PETROCHEMICALS

KMG will be strongly involved in developing Kazakhstan's petrochemical industry with support from the government, which is expected to significantly boost the national economy as growth in the petrochemical sector will have a multiplier effect on the entire domestic market.

Polypropylene

KPI Inc.

Kazakhstan Petrochemical Industries Inc. Limited Liability Partnership (KPI) is the operator of Phase I of the first integrated gas chemical complex project in the Atyrau Region. Established in 2008, the Partnership is a member of the National Industrial Petrochemical Technopark, a special economic zone where the project is being implemented. The Partnership's abbreviated name is KPI Inc.

Project participants: National Company KazMunayGas with 49.5%; Samruk-Kazyna Ondeu with 49.5% (the sole member of Samruk-Kazyna Ondeu is Sovereign Wealth Fund Samruk-Kazyna. Samruk-Kazyna Ondeu was established to carry out the commission of the President of the Republic of Kazakhstan to implement projects in the chemical industry); Firm Almex Plus with 1% (a private investor, member of a major Kazakhstani holding group, Holding Group ALMEX).

In July 2018, KMG accepted the trust over KPI Inc. for the construction of a polypropylene complex in order to manage this investment project, given KMG's experience and expertise in the construction of large-scale projects.

On 13 June 2022, KMG acquired 49.5% of KPI Inc. as part of its strategic goal to diversify its business and expand its product portfolio, and, in particular, develop petrochemical projects which will be one of the key drivers for the Company in the future.

In November 2022, Samruk-Kazyna and SIBUR Holding entered into an agreement with conditions precedent on the acquisition of 40% in the capital of KPI Inc. The conditions precedent include infrastructure conclusions, marketing conditions and permits. It is expected that suspensive conditions will be fulfilled during 2023.

KPI polypropylene production was officially launched in November 2022 as part of Phase I of the integrated gas chemical complex construction project in the Atyrau Region. The facility has an annual capacity of 500 thous. tonnes of polypropylene, which is used as feedstock in mechanical engineering, medicine and electrical engineering, production of packaging materials, containers, fibre, pipes and fittings for hot water supply, office equipment, consumer electronics, consumer goods, outdoor and office furniture. Shipment of polypropylene is already underway.

KPI's project relies on modern technology, enabling the company to move ever closer to full digitalisation. Specialised IT solutions and corporate accounting systems will make it possible to keep highly accurate records – from the planning of operations to the sale of finished products to end customers.

The plant meets all environmental regulations. It takes in propane free of harmful impurities to turn it into propylene and then polypropylene all through the production chain. The processes are designed in a way that removes the possibility of harmful substances such as hydrogen sulphide, sulphur dioxide and aromatic hydrocarbons being produced.

The facility is sustainable in terms of water consumption, as it uses a circular water system to supply water to its processes. It is integrated with Karabatan Utility Solutions' water treatment facilities, which makes it possible to reduce water consumption through recycling and reusing of almost all wastewater.

Key objectives of KMG's petrochemical projects:

- **build the first gas chemical complex and establish a petrochemical cluster in the Republic of Kazakhstan;**
- **use the available large volumes of gas for the petrochemical complex;**
- **manufacture export-oriented products with high added value;**
- **produce polymers to diversify industry sectors.**

History of the Company

In 2018, the EPC contractor, China National Chemical Engineering Co. (PRC), was determined and debt financing (USD 2 bln from China Development Bank for 20 years at 5.8% per annum) was raised. On 28 June of the same year, the project was transferred to KazMunayGas for trust management. In July, the master plan was approved and 30% of the project 3D model was completed.

On 28 August, an order for the manufacture of a propane-propylene splitter – the biggest column (height – 105 m, diameter – 8.4 m, weight – 1,100 tonnes) – was placed with Atyrauneftemash. On 5 December, the first phase of the construction camp was completed, and the staff of the Client and the Contractor moved to Karabatan. On 25 December, the installation of 18,124 driven piles was completed for 45 facilities.

In January 2019, 60% of the plant's 3D model was completed. On 26 April 2019, Beijing hosted a reporting meeting on the integrated gas chemical complex construction project in the Atyrau Region (Phase 1 – polypropylene production) with the

participation of the management of KazMunayGas, KPI Inc., and the management of China National Chemical Engineering, Co. (CNCEC). At their bilateral meetings, KMG and CNCEC noted the measures taken by the companies. In turn, CNCEC engaged Kazakh companies in construction, ordered equipment and metal structures from Kazakhstani manufacturers and contributed to organising the Local Content Forum for the project.

On 8 October 2019, Kazakhstan Petrochemical Industries and Air Liquide signed a dry compressed air and nitrogen supply and purchase agreement. According to the agreement, a modern and fully automated technical gas plant will be built. This, in turn, will ensure uninterrupted operation of production facilities of Kazakhstan Petrochemical Industries and the production of polypropylene, a petrochemical with high added value.

Transportation and installation of equipment

2019–2022 saw a most complex phase of delivering oversized and special cargo. The first equipment of the kind with a long lead time, three polymerisation reactors each weighing 97 tonnes, was delivered on 20 November 2019. The reactors for the polypropylene polymerisation unit were manufactured by COEK ENGINEERING N.V. in Belgium, shipped by sea from the port of Antwerp on 18 October 2019, and delivered in a very short time via the Baltic Sea and then through the Volga-Baltic Waterway to the Caspian port of Aktau.

On 27 January 2020, the largest item of industrial equipment was assembled – propane-propylene splitter column with a mass of over 1.100 tonnes, a height of 105 m, a diameter of more than 8 m, and a volume of 5.132 m3. It was made by Atyrauneftemash in Atyrau. The equipment was lifted by a 3.200-tonne hydraulic gantry and a 750-tonne auxiliary crawler crane.

On 6 March, M/S NOWOWIEJSKI was loaded with critical large-sized equipment made in South Korea – eight Catofin dehydrogenation reactors (manufactured by WOOYANG), four propane storage tanks (manufactured by GS Entec), five pressure vessels and heat exchangers (manufactured by GS Entec). The vessel made its way from the Port of Ulsan to Constanța, Romania, to reload the equipment onto offshore barges. In January and February 2021, seven convoys of oversized equipment arrived from the KCOI port (Mangistau Region) at the construction site. The following critical equipment was delivered: ethylene and propylene compressors (MAN, Germany), reaction gas compressor (Mitsubishi, Japan), waste heat boiler components (Hamon, China), extruder components (Coperion, Germany), regeneration air heater vessel (Zeeco, India), pressure vessels (KNM, China).

In September 2021, preparatory work for the pre-commissioning of the technical gas system was completed, including testing of the main drinking water supply manifold and drinking water intake at the Complex's drinking water station; individual testing of electrical and dynamic equipment (pumps) at the Complex's off-site facilities.

On 27 December, the new facility received its first batch of propane from Tengiz. In November, it received nitrogen and dry compressed air. In the summer, the Company electrified the main step-down substation and later took pre-desalinated, demineralised and process water from Karabatan Utility Solutions. The plant thus received all energy resources required for commissioning and subsequent start-up.

In December 2021, 100% of metal structures required for the project were delivered to the site.

On 1 April 2022, a gas compressor turbine was launched at the gas chemical complex for polypropylene production in the Atyrau Region. This was one of the most important stages in the commissioning of the facility.

On 27 April, a testing laboratory of SGS, a multinational company, was opened at KPI's integrated gas chemical complex under construction in the Atyrau Region.

On 10 July 2022, the plant started feeding propane to the process units. The Company then proceeded to the second phase of commissioning – loading the catalyst into propane dehydrogenation reactors.

Plant highlights

A capacity of 500 thous. tonnes of polypropylene per year represents:
- