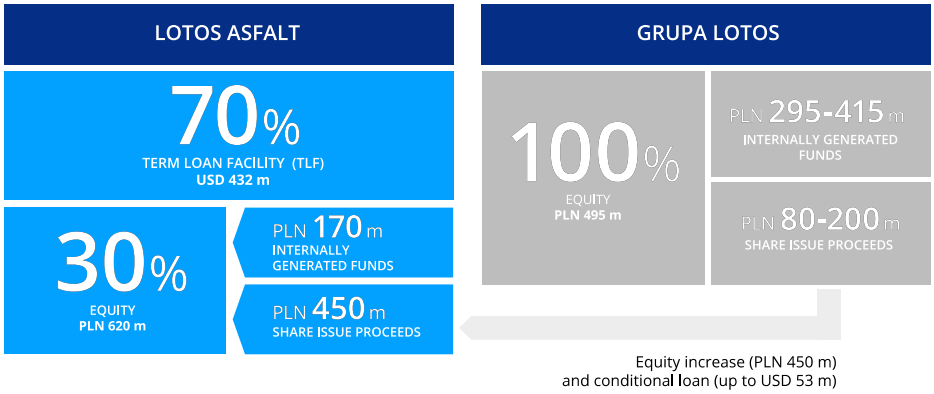
**January/February**

- The issue of series D shares is completed, with the proceeds of nearly PLN 1bn to be spent on the EFRA Project. The State Treasury subscribed for 53% of the new issue shares, and entered into an assistance agreement with Grupa LOTOS, committing PLN 530m to finance the investment.

**May/June**

- Grupa LOTOS launches the EFRA Project together with its subsidiary LOTOS Asfalt, following approval by the Company's Supervisory Board of the terms of financing and collateral, and a share capital increase at LOTOS Asfalt.
- LOTOS Asfalt signs credit facility agreements to finance 79% of the EFRA Project investments with a consortium of eight financial institutions.

## Financing structure of the EFRA Project *




* Together with borrowing costs and funds deposited in reserve accounts.

### July/August

- As part of the EFRA Project, LOTOS Asfalt signs a PLN 1.26bn EPC contract with Kinetics Technology of Italy for three key project units.
- The cornerstone is laid for the units to be built as part of the EFRA Project.
- LOTOS Asfalt signs a coke sale agreement with Oxbow Energy Solutions B.V. of the Netherlands. Oxbow agreed to buy coke from the Delayed Coking Unit, the main component of the process line to be built in the EFRA Project. In this way LOTOS Asfalt has ensured that the entire volume of output coke will be sold.

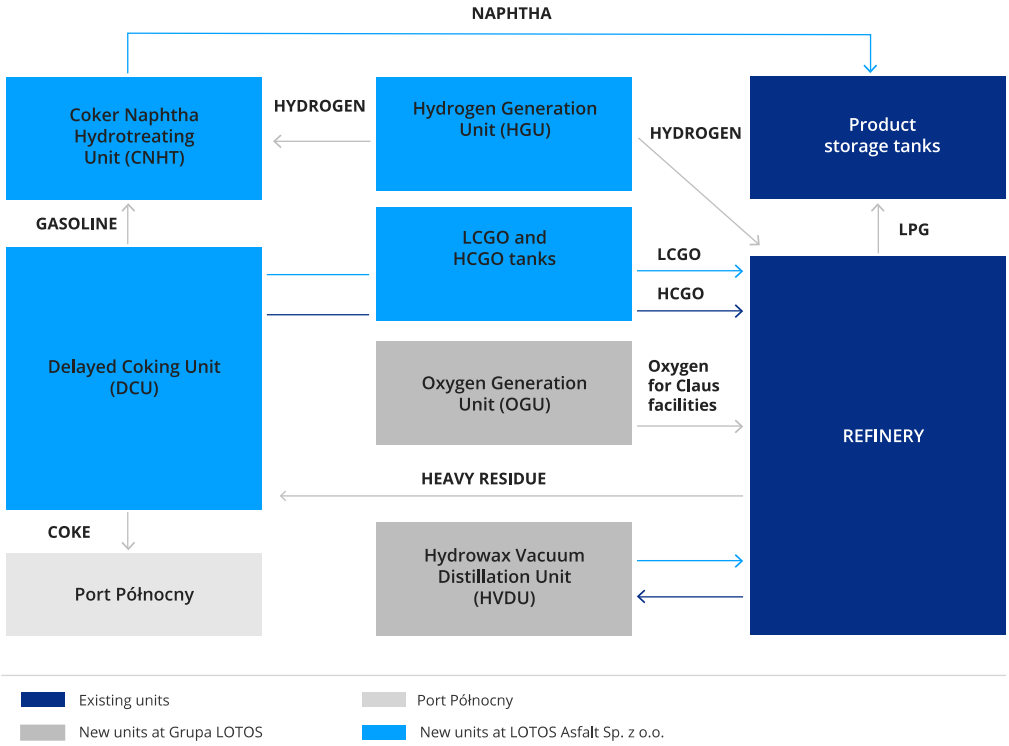
### September/October

- Lotos Asfalt enters into an agreement with Przembud Gdańsk on the construction of a power system facility as part of the EFRA Project. The company also signs a contract with Keller Polska for piling work at the site for a structure that will serve as a flyover linking the new units with the LOTOS refinery units and storage facilities.

### November

- At the EFRA Project complex, there has been an unique survey conducted, that allowed the proper preparation of support structures for the new units. The construction site has been thoroughly tested to a depth of approx. 30 meters using seismic studies by the German company Geotomographie.

## How the EFRA units work




The EFRA Project is consistent with the LOTOS Group's strategy for 2011–2015 for the refining segment, whose key objective is to ensure efficient use the refinery's expanded processing capacities and further increase in distillate yields. The EFRA Project will allow us to fully harness the potential of production units built as part of the 10+ Programme, thus maximizing the use of Grupa LOTOS' existing assets.

The main facilities comprising the new EFRA complex will be the Delayed Coking Unit (DCU), Hydrogen Generation Unit (HGU), Coking Naphtha Hydrotreating Unit (CNHT), LPG Treatment Unit (LPGTU), Coke Logistics and Storage Facility (CS-LF), and Hydrowax Distillation Unit (HVDU).

The project is compliant with the Best Available Techniques (BAT) and carried out with respect for the natural and social environment. In some aspects, it even exceeds the BAT requirements, a case in point being the compressor to lower pressure in the coking reactor.

# Why did we select this solution?

Currently, coking units, including the one to be constructed under the EFRA Project, come with numerous enhancements which reduce their environmental impact. An additional advantage in the case of our compressor is that it will be equipped with a Closed Coke Slurry System (CCSS), a cutting-edge innovation designed to completely eliminate dust and hydrocarbon emissions during coke unloading. Furthermore, it will enable us to process hydrocarbon sediments and sludge created during sewage treatment.

# EFRA means new jobs

# EFRA means new jobs

As anticipated in the EFRA Staff Programme, staff with specialist qualifications will need to be recruited and trained to prepare and execute the project, and then, once it is completed, manage its operation and maintenance. This will also require transfer of capabilities and staff within the LOTOS Group. The EFRA Staff Programme is scheduled for gradual implementation in 2014–2019.

From 2014 to 2019, we plan to achieve the following goals in our personnel policy:

- Manning 40 workstations with employees from the LOTOS Group by reallocating them between organizational units and companies;
- Employing 80 additional staff from the market.

The general contractor for the EFRA Project is Kinetics Technology of Italy, a leading international contractor for such projects, but a number of Polish subcontractors are also involved, as the project assumed engaging proven Polish partners and employees in the construction process.

We estimate that at the height of activity under the EFRA Project in 2017, the site will see approximately 2,000 workers, predominantly from Polish-owned companies.

Already today, such companies as Przembud Gdańsk, P.R.I. Centrum, Mostostal Zabrze and Elektromontaż Gdańsk are involved in the Project activities. What is more, Polish specialists will be assigned to work on electrical systems, road infrastructure and inter-unit connections, with 50 Polish experts from Tebodin Polska performing supervision tasks on behalf of the project sponsor. Design work for auxiliary facilities and connections between the new project and the refinery was entrusted to the Polish branch of Fluor (approximately 80 persons). The construction process will require engaging regional transport, service, catering and hospitality companies.

More information on the EFRA Project

# Hydrogen Recovery Unit (HRU)

Before a new Hydrogen Generation Unit (HGU) is built as part of the EFRA Project, the Hydrogen Recovery Unit currently constructed at the Gdańsk refinery will increase hydrogen output by nearly 1 tonne per hour.

The annual production capacity of the new HRU will be:

- 100 thousand tonnes of LPG;
- 9 thousand tonnes of hydrogen;
- 40 thousand tonnes of naphtha.

Those valuable products will be obtained from hydrogen gasses that are currently used mostly in the fuel gas network. Additional benefits of the HRU include:

- Higher output from the hydrocracking and HDS units;
- Reduced costs of hydrogen production;
- More stable and secure gas supply to the fuel gas network thanks to replacing hydrogen gasses with natural gas;
- Reduced $CO_2$ emissions.

Construction of the Hydrogen Recovery Unit began in September 2015 and its completion is scheduled for the fourth quarter of 2016.

Grupa LOTOS' expenditure on key investment projects in 2015 included PLN 44.4m spent on the HRU.

## Operation of the HRU:

The central component of the unit is a coldbox, where hydrogen gas blend is cooled down to low temperatures and hydrogen is separated from hydrocarbons, which subsequently liquefy. Next to the HRU and the LPG tank, an LPG loading facility and a natural gas pressure reduction station will also be built.

# Development of the B8 field

As planned, on September 30th 2015 we started initial production from the B8 field using the LOTOS Petrobaltic drilling rig. Thus, LOTOS Petrobaltic has doubled its production of hydrocarbons in the Baltic Sea, and the incremental output generated by the field has a positive effect on its financial standing.

In mid-November 2015, daily production rate from the B8 field exceeded that of the B3 field, and on December 4th aggregate daily production from our two fields operated in the Baltic Sea exceeded 1,000 cubic metres.

## Importance of the B8 field to Grupa LOTOS:

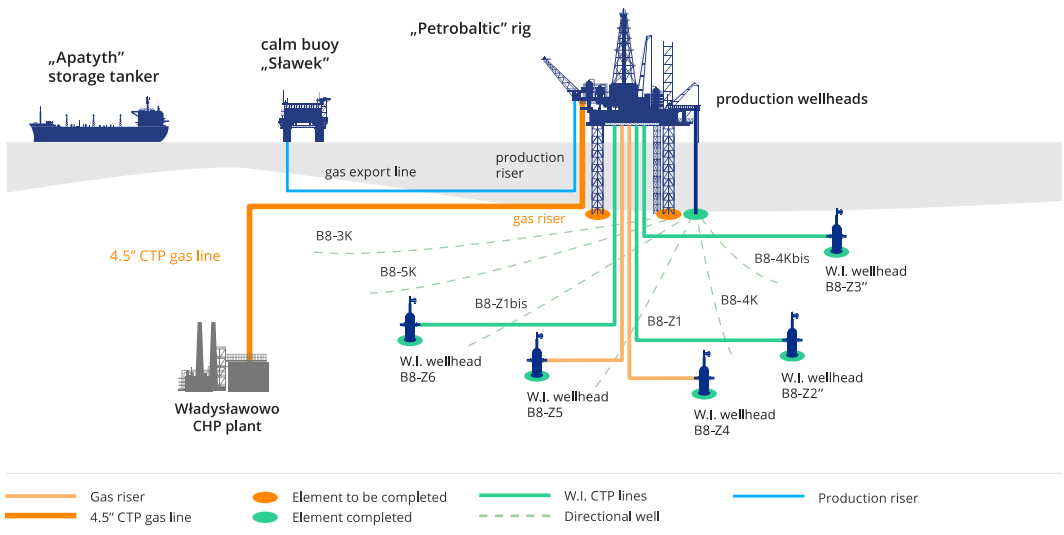
B8 is the third largest oil production facility in Poland and the oil field holding the largest recoverable oil reserves in the Polish part of the Baltic Sea. The field is situated in Poland's Exclusive Economic Zone of the Baltic Sea.

### 3.5 million tonnes = 28 million barrels

**estimate of the 2P production reserves of the B8 oil field**

Once the Petrobaltic rig is converted into a production centre and placed in the B8 field, and after the pipeline to Władysławowo is completed, in the second half of 2017 we expect to launch full-scale production from the field at a daily rate of some 5 thousand barrels of crude oil (250 thousand tonnes annually).

## B8 Field development



In 2015, having carried out detailed technical analyses, LOTOS Petrobaltic resolved to optimize the Petrobaltic rig conversion project by reducing the weight of the hull. This will improve the economics of the B8 field development project in the difficult macroeconomic environment, with low oil prices.

In 2015, the LOTOS Petrobaltic Group spent PLN 304.3m on the development of the B8 field.

# Development of the B4/B6 gas fields

The purpose of the project is to develop and produce natural gas from the B4 and B6 fields in the Baltic Sea together with CalEnergy Resources Poland. In the summer of 2015, we began the third phase of the project, as part of which detailed technical solutions leading to the development of the fields are to be worked out.

Despite the technical complexity of the project and difficult macroeconomic conditions (significant decline in oil prices) we expect to complete that phase in 2016.

**nearly**

**4.3 bcm**

**estimated recoverable gas resources of the B4/B6 fields**

The fields are planned to be put on stream between 2019 and 2020. The mixture of hydrocarbons (raw gas) will be transported via underwater pipelines on shore and processed into commercial products: natural gas, LPG and condensate, to be subsequently delivered to end users.

In 2015, the LOTOS Petrobaltic Group spent PLN 3.9m on activities continued under the B4/B6 gas field development project. In accordance with relevant agreement, at this stage the project is mainly financed by the partner, CalEnergy Resources Poland.

# Acquisition of the Sleipner field

On December 30th 2015, LOTOS Norge finalized the acquisition of a portfolio of Sleipner assets located in central part of the North Sea. Being the second largest gas hub in the North Sea, the Sleipner area is of strategic importance to gas exports from Norway to Continental Europe and the United Kingdom.

more than

**16 thousand boe/d***

**production volume attributable to LOTOS Norge's interest in the Sleipner assets towards the end of 2015**

**9.5 thousand boe/d**

**estimate of the expected average oil and gas output from the Sleipner fields attributable to LOTOS Norge's interest in 2016–2018**

The base purchase price of the Sleipner portfolio was USD 160m (PLN 587.3m). The acquisition was a non-cash transaction executed by unlocking the tax asset generated from the YME Project.

The transaction covered interests in five licences, including four production fields and the Alfa Sentral field, discovered and scheduled for development. Statoil is the operator of all those licences, and the other consortium partners are Exxon and Total.

As at December 31st 2015, following the acquisition of the Sleipner assets, LOTOS Norge held interests in 27 licences for oil exploration and production on the Norwegian Continental Shelf.

* Barrels of oil equivalent per day

# Recovery of the tax shield related to the YME field

In view of the persistently macroeconomic environment, including unstable conditions on the commodities market and sharp declines in crude oil prices, the LOTOS Group intends to initiate measures to improve the efficiency and ensure financial stability of its upstream segment. Apart from focus on the key projects, this will involve using cash flows from the Heimdal and Sleipner fields to recover the capital locked in the tax asset in Norway based on the cash flows from Heimdal and Sleipner fields.

