



LOTOS Group
Integrated Annual Report 2016

04

READINESS TO EMBRACE INNOVATION

Readiness to embrace innovation > Innovation Our approach

Innovation Our approach



THE GLOBAL GOALS
For Sustainable Development



Our approach to innovation:

- Makes innovative projects **an integral part of all investment projects.**
- Seeks synergies between the needs of the company and benefits to the environment, especially to the natural world. The **technologies we use are ahead of the increasingly stringent environmental protection** standards and regulations.
- Is based on the assumption that **there is no single pattern of innovation-driven operations** in the refining industry, therefore each company, including the LOTOS Group, seeks its own way. We do not merely rely on the manufacturer's knowledge but we also **develop proprietary solutions.**
- Takes into account the fact that growth of the refining business requires application of state-of-the-art technologies and systemic solutions in the organisation's structure.
- Results in a regular analysis of new technologies with a view to **improving them to meet refinery's needs.**
- **Uses synergies between various industries.** We collaborate with other businesses in creating innovations.
- Recognises the fact that innovative projects **bolster our competitiveness.** That is why we have assigned strategic importance to their development and implementation and made them a foundation for one of the five objectives in the LOTOS Group's strategy for 2017–2022.

Readiness to embrace innovation > Innovation Our approach > We invest in state-of-the-art technologies

We invest in state-of-the-art technologies

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Deep oil processing technologies

Our innovative projects completed so far focused on developing technologies for manufacturing products which ensure higher margins on the processing of crude oil. However, sales volumes of those products are smaller than our output of fuels and range from a few to a few dozen thousand tonnes per year.

Therefore in 2016, as in the previous year, as part of the EFRA Project we invested in cutting-edge deep oil processing technologies to increase our production of high-quality fuels.

Advantages to be gained by the LOTOS Group following completion of the EFRA Project:

- Our refinery will be able to add heavier (and thus cheaper) crudes from, e.g. Canada or Venezuela, to its feedstock mix.
- They will be processed into the highest quality fuels and coke that will be used in power generation.
- A unique solution will be applied at the DCU (the main component of the EFRA process line), which will make the Gdańsk refinery one of the most environmentally-friendly refineries in the world. An innovative Triplan technology used as part of the EFRA Project will make the DCU – globally considered to be a unit with a harmful impact on the environment - at our refinery a completely enclosed system.
- As early as in 2018 Grupa LOTOS will increase its volumes of high-margin products.

Phasing out unprofitable and environmentally unfriendly products

EFRA The end of heavy fuel oil

The main objective of EFRA is to ensure a more efficient use of heavy residue, which is the heavy end of crude oil now used to make heavy fuel oil or bitumens. When the project works are completed and the new units come on stream, each tonne of heavy residue will be processed into some 700 kg of fuels and 300 kg of coke. As part of the EFRA Project, as of 2018 the LOTOS Group will phase out heavy fuel oil from the production process as it yields negative margin and is not environmentally friendly.

UCOPure – purified oil

The UCOPure project, implemented by Grupa LOTOS in a consortium with Polymemtech Sp. z o.o., focuses on developing a new technology for processing unreacted oil from hydrocracking. **The aim of the project is to develop a new, world-class innovative technology making it possible to earn higher margins** by treating the unreacted oil stream into a product of much higher quality, which will be converted in further stages of the production process into main refinery products such as fuels.

- **UCOPure** is the only technology in the world that employs integrated **filtration** to remove **PAH** – heavy polycyclic aromatic hydrocarbons from unreacted oil from hydrocracking, and involves development and preparation of membranes and filtration systems used in the process.

The project is co-financed by the National Centre for Research and Development under the INNOCHEM sectoral programme. The consortium of Grupa LOTOS and PolymemTech Sp. z o.o. came fifth in the INNOCHEM competition, having scored 20 out of 22 points to be won.

Durable bitumens – MODBIT HiMA

In 2016, LOTOS Asphalt developed and commercialised **highly polymer-modified bitumens** – MODBIT HiMA.

- ➔ Such bitumens are used in the construction and maintenance of roads, airports and other hard surfaces.
- ➔ They are recommended for bitumen-aggregate mixtures used in highly durable layers of perpetual pavements which require > **high resistance to aging** > **resistance to fatigue and low-temperature cracking** > **and resistance to rutting**.
- ➔ The content of SBS 25/55-80, 45/80-80, and 65/105-80 polymers in those bitumens **is more than double that in modified bitumens** typically used in the wearing course of roads.

Readiness to embrace innovation > Innovation Our approach > Investing in efficiency

Investing in efficiency

→ In 2016, a blending online system for blending fuels was introduced at the Gdańsk refinery. The project increased the refinery's output and reduced its energy intensity.

How we reduce the refinery's energy intensity and costs – innovation in 2016

At the LOTOS Group we are consistently investing in technologies reducing energy intensity, which makes our business more environmentally friendly and economically efficient.

New blender – online fuel blending

In 2016, in order to further improve the efficiency of our refinery's production processes we launched a **new innovative blender** for blending gasoline and diesel oil. The project to upgrade and extend the existing unit was designed by the LOTOS Group engineers.

Blender is a system designed to blend fuels **online, i.e. in the pipelines**, which supplements the traditional method where all the components are blended in tanks. Online blending is a **key functionality of a modern and smart refinery**.

Completion of the investment project increased our production efficiency through:

- Diversifying the methods of product blending,
- Facilitating adaptation to changes in the refinery operation,
- Reducing the time for blending a batch by half,
- Reducing the number of re-blends,
- Automating the blending process.

The scope of product quality checks will increase, too.

Readiness to embrace innovation > Creative employee engagement

Creative employee engagement

- In 2016, we tested the employee innovation management system through a pilot edition of the 'Turn an Idea into Reality' competition.
- In 2016 and 2017, 194 innovative projects were submitted in the competition to improve the operating efficiency of various areas in the three companies: LOTOS Asphalt, LOTOS Oil, and LOTOS Petrobaltic.

Innovative employees – the 'Turn an Idea into Reality' competition

The purpose of the competition, launched in 2016, is to creatively engage the employees and use their innovative potential. In 2016 and 2017 (as at July 2017) the competition was entered by LOTOS Asphalt, LOTOS Oil, and LOTOS Petrobaltic employees, who worked on their projects either in teams or individually.

Summary of the projects at the three companies: most of the projects related to improvements in **production (59)**, then **trading (29)**, and finally **logistics (22)**. Most of the projects were submitted by employees of LOTOS Asphalt (77).

The 'Turn an Idea into Reality' competition is based on the following assumptions:

- The submitted projects should be capable of being implemented in the future and should bring measurable economic benefits to the company,
- The competition is run in a transparent manner, its rules are known and clear to all the participants,
- Award-winning improvement projects will be implemented at the LOTOS Group.

Summary of the competition results at individual companies:

Innovative ideas put forward by LOTOS Asphalt employees

In 2016, a pilot edition of the competition was run at LOTOS Asphalt as part of a project to test the innovation management system at the LOTOS Group.

- The competition jury received **77 submissions**, presenting ideas on how to enhance processes in various areas of the organisation. Most of the projects related to **production (19) and logistics (14)**. There were also projects pertaining to the IT (8), administration (7), or HR (6) areas.
- **47 employees**, that is more than **20% of the company's total headcount**, signed up for the competition.

- The winning project, aimed at optimising bitumen production, was **'Improving the Efficiency of Bitumen Modification with Polymers in the Process Units'**. The second place was awarded to the design of an application for road designers and building inspection offices, which can be used for verifying the credibility of trading partners, and the third – to a project entitled 'Bunker Receipt Generated Automatically by the SAP System'.
- The winners were given cash prizes from PLN 3,000 to PLN 10,000. Additionally, eight distinctions were awarded, and each of the distinguished participants received PLN 1,000.

Innovative ideas put forward by LOTOS Oil employees

- The competition jury received **69 innovative projects**, including 52 individual and 17 team submissions.
- The competition was entered by 43 LOTOS Oil employees (33 men and 10 women, representing **over 15% of the company's total workforce**), of whom 25 work in Czechowice and 14 in Gdańsk.
- The winning project was **'Manufacturing and Sale of Process Oils'**. It envisages manufacturing of process oils from raw materials available at the LOTOS Group. The oils will be used in rubber and tyre manufacturing and in related industries. The second place was awarded to a project related to the trade area, and the third – to a project from the logistics area, entitled 'Flexes to the Tracks'.

Innovative ideas put forward by LOTOS Petrobaltic and SPV Baltic employees

- The competition was held at the company in the first half of 2017. **48 projects were submitted in total**, including 40 from individuals, and 8 from teams.
- The competition was entered by a total of **35 employees of LOTOS Petrobaltic** (9 women and 26 men), which represents almost **9% of the LOTOS Petrobaltic Group's** entire workforce.
- The winning individual project was **'Purchase and Installation of a Container Steam Boiler House Adapted to Be Fed with Separated Gas from the B8 Field'**. The second place was won by a project entitled 'Use of Gasoline Separator to Separate Natural Gasoline from Gas Burnt in Outboard Flares', and the third by 'Migration and Integration of Platform Warehouses and Deposits from the Onshore Base to the SAP System'. The winners were given cash prizes.
- **All the award-winning projects will be implemented and will bring measurable economic benefits to the companies.**

Company name	Number of projects	Active innovators as % of workforce
LOTOS Asfalt	77	19,5
LOTOS Oil	69	14,7
LOTOS Petrobaltic	48	9
Areas		
Trade	29	
Refining	57	
Exploration	2	

Company name	Number of projects	Active innovators as % of workforce
Drilling	2	
Logistics	22	
Finance	3	
IT	15	
Administration	16	
Marketing	11	
HR	10	
Other*	27	

* OHS, training/certifications, development, procurement, employee integration, business practices and public relations, work organisation, communication.

Readiness to embrace innovation > Trading and other partners

Trading and other partners

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In 2016, we implemented projects extending beyond the refining business, working with research centres, the manufacturing industry and local governments. We actively seek partnerships that allow us to build innovation and technological advantage over competitors.

Smart specialisation partnerships

LOTOS Group companies are active participants in two out of four research and development areas of the **Pomerania Smart Specialisation (ISP) project**.

- Grupa LOTOS, LOTOS Lab, LOTOS Asphalt, LOTOS Oil and LOTOS Petrobaltic have been included in the 'Eco-Efficient Technologies for the Production, Transmission, Distribution and Consumption of Fuels and Energy and for Construction' area or **ISP3**.
- In parallel, LOTOS Petrobaltic participates in 'Offshore, Port and Logistics Technologies' or **ISP1**, which covers floating and stationary structural components of offshore wind farms and **production platforms**, unmanned marine, land and air vehicles for monitoring and inspection of offshore facilities, as well as systems for **removal of petroleum contamination from water and environmental monitoring systems**.

> What **Smart Specialisation** means in practice is that public funds within the EU will be spent to unlock and harness the potential of the areas (**like Pomerania**) and sectors (**like extractive industries**) which stand out in a given region in terms of **significant potential for rapid growth** and international expansion.

The ISP programme assumes that its participating projects, which now include the research initiatives of LOTOS Group companies, will have **easier access to funding** under the 2014–2020 Regional Operational Programme for the Gdańsk region, Smart Growth Operational Programme, and HORIZON 2020. Thanks to involvement in the ISP project, we established **collaborative relationships with the Marshal Office of the Gdańsk region and the academic community**.

We support start-ups – working with start-up incubators

Our subsidiary LOTOS Paliwa has teamed up with the Academic Business Incubators to support new business ventures. The initiative helps new businesses to reduce operating costs.

Our partner start-ups are offered **lower fuel prices** and discounts on products and services purchased at LOTOS service stations. Last year **2,200 early stage companies housed in 50 incubators** were given attractive fuel discounts. By forging relationships with businesses at an early stage, we lay the foundations for long-term collaboration.

A special edition of the LOTOS Biznes fleet card for businesses participating in the Academic Business Incubators programme provides them with an option to continue the business relationship with us and use fuel discounts even after they leave the incubator. Micro-enterprises and small businesses are an increasingly important customer group at our service stations.

DIRECTION: THE FUTURE – OUR RESEARCH PROJECTS

Readiness to embrace innovation > Direction: the future – our research projects >
LOTOS here and now – hydrogen, CNG/LNG

LOTOS here and now – hydrogen, CNG/LNG

New LNG reloading terminal on the TEN-T map

At the LOTOS Group we deliver projects co-funded by the EU that enable us to develop and implement innovative technologies and logistics solutions. One of them is **a project to construct a small-scale LNG terminal in Gdańsk** to operate as a local hub for transshipment, bunkering and distribution of LNG to end users and service stations.

The feasibility study of the project was awarded EU funding in the CEF-Synergy competition.

The initiative is related to the project to expand reload capacity at the LNG terminal **in Świnoujście** from 5 bcm to 7.5 bcm of LNG annually. The LNG hub in Gdańsk, combined with the capacity of the Świnoujście terminal, **will enable development of the local LNG market in Poland.**

The LNG hub in the Port of Gdańsk will bring the following benefits:

- It will provide infrastructure to use LNG as a marine fuel at TEN-T ports in Gdańsk, Gdynia and Sopot,

> TEN-T stands for the **Trans-European Transport Network** and ensures interconnectivity of infrastructure projects across the EU. It is the backbone for transport in Europe on which the EU will focus to enhance cross-border connections, **fill missing links and remove bottlenecks.**

- It will prompt construction of local LNG storage infrastructure enabling LNG to be used as an energy source (in refineries or ships moored in ports) or as fuel for marine and land transport **along the TEN-T Baltic Sea-Adriatic Sea corridor,**
- It provides an option to connect LNG storage facilities to the high-pressure gas network of the LOTOS refinery,
- It will prompt construction of infrastructure for distribution of LNG to heat and power plants in **regions unserved by the gas pipeline network in north-eastern Poland.**

Hydrogen as an energy source – HESTOR

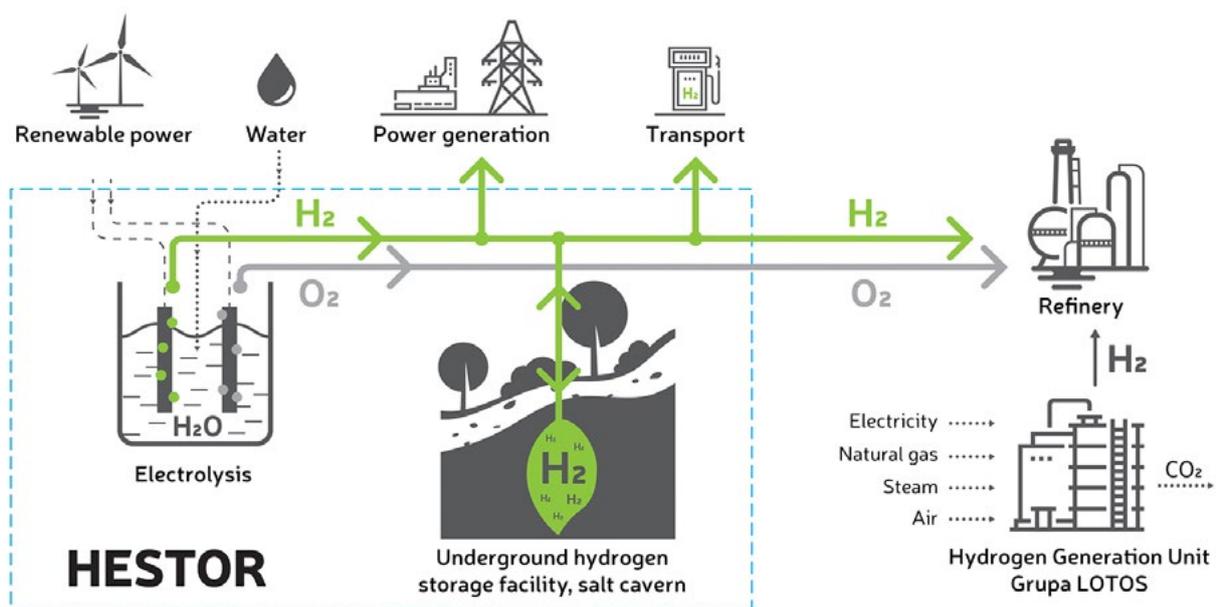
→ At the LOTOS Group we are analysing the efficiency of storing hydrogen obtained from surplus renewable energy.

The research project combines environmental protection with innovation and aims to **develop a technology for storing hydrogen as an energy carrier**. Grupa LOTOS is the leader of the project consortium comprising AGH University of Science and Technology in Kraków, Silesian University of Technology, Warsaw University of Technology, CHEMKOP and GAZ-SYSTEM.

The purpose of the project is to **investigate the efficiency of salt-cavern storage** of hydrogen produced from excess wind and solar power through electrolysis. Hydrogen obtained in this way could be used in technological processes at the **refinery** and for electricity generation in gas turbines. If successful, the project could lead to a substantial reduction in CO₂ emissions.

> The central element of HESTOR is generation of **hydrogen from excess renewable energy** and directing it to refining processes or for storage in salt caverns.

> One of the scenarios contemplated by the HESTOR project is using hydrogen to **power fuel cell vehicles in urban agglomerations**, including public transport vehicles, at hydrogen compression and refuelling stations, to cut exhaust emission levels in cities.



The HESTOR project, or underground caverns for storing surplus electricity in the form of hydrogen, will deliver the following environmental benefits over ten to twenty years:

- Solution for storing and recovering surplus energy in an environmentally-friendly way with no additional emissions generated, as hydrogen is the cleanest energy carrier,
- Environmental safety of underground energy storage facilities, similar to that of existing underground gas, oil and fuel storage facilities,
- Higher efficiency and environmental safety of underground storage relative to hydro power plants,
- Better use (in technical and economic terms) of periodic energy excess from power plants and combined heat and power plants, resulting in a substantial reduction of CO₂ emissions,
- Easier integration of large wind and solar farms into the power system,
- Reduced combustion of conventional fossil fuels,
- Advancement of fuel cell vehicles and reduction of exhaust emissions,
- Possibility of utilising carbon dioxide by using hydrogen in methane production.

[Readiness to embrace innovation](#) > [Direction: the future – our research projects](#) >
 LOTOS Energy Hub – modern refuelling

LOTOS Energy Hub – modern refuelling

Our concept of LOTOS Energy Hub is an extension of the HESTOR project and the new LNG hub in the Port of Gdańsk. The project envisages the rollout of modern multi-energy service stations **that would enable the refuelling of vehicles** with conventional and alternative fuels **like LNG, CNG, hydrogen and electric energy**.

More information

[Directors' Report on the operations of Grupa LOTOS S.A. and the LOTOS Group in 2016](#)

Chapter 2.2. Status of key development projects in 2016 (in terms of subtitle „Innovation and development projects”)