In June 2015, the Norwegian Ministry of Petroleum and Energy (MPE) approved the request not to submit a Revised Development Plan and start the process of planning the field liquidation, made by Repsol of Spain, the operator of the YME licence. As at December 31st 2015, a decommissioning plan for the Yme field for 2016−2020 was to be provided to MPE for approval by the end of 2016. However, when OKEA, a new player on the Norwegian market, declared its intention to buy an interest in the YME field and proceed with its development, the decommissioning process was suspended and a reassessment of the field development options was commenced. The Operator has carried out efforts to prepare the Field Development Project (PDO), planned for 1Q 2017. The LOTOS Group supports the Operator in the activities likely to increase the market value of the YME asset by avoiding the field liquidation and return to the development.

Grupa LOTOS is monitoring the situation on an ongoing basis to choose the best solution for the YME project.

# Innovation potential, cooperation and knowledge sharing

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Innovative approach is a crucial element of our business. By investing in state-of-the-art oil refining technologies, obtaining patents and cooperating with research partners, we improve our competitiveness and the quality of our products, while supporting the environment in which we operate.

The LOTOS Group's research and development activities focus on crude oil production and refining.

## What do we do?

- In the upstream segment, in line with the trends set by European oil companies, our key R&D initiatives focus on technologies for hydrocarbon exploration and optimizing hydrocarbon production.
- In the downstream segment, we focus on effective utilization of the refinery's expanded processing capacities and refinery streams, further increase in oil conversion depth, and optimum use of synergies between the refining industry and the chemical, power and construction industries with a view to maximizing the refining margin.

**Our innovation objectives:**

- Invest in new technologies across all business areas;
- Improve efficiency by further development of business and logistics processes;
- Use advanced technological process optimization methods;
- Promote innovation among employees as well as our trading and social partners.

# LOTOS Lab

The LOTOS Group's research and development activities are led and coordinated mainly by **LOTOS Lab**. In July 2015, the R&D Division and the R&D Team were appointed to support the LOTOS Group companies in the following areas:

- Identifying and keeping a record of project ideas on an ongoing basis;
- Improving access to the project portfolio for interested persons;
- Participating in advisory capacity in meetings held with a view to partnering with third parties in R&D projects;
- Analysing the documentation of R&D funding programmes to identify potential financing sources for project ideas;
- Intermediating in relations with institutions managing public funds for research and development initiatives as well as information centres for EU and national funds;
- Preparing relevant applications related to R&D projects.

LOTOS Lab has framework agreements on R&D cooperation with the following entities:

- Faculty of Chemistry of the Gdańsk University of Technology;
- Faculty of Civil and Environmental Engineering of the Gdańsk University of Technology;
- Oil and Gas Institute;
- Road and Bridge Research Institute.

# Key R&D projects

Grupa LOTOS is the leader of a consortium conducting the HESTOR research project **co-financed by the National Centre for Research and Development**.

## HESTOR project

**The project's objective:**

Examine the efficiency of storing hydrogen obtained from surplus energy generated from renewable sources.

**The intended results:**

The surplus electricity used to generate hydrogen through electrolysis would be delivered by wind farms and solar power plants. Hydrogen stored in caverns would be used:

- Directly in technological processes at the Grupa LOTOS' refinery, thus reducing the need to generate hydrogen from natural gas;
- For energy generation as a fuel firing gas turbines during peak demand hours.

### HESTOR and the environment

The pro-environmental effect of the project would be a reduction in greenhouse gas emissions by balancing the fluctuating supplies of electricity from renewable sources.

In a longer time horizon, hydrogen generation and storage on a larger scale would increase the share of RES in Poland's energy mix, owing to better utilization of the output of wind farms and solar power plants.

### Partners of Grupa LOTOS in the HESTOR project:

- Warsaw University of Technology;
- Operator Gazociągów Przesyłowych GAZ-SYSTEM S.A.;
- Stanisław Staszic AGH University of Science and Technology of Kraków;
- Ośrodek Badawczo-Rozwojowy Górnictwa Surowców Chemicznych CHEMKOP Sp. z o.o.;
- Silesian University of Technology.

# Smart specializations of the Pomerania region

On April 9th 2015, the Local Government of the Gdańsk Province passed a resolution to establish smart specialization areas in the Pomerania region. One of the four approved specializations was 'Eco-efficient technologies in production, transmission, distribution and consumption of energy and fuels' recommended by a consortium whose members include LOTOS Group companies: Grupa LOTOS, LOTOS Asfalt, LOTOS Lab, LOTOS Oil, and LOTOS Petrobaltic.

Smart specializations of the Pomerania region cover business activity areas which may prove crucial to the region's future competitive position, and as such they are to be promoted by easier access to funds allocated as part of the Regional Operational Programme for the Gdańsk Province for 2014 −2020.

**The project's objectives:**

- Obtain the smart specialization status to facilitate the commencement of innovative projects related to effective crude oil production technologies and production of state-of-the-art Group 2 base oils;
- Develop technologies for obtaining high-margin petroleum products, and production technologies for next generation biofuels, i.e. biofuels that do not compete with food production;
- Develop state-of-the-art building materials and their application technologies.

**Partners of the LOTOS Group companies in the project:**

- Energa;
- Silesian University of Technology;
- University of Gdańsk;
- Polish Naval Academy;
- Gdynia Maritime University;
- Institute of Fluid-Flow Machinery – Polish Academy of Sciences;
- Institute of Power Engineering.

More information on smart specializations of the Pomerania region

# Best practices

## Cooperation with higher education and research institutions:

- In one of the projects planned for 2015–2016 LOTOS Petrobaltic is a member of a consortium which is among the four consortia that have obtained the status of smart specialization of the Pomerania region (the 'Off-shore and port and logistics technologies' project). 39 enterprises, 10 academic institutions and 10 business support organizations participate in the programme, run by the Marshal Office of the Gdańsk Province.

- Grupa LOTOS is conducting analyses to prepare a submission for a competition to obtain co-financing for R&D projects executed by large enterprises, announced by the National Centre for Research and Development. The project would be the continuation of a study implemented in 2014, focusing on hydrocarbon generation, expulsion, migration and accumulation, performed with the use of technologically advanced tools and techniques for modelling petroleum processes in exploration activity and the state-of-the-art methods for analysis of rock and porous media from the Baltic Sea basin.

## Cooperation with customers and suppliers, experience sharing in the industry:

- LOTOS Petrobaltic and Polskie Górnictwo Naftowe i Gazownictwo signed joint operating agreements concerning the Kamień Pomorski (in north-western Poland) and Górowo-Iławeckie (in north-eastern Poland) licences. Together the two companies performed a 3D seismic survey in the Kamień Pomorski licence area (survey area: 134.8 sq. km, area with receiver points: 267.5 sq. km), and processed and interpreted the image against a part of an archive 3D seismic image. The cooperation on the Górowo Iławieckie licence involved the acquisition of a total of 200.4 km of 2D seismic data and processing of archive data.

- Grupa LOTOS and Honeywell entered into an agreement on supervision of control systems (80% of the systems were developed by Honeywell). The agreement provides for effective management of the life cycle of individual units and ensures the highest level of safety at work.

- LOTOS-Air BP Polska and the Olsztyn Mazury Airport signed an agreement for the supply of aviation fuels (effective as of January 2016). From the commencement of talks on prospective cooperation, LOTOS-Air BP Polska's staff actively supported the airport in its work on fuel infrastructure, formal and technical aspects, as well as tax and legal matters, to ensure that the airport is ready to start operations on time.

- Grupa LOTOS held a meeting with heads of information divisions from more than a dozen companies based in the Pomerania region. The main theme of the meeting was data and system security issues. It was one of the regional meetings of the CIO Club.

- In May 2015, the LOTOS Group joined the Technology Transfer Platform, which collect the resources of companies willing to share their innovative solutions and information on the needs of entities that look for innovations. The search mechanism helps match technology providers with seekers. It is a helpful tool for inventors, research institutes and businesses. Other participants of the Technology Transfer Platform include: Enea, Polska Grupa Energetyczna (PGE), KGHM Polska Miedź, and Polska Grupa Zbrojeniowa.

# Eco-friendly growth

# Eco-friendly growth

We have taken a strategic approach to minimizing our environmental impacts, which is why the Grupa LOTOS refinery, our major plant, is now one of the most environmentally friendly refineries in Europe. We believe that reducing negative environmental impacts brings benefits to Grupa LOTOS, and thus to its shareholders. In this way, we create additional value for our other stakeholders, who support us as partners in pro-environmental activities.

One of the key objectives of our CSR strategy for 2012−2015 was to reduce the environmental risk and seek to continually minimize the environmental impact of the LOTOS Group's operations.

Four operational goals have been assigned to this objective:

- Promote environmental standards and best practices across the LOTOS Group;
- Monitor the environmental footprint of the LOTOS Group's infrastructure beyond mandatory obligations;
- Reduce the contamination level in the streams of treated wastewater and discharged water;
- Improve the ERM Portal supporting environmental risk management.

Environmental matters are also addressed in the LOTOS Group's Code of Ethics. The recommended approach is put into practice by:

- Adhering to internal procedures intended to ensure conformity of our processes with the requirements imposed by applicable environmental laws;
- Implementing solutions designed to mitigate the LOTOS Group's environmental impacts;
- Engaging in educational initiatives to raise environmental awareness within the organization and in a wider social environment;
- Care for the environment in and outside of the workplace.

The business activity of the LOTOS Group may involve significant environmental impacts resulting from emissions of pollutants into the air, generation of waste, use of water and discharge of wastewater. The scale and nature of our environmental impacts are regulated under the environmental protection laws. In connection with their activities, companies of the LOTOS Group hold a number of permits, including integrated permits, which govern the operational and environmental aspects of the LOTOS Group's installations.

The most critical source of environmental impact caused by our plants, both for the installations' immediate environment and areas located further away, are gas emissions. Therefore, we are most concerned to ensure that the processes involving gas emissions are based on Best Available Techniques and best practices reducing the plants' impact in that respect.

Accordingly, when selecting and implementing innovative solutions, we always seek synergies between the needs of the company and benefits to the environment, and especially to the natural world.

## Total environmental protection expenditures and investments

| | |
|---|---|
| **Waste disposal, emissions treatment, and remediation costs (PLN thousand)** | 33,523 |
| **Prevention and environmental management costs (PLN thousand)** | 84,839 |
| **Eco-friendly projects (PLN thousand)** | 72,211 |

The EFRA Project is not only a breakthrough initiative for Grupa LOTOS in terms of efficiency and competitiveness, but it also limits our environmental footprint.

When implementing the project, we decided to apply solutions that go beyond environmental protection regulations and BAT requirements:

- In the Delayed Coking Unit, before opening the DCU reactor, the water pressure will be reduced more than it is normally done, in order to achieve a maximum withdrawal of gaseous hydrocarbons still before the coke cutting and removal processes;
- All the processes related to coke unloading, transfer, storage, loading and transport out of the refinery will be carried out using a system that ensures above-standard environmental safety.

EFRA Project

# Best practice:

THE GLOBAL GOALS
For Sustainable Development

17 PARTNERSHIPS FOR THE GOALS

## Key projects and initiatives to minimize the environmental impact

- In 2015, the LOTOS Group became the Major Partner of the Baltic Programme, carried out by UN Global Compact in Poland. The Baltic Programme is aimed at developing optimised sustainable development directions in the Baltic Sea region by supporting the expansion of sea transport corridors and transport in the region, paying special attention to improved transport security and infrastructure, increased competitive advantage of the Baltic Sea region, and also to protecting its ecosystem. The environmental protection of the Baltic Sea, including prevention of the eutrophication process, were considered one of the key priorities of the Baltic Programme.
- In pursuance of the objective of reducing the environmental risk and seeking to continually minimize the environmental impact of the LOTOS Group's operations, in 2012–2015 we carried out a large-area wildlife survey in the vicinity of the refinery in Gdańsk, and revised the environmental documentation of our service stations across Poland. We organized environmental experts' meetings to discuss best practices in environmental protection and important protective activities.
- LOTOS Kolej received modern rolling stock, which eliminated leakage of lubricating oils. In 2015, we eliminated the process of gas removal from LPG tanks on the LOTOS Kolej's site in Gdańsk. The process was relocated to a Grupa LOTOS unit, where gas is recovered by sending to the fuel gas system.

- LOTOS Asfalt reduced production costs through the introduction of efficient energy management and feedstock optimization. Its products are manufactured with due care for the environment and transported using eco-friendly means. The company promotes tractors that comply with the highest emission standard (minimum Euro 5), reducing nitrogen oxides (NOx), hydrocarbons (HC), carbon oxides (CO) and particulate matter (PM) emissions. Transport is preferably arranged on safe, fast-traffic express roads and motorways, with non-collision crossroads, which leads to mitigation of social consequences of road accidents.

- Polskie Centrum Badań i Certyfikacji, a Polish certification body, awarded LOTOS Serwis the Integrated Management System Certificate, which covers maintenance activities, overhauls and upgrades, industrial plant construction and commissioning. The certificate also extends to works carried out on the oil and gas production installations.

- In order to minimize the risk of environmental disasters, LOTOS Petrobaltic has put in place procedures based on international regulations, and regularly conducts emergency spill response training in the sea. It is organized in cooperation with the Maritime Search and Rescue Service (SAR) and the Maritime Office in Gdynia.

- Our employees' engagement in numerous ecological initiatives testifies to the importance they attach to environmental protection. For instance, LOTOS Asfalt, partner of the 'Tree for a Tyre' campaign organized a collection of worn-out tyres in a facility of Grupa LOTOS in the Gdańsk Province. Within just a few hours, employees from our Gdańsk-based companies brought as many as 300 tyres, receiving 300 guelder-rose, bird cherries, dogwood, fir and spindle seedlings in exchange.

- During the conference 'TIME OF INNOVATION. OIL AND CHEMICAL INDUSTRIES 2015, Grupa LOTOS received an award for the development and implementation of a technology that prevents water in the storage reservoir serving as a source of water for the refinery from turning green with algae. With the new technology, the total amount of water abstracted from the environment was reduced by approximately 6%, despite increased volumes of oil processed. This innovative solution is a source of technological benefits (no problems with water treatment), economic benefits (stable production cost) and environmental benefits (improved water quality).

# Reduction of energy consumption

In 2015, companies of the LOTOS Group engaged in efficiency initiatives to reduce energy consumption.

At Grupa LOTOS, this goal was pursued as part of the currently implemented Energy Management System based on ISO 50001, and is in line with the Company's Energy Policy underlying the System. Activities improving energy efficiency are part of our constant development efforts and are carried out in compliance with established and documented procedures. They focus primarily on such matters as optimization of technological processes, maintenance of energy-consuming infrastructure in proper technical condition, investments to improve energy efficiency, and procurement of services and assets taking into account their energy intensity's effect on long-term costs of their use. In 2015, projects involving optimization of steam network performance and rotating machinery were conducted, which helped reduce energy consumption by 90,760 when converted GJ/MWh in total.

LOTOS Oil completed three initiatives resulting from its five-year overhaul schedule and consultations with the staff on the possible ways of reducing branch costs. The initiatives involved replacement of pipeline and tank heat insulation as part of ongoing maintenance activities, and employee-targeted information campaign on the importance of heat and energy saving.

As for LOTOS Asfalt, the company's activities under the Energy Management Systems produced efficiencies amounting to 63,139 when converted GJ/MWh.

Other companies of the LOTOS Group also take steps to minimize their energy and fuel consumption. In 2015, LOTOS Paliwa upgraded lighting of petrol pump canopies at 13 service stations. LOTOS Kolej reduced its fuel consumption − in 2015 it used 0.18 l/km less diesel oil than in 2014.

## Direct and indirect energy consumption within the organization

### LOTOS Group (Table 1a, 1b)

### 1a) Primary energy

| Total consumption of primary energy from non-renewable sources (own or purchased), by type of fuel | Amount (GJ) - GL S.A. |
|---|---|
| Natural gas | 7 919 009 |
| Fuel gas | 11 650 729 |
| Residual gases | 3 595 562 |
| LSFO | 2 560 821 |
| Light fuel oil (HON) | 1 131 |
| Resale of heat generated from waste primary energy to other entities | -118 907 |
| **Total consumption** | **25 608 345** |

## 1b) Useful energy

| Total consumption of useful energy purchased from other entities (including the affiliates of the LOTOS Group),: electricity and heat | |
|---|---|
| Electricity | 1 814 958 |
| Heat (including steam and cooling) | 0 |

| Total sales of useful energy to entities outside the LOTOS Group purchased outside the LOTOS Group or produced inside the LOTOS Group [electricity and heat] | |
|---|---|
| Total electricity sales | 6 048 |
| Total heat sales (net) | 660 |

## LOTOS Group (Tab.2)

## Primary energy

| Total consumption of primary energy from non-renewable sources (own or purchased), by type | Values (GJ) — draft report |
|---|---|
| Natural gas | 8 833 545 |
| Fuel gas | 11 650 729 |
| Residual gases | 3 595 562 |
| Fuel oil (including LSFO fuel oil) | 2 718 694 |
| Diesel oil (including HON light oil) | 462 319 |
| **Total consumption** | **27 260 849** |

Companies included in the calculations: Grupa LOTOS (Tab. 1), AB LOTOS Geonafta, LOTOS Oil, LOTOS Petrobaltic, Energobaltic, LOTOS Infrastruktura, LOTOS Kolej, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa, LOTOS Ochrona, LOTOS Straż (Tab. 2).

# Emissions management

2015 was the last year covered by the LOTOS Group's Corporate Social Responsibility Strategy for 2012–2015. One of its objectives was to bring average annual carbon ($CO_2$) emissions intensity ratio at the Grupa LOTOS refinery, expressed in kg $CO_2$/CWT, below 90% of the 2011 levels in 2015.

**29.8 kg $CO_2$/CWT***

that low was the average carbon emissions intensity ratio at Grupa LOTOS installations, down 79% on 2011 The reduction was made possible by connecting the refinery to the gas grid in 2012 and use of natural gas as fuel in the CHP plant, and as feedstock for hydrogen generation, as well as a number of other upgrades and efficiency-promoting measures.

* plant's total $CO_2$ emissions divided by the total throughput of all it's installations emitting this gas

## Direct greenhouse gas emissions

| | Source | GHG emissions [tonnes of $CO_2$] |
|---|---|---|
| 1 | Emissions associated with electricity production | 30 998 |
| 2 | Emissions associated with heat production | 1 336 835 |
| 3 | Emissions associated with gas flaring | 10 550 |
| 4 | Emissions from processes | 621 773 |
| | **Total direct emissions** | **2 000 156** |

| Operations/processes of particular relevance | GHG emissions [tonnes of $CO_2$] |
|---|---|
| **Refining production** | 1 612 667 |
| **Crude oil production** | 44 277 |
| **Emissions from CHP plants** | 328 754 |

Companies included in the calculations: Grupa LOTOS, LOTOS Petrobaltic, LOTOS Asfalt, Energobaltic, RCEkoenergia.

## Indirect greenhouse gas emissions

| | Source | GHG emissions [tonnes of $CO_2$] |
|---|---|---|
| 1 | Emissions from electricity purchased for the organization's needs | 554 755 |
| 2 | Emissions from heat purchased for the organization's needs | 13 027 |
| | **Total indirect emissions** | **567 782** |

| Operations/processes of particular relevance (where they represent a material proportion of the organization's emissions profile) | Indirect GHG emissions [tonnes of $CO_2$] |
|---|---|
| **Purchased electricity consumption at the onshore facility (LOTOS Petrobaltic)** | 1 611 |
| **Consumption of electricity purchased for refinery production purposes (Grupa LOTOS)** | 427 933 |
| **Pumping of water for power generation and wastewater treatment (RCEkoenergia)** | 289 |

Companies included in the calculations: Grupa LOTOS, LOTOS Oil, LOTOS Petrobaltic, LOTOS Infrastruktura, LOTOS Kolej, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa, LOTOS Ochrona, LOTOS Straż, LOTOS Terminale, LOTOS Lab, LOTOS Biopaliwa, RCEkoenergia.

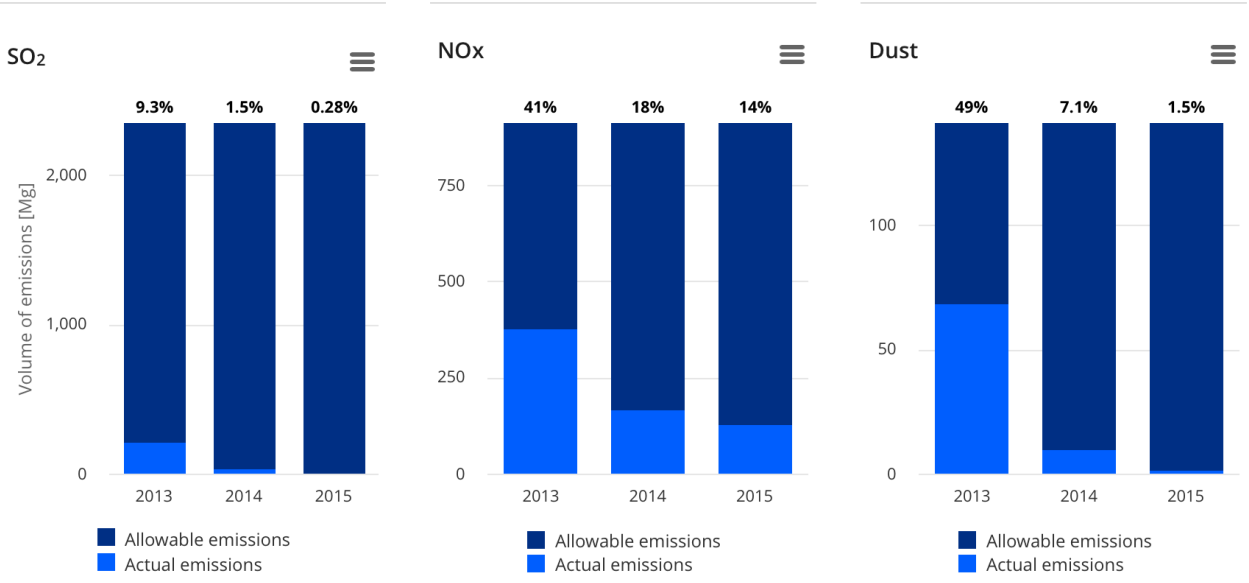
The 2015 $CO_2$ emissions intensity ratio (per production unit, direct emissions only) was:

- at Grupa LOTOS: 29.8 kg $CO_2$/CWT
- at LOTOS Petrobaltic: 0.261 t$CO_2$/toe
- at LOTOS Asfalt: Gdańsk plant − 0.018 t $CO_2$/t of the product, Jasło plant − 0.11 t $CO_2$/t of the product (various processes run at the Gdańsk plant and the Jasło plant characterised with different emission levels)
- at Energobaltic: 0.06 tonnes/GJ

Falling oil prices and the resulting decrease in prices of finished goods had a bearing on the environmental impact of the Grupa LOTOS refinery in Gdańsk in 2015. In the new price environment, the unit cost of energy generated from the refinery's finished goods turned out to be lower than the unit cost of energy from natural gas. This was an opportunity to reduce operating expenses and improve our competitive position.

The larger share of crude oil products, the so-called finished goods in the energy and feedstock mix at our Gdańsk refinery had a marked impact on sulfur dioxide ($SO_2$) and particulate emissions from our installations. At one of the hydrogen generation units, we used LPG as feedstock on a temporary basis.. It is worth stressing that the quality of finished goods, and the amount of emissions into the air were within the permitted levels set out in the integrated permit.

## Air emissions of main pollutants from the Grupa LOTOS' CHP plant as percent of permitted values




## $NO_x$, $SO_x$, and other significant air emissions

| $NO_x$, $SO_x$ and other significant air emissions | Amount of air emissions (tonne) |
|---|---|
| **$NO_x$** | 1 135.33 |
| **$SO_x$** | 2 578.88 |
| **Persistent organic pollutants (POP)** | 0.00 |
| **Volatile organic compounds (VOC)** | 230.81 |
| **Hazardous air pollutants (HAP)** | 1.81 |
| **Particulate matter (PM)** | 231.48 |
| **Other standard categories of air emissions** | 16.33 |

| The emission intensity in the process of oil and gas production | The emission intensity (t/mboe) |
|---|---|
| $NO_x$ | 29.71 |
| $SO_x$ | 3.47 |
| Volatile organic compounds (VOC) | 357.26 |
| Particulate matter (PM) | 3.66 |

Companies included in the calculations: Grupa LOTOS, AB LOTOS Geonafta, LOTOS Oil, LOTOS Petrobaltic, Energobaltic, LOTOS Kolej, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa, LOTOS Terminale, LOTOS Lab, LOTOS Biopaliwa, RCEkoenergia.

## Volume of gases flared

| Location | Amount of flare gas [thousand cubic metres] | Total volume of flared gases per production unit |
|---|---|---|
| | 2015 | |
| **LOTOS Petrobaltic (international waters, Polish Exclusive Economic Zone)** | 3 552.5 | 2 586.1 thousand $m^3$/Mboe |
| **Grupa LOTOS (Gdańsk refinery)** | 5 448.0 | |
| **AB LOTOS Geonafta (Lithuania)** | 415.7 | 2 233.0 tys. thousand $m^3$/Mboe |

# Production of hydrocarbons

To reduce the environmental footprint of its operations, the LOTOS Group monitors the producing fields on an ongoing basis.

The main raw materials used in exploration and production drilling and well workovers include drilling mud components (which are environmentally neutral) and cement used to bind casing to the drilled rock. LOTOS Petrobaltic does not use oil-based muds for drilling, but relies only on water-based muds, which circulate within a closed-loop system.

The main raw materials used in the production process include chemical substances added to the formation and sea water pumping system, as well as methanol added to the gas transported to Energobaltic.

## Materials used, by weight and volume

| Materials used | Total consumption |
|---|---|
| **natural gas** | 31 020 258 $m^3$ |
| **LPG** | 25 tonnes |
| **crude oil** | 10 213 160 tonnes |
| **fuel oil** | 367 tonnes |
| **diesel oil** | 4 773 $m^3$ |
| **gasoline** | 17 tonnes |
| **materials and components** | 685 001 tonnes |
| **enhancing additives** | 2 183 tonnes |
| **hydrated lime** | 27 tonnes |
| **other materials used for drilling and production** | 773 tonnes |

Companies included in the calculations: Grupa LOTOS, AB LOTOS Geonafta, LOTOS Oil, LOTOS Petrobaltic, Energobaltic, LOTOS Infrastruktura, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa.

LOTOS Petrobaltic used 6,988,225 cubic metres of natural gas, with 6,833,493 cubic metres of gas produced by the Baltic Beta platform on the B3 field through separation from the formation fluid and used to supply the platform systems).154,732 cubic metres was gas purchased from a third-party provider to heat office buildings at the onshore facility of LOTOS Petrobaltic). Fuel gas used for heating offices accounts for 2.26% of the total gas consumed.

# Water and wastewater management

THE GLOBAL GOALS
For Sustainable Development


The economic use of water resources at the LOTOS Group is based on relevant water use and integrated permits. Analyses of the environmental impact of our water abstraction activities confirm that they do not significantly affect any protected sites or areas of environmental value, and that the amount of water withdrawn is substantially below permitted volumes.

## Total water withdrawal by source

| No. | Total volume of water withdrawn by the organization by source | Total volume [m3] |
|---|---|---|
| 1 | Water from rivers | 4 007 379 |
| 2 | Seawater | 334 002 |
| 3 | Ground water | 328 810 |
| 4 | Water supplies from a third party | 322 492 |
| | **TOTAL** | 4 992 683 |

Companies included in the calculations: Grupa LOTOS, AB LOTOS Geonafta, LOTOS Oil, LOTOS Petrobaltic, Energobaltic, LOTOS Infrastruktura, LOTOS Kolej, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa, LOTOS Ochrona, LOTOS Straż, LOTOS Terminale, LOTOS Lab, LOTOS Biopaliwa, RCEkoenergia.

| Processes consuming large quantities of water | Water demand [m3] | Company |
|---|---|---|
| **CHP plant - utilities production** | 3 123 762 | Grupa LOTOS |
| **Refinery - circulatory cooling water** | 1 356 650 | Grupa LOTOS |
| **Injection of seawater into reservoir** | 334 002 | LOTOS Petrobaltic |
| **Production of decarbonized water** | 214 039 | LOTOS Infrastruktura |
| **Water consumption at the CHP plant (heating and process steam generation, cooling system)** | 152 365 | RCEkoenergia |
| **FAME production — circulating cooling water** | 41 754 | LOTOS Biopaliwa |
| **Technological processes of washing locomotives and tankers** | 35 094 | LOTOS Kolej |
| **Fire safety purposes** | 7 453 | LOTOS Terminale |
| **Production of fatty acid methyl esters (FAME)** | 6 714 | LOTOS Biopaliwa |
| **Water consumption at the treatment plant** | 3 612 | RCEkoenergia |

| | | |
|---|---|---|
| **Water treatment unit (water for heating systems)** | 3 498 | Energobaltic |
| **Cooling** | 1 754 | LOTOS Oil |
| **Fire safety purposes** | 1 200 | LOTOS Straż |

## Percentage and total volume of water recycled and reused

| | |
|---|---|
| Total volume of water withdrawn by the organization | 7 879 566 $m^3$ |
| Volume of water recycled or reused | 3 901 647 $m^3$ |
| Share of water recycled or reused in the total volume of water withdrawn by the organization | 50% |

Companies included in the calculations: Grupa LOTOS, LOTOS Asfalt, LOTOS Paliwa, LOTOS Biopaliwa. Total volume of water withdrawn by the companies was calculated as the volume of water that would have to be abstracted from the environment to satisfy the Company's needs (i.e. actual water withdrawal + reused water).

For years, Grupa LOTOS has maintained a high quality of treated wastewater. Regular monitoring has confirmed that the wastewater discharged meets the required parameters, with the majority of indicators below 50% of the maximum levels defined in our permit.

## Total volume of wastewater by quality and destination

| **Wastewater discharge destination** | **Volume ($m^3$)** |
|---|---|
| To surface water (lakes, rivers, etc.) | 5 788 064 |
| To third-party plants (including municipal utilities) | 256 820 |
| **Total wastewater volume** | **6 044 884** |

| **Wastewater treatment** | **Volume ($m^3$)** |
|---|---|
| **Through the Organization** | 5 788 064 |
| **Through the treatment plant** | 256 820 |
| **Total wastewater treatment** | **6 044 884** |

Companies included in the calculations: Grupa LOTOS, AB LOTOS Geonafta, LOTOS Oil, LOTOS Petrobaltic, Energobaltic, LOTOS Kolej, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa, LOTOS Terminale, LOTOS Infrastruktura, LOTOS Ochrona, RCEkoenergia, LOTOS Biopaliwa.

# Wastewater discharged by Grupa LOTOS (mg/dm$^3$)

$BZT_5$ (pięciodobowe biologiczne zapotrzebowanie na tlen) = 2.97

COD=44.53

suspended solids = 5.08

phenols = 0.001

ether extract = 0.54

petroleum hydrocarbons = 0.12

$N_{og}$ (Total Nitrogen) = 4.5

$P_{og}$ (Total Phosphorus) = 0.75

sulphides = 0.022

Ni (Nickel) = 0.0013

V (Vanadium) = 0.0039

Al (Aluminium) = 0.0703

petroleum = 0.12

Phenols, ether extract, hydrocarbons, nickel, vanadium and aluminium are typical pollutants in the refining industry. The other substances are very important for environmental protection in general. Wastewater discharged by Grupa LOTOS to the environment meets by a wide margin the parameters defined in the integrated permit granted to the company.

# Formation water

Until recently, formation water separated from the formation fluid as part of LOTOS Petrobaltic's operations used to be purified of oil components to a level below 15 ppm ("parts per million") and discharged into the sea. At present, in line with the requirements of the Baltic Sea Action Plan, developed by the Helsinki Commission (HELCOM) and approved in 2007 by the Environmental Protection Ministers of the Baltic States, the 'zero discharge' principle applies to offshore activities in the Baltic Sea. Therefore, a special water injection system was installed on the Baltic Beta platform to inject water back into the rock mass. This has a positive effect on the environment and raises the reservoir pressure, improving efficiency.

## Volume and disposal method for formation water and water produced in the oil extraction process

| Disposal method | Volume of formation water and water produced in the oil extraction process [m³] | | Share of water produced in the oil extraction process | |
|---|---|---|---|---|
| | LOTOS Petrobaltic | AB LOTOS Geonafta | LOTOS Petrobaltic | AB LOTOS Geonafta |
| **Re-injection into reservoir** | 183 518.2 | 249 449 | 98.63% | 99.09% |
| **Other** | 2 546.4 | 2 291.5 | 1.37% | 0.91% |
| TOTAL | 186 064.6 | 251 740.5 | 100% | 100% |

In 2015, formation water produced in the process of oil extraction from the B8 field was loaded into a tanker together with the oil. As production from the field was launched on September 30th 2015, the content of water in the formation fluid was negligible (1%). Once the Petrobaltic rig (currently undergoing conversion), with the formation water injection system installed, is placed on the B8 field, water will be injected back into the field.

In 2015, LOTOS Geonafta produced 251,741 cubic metres of formation water. The water was injected back into the formation and therefore is not subject to any specific requirements in terms of hydrocarbon content or salinity. The company intends to maintain the concentration of hydrocarbons in formation water below the level of 40 mg/litre. In 2015, 2,291.5 cubic metres of the produced brine was supplied to municipal utilities.

# Waste management

The LOTOS Group complies with all national and EU regulations and decisions, making every effort to manage its waste in an environmentally safe manner.

## Total weight of waste by type and disposal method

| Weight of waste [Mg] | | |
|---|---|---|
| **Disposal method** | **Non-hazardous waste** | **Hazardous waste** |
| **Reuse of waste** | 148.93 | 0.00 |
| **Recycling (including organic recycling, e.g. composting)** | 6 343.92 | 10 038.46 |
| **Recovery (including energy recovery)** | 2 562.51 | 677.40 |
| **Burning (or use as fuel)** | 13.26 | 265.73 |
| **Landfilling** | 130.61 | 17.58 |
| **Discharge to deep wells** | 0.00 | 0.00 |
| **On-site storage** | 92.89 | 1 221.46 |
| **Other** | 2 815.54 | 864.12 |
| **TOTAL** | **12 107.65** | **13 084.74** |

Companies included in the calculations: Grupa LOTOS, AB LOTOS Geonafta, LOTOS Oil, LOTOS Petrobaltic, Energobaltic, LOTOS Kolej, LOTOS Infrastruktura, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa, LOTOS Terminale, LOTOS Straż, LOTOS Lab, LOTOS Ochrona, LOTOS Biopaliwa, RCEkoenergia.

## Weight of transported, imported, exported, or treated waste deemed hazardous and share of transported waste shipped internationally

| Hazardous waste (Mg) | |
|---|---|
| **Total weight of hazardous waste transported, including:** | 11 689.88 |
| **Total weight of hazardous waste imported** | 0.00 |
| **Total weight of hazardous waste exported** | 31.88 |
| **Total weight of hazardous waste treated** | 3 226.04 |
| **Share of hazardous waste shipped internationally** | 0.27% |

Companies included in the calculations: Grupa LOTOS, LOTOS Oil, LOTOS Petrobaltic, Energobaltic, LOTOS Kolej, LOTOS Infrastruktura, LOTOS Asfalt, LOTOS Serwis, LOTOS Paliwa, LOTOS Terminale, LOTOS Lab, LOTOS Ochrona, RCEkoenergia, LOTOS Biopaliwa.

Drilling mud and drill cuttings are the main waste products of the drilling process. Once carried to the surface, they are directed to the treatment system.

Total volume of drilling waste generated by LOTOS Petrobaltic using water-based drilling fluid was 235.76 Mg, of which 73.44 Mg of drill cuttings and 152.96 Mg of drilling mud was transferred for recovery, and 9.36 Mg of drill cuttings was burnt.

Total volume of drilling waste generated by AB LOTOS Geonafta using water-based drilling fluid was 2,206.84 Mg. Most of the compounds used in 2015 were biodegradable. All of the drilling waste (drilling mud and drill cuttings) was shipped to the waste treatment plant.

The LOTOS Group favours eco-friendly waste management methods, such as recycling and recovery, and takes firm steps to curb the use of methods that are harmful to the environment, such as burning without energy recovery, landfilling and other forms of disposal.

# Biodiversity



The LOTOS Group operates close to areas of high environmental value and therefore makes every effort to continuously monitor potential hazards to biodiversity that may follow from its business growth. The LOTOS Group's sites neighbouring areas of environmental value include:

- The Słupsk E and Słupsk W licence areas (2,160.3 sq. km), owned by LOTOS Petrobaltic, located in the Polish Economic Zone of the Baltic Sea and bordering on a Natura 2000 site.
- Five sites of AB LOTOS Geonafta in the Kretinga region (with a total area of 0.06 sq. km), in close vicinity to areas of great natural value due to aquatic ecosystems (Natura 2000).
- Energobaltic's sites in Władysławowo (0.02 sq. km), bordering on the Coastal Landscape Park protected area (Natura 2000).
- The refinery in Gdańsk, located 2 km in a straight line from a protected area, unique on a European scale due to its location on a waterbird migration route (Natura 2000).

During uninterrupted operation, none of the units at the LOTOS Group companies has a major negative impact on the native species. Technical, organizational and systemic solutions have been put in place to ensure that immediate action is taken in the event of a failure involving, for example, an oil spill, in order to control any possible eruption or spill before it reaches the protected areas.

For several years, Grupa LOTOS has been investigating the impact of the Gdańsk refinery, which is its main plant, on biodiversity. As one of environmental protection tasks completed as part of our CSR strategy effective until 2015, in 2014 we carried out a voluntary comprehensive survey of wildlife within the refinery premises and in surrounding areas. The survey report serves as a basis for expanding our knowledge of biodiversity and as a starting point for monitoring sites identified as most valuable nature conservation areas.

Neither the wildlife survey carried out in 2014, nor the initial assessment of the refinery's impact on biodiversity, showed any negative effects of the refinery's operations on the surroundings. No investment projects are planned that could change this status.

Two endangered species included in the IUCN Red List have been identified in the vicinity of the Gdańsk refinery. However, the refinery's operations have been found to have no adverse effect on the protected species living in the surrounding area. Repairs of the CHP plant's chimney stack are carried out so as not to disrupt the breeding cycle of peregrine falcon nesting there.

More information

# Process safety

# Process safety management

The LOTOS Group places a strong focus on ensuring and maintaining a high process safety culture across the organization. The LOTOS Group companies monitor incident rates on an ongoing basis and eliminate all potential threats.

Grupa LOTOS has for many years been following best practices in preserving the integrity of its technical infrastructure. The practices include predictive and preventive maintenance, an inspection and supervisory test programme, non-destructive testing programme, risk-based inspection programme, regular repairs of process units, repair quality control, and a corrosion prevention programme.

**To ensure process safety and thus prevent plant failures and limit their consequences, Grupa LOTOS maintains an Industrial Accident Prevention Programme. In addition, as part of supervision of infrastructure and instrumentation and control systems we apply regulations that define the procedures for:**

- Selection and purchase of plant and equipment as well as instrumentation and control systems;
- Oversight of their operation, planning and execution of inspections and repairs;
- Control and certification of instrumentation and control systems and steps to be taken if any damage to the equipment is identified.

Energobaltic holds periodic preventive inspections with a frequency defined in the technical documentation for particular equipment. The operation and parameters of the equipment are constantly monitored by the company's employees.

At its facilities, LOTOS Infrastruktura has deployed CCTV, tank bottom leak tightness monitoring, tank loading monitoring to prevent overfilling, as well as monitoring of tank outflow trays to prevent soil contamination.

LOTOS Asfalt attaches great importance to identifying potential safety hazards. Its employees responsible for process control undergo training courses, and the company incorporates best engineering practices in its technological and job instruction manuals.

To ensure quick and effective crisis management, LOTOS Oil has introduced an accident and crisis response procedure. The procedure is designed to mitigate the effect of accidents on human health and life as well as the environment, ensure quick and effective management of the organization during an accident and a smooth return to normal operation, and also to limit and minimize loss of LOTOS Oil assets.

LOTOS Petrobaltic holds periodic preventive inspections with a frequency defined in the technical documentation for particular equipment and introduced into the SAP system. This inspection regime facilitates ongoing checks of key system elements and removal of weak links in the units. Platform crews also ensure ongoing supervision of the operating parameters of the units. If the permitted operating limits are exceeded, the system operators take appropriate steps to eliminate pressure overrun.

For the purpose of fire prevention, rules to minimize the risk of accidental fire during work and rest time on platforms have been implemented. For example, one of the rules is that works entailing a potential risk of fire are permitted only upon authorization. Such authorizations are issued in accordance with a special procedure. Smoking is prohibited on platforms and in port facilities, outside of designated areas, and use of open fire is prohibited in all buildings. All rules applicable at the facilities are consolidated in the Safety Policy manual for the organization.

To mitigate risks related to the activities of subcontractors, each subcontractor agreement includes a Safety Annex, binding on all subcontractor representatives working in the port facilities and on the organization's platforms.

## Process safety incidents reported in 2015

In 2015, Grupa LOTOS reported one incident classified as Tier 1 process safety event and two incidents classified as Tier 2 process safety event under Standard RP 754 of the American Petroleum Institute (API). Both events occurred in refining operations and had no environmental impact.

LOTOS Paliwa reported two Tier 2 safety events. The events were related to an LPG installation damage at the company's service stations. The following hazardous situations were also reported: 10 customer car fires at or near service stations, 2 fires, and 2 fuel spills.

All hazardous situations, and the above cases in particular, are reported by the station operators to the LOTOS Paliwa OHS staff. Next, the risk of similar situations occurring in the future and potential requirement for preventive measures are analysed.

In addition, three Tier 2 safety events were also reported at LOTOS Kolej. The events involved railcar and locomotive derailing without any environmental impact.

At LOTOS Kolej, an emergency preparedness and response procedure was put in place. It imposes the requirement to report the type of hazard, the place of incident, threat to human life, materials and objects involved in the accident, and their possible effect. The procedure lays down detailed rules to follow in case of emergency.

# RBI methodology – risk under control

In 2011, Grupa LOTOS was first in Poland to implement the Risk Based Inspection (RBI) methodology, a system for comprehensive management of risk related to the operation of pressure equipment. The system allows us to predict potential equipment failures.

In 2015, we completed an analysis of unit 250 (Hydrogen Generation Unit). Currently, we are analysing risks for 12 key units which, if stopped, may have extremely adverse consequences for the operation of the refinery as a whole.

**Key benefits of full RBI implementation:**

- It results in greater reliability of unit operation;
- The period of uninterrupted operation of the refinery between maintenance shutdowns should extend from 4 to 5 years;
- Accident prevention is a source of savings counted in millions;
- Higher output.

## Why is RBI so important to Grupa LOTOS?

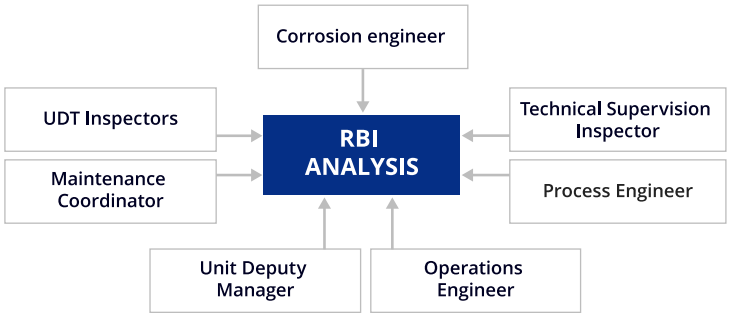
Most of the refinery's plant is pressure equipment: pipelines, columns, reactors, tanks. They are often subject to high pressures and temperatures and exposed to corrosion and erosion. Even though made of resistant metal alloys, their wear and tear is inevitable as time passes. The equipment is overseen by internal services and the Polish Office of Technical Inspection (UDT), which defines its safe operating lives and decides how long the equipment, units and refinery can operate without a maintenance break.

By Implementation of the RBI together with the UDT involves a check of nearly 8,500 pieces of equipment and determining which carry the highest risk of damage. By focusing on particular pieces of equipment we limit the risk of breakdown.

## What are our goals?

2017 will see a maintenance shutdown and our plan is that by that time the RBI methodology should cover as many key units as possible. In this way, during the shutdown we will be able to inspect the instruments and equipment that carry the highest risk of degradation, selected based on an RBI analysis.

## RBI Team




The RBI teams assigned to individual units comprise more than 40 staff. In addition to the team leader – a supervision inspector from Grupa LOTOS, each team includes two or three UDT inspectors, scientists from the Gdańsk University of Technology, corrosion engineers, plant engineering and maintenance engineers, as well as process and operations engineers from the production division.

Our teams include two engineers who are the only engineers in Poland holding certificates issued by the American Petroleum Institute (API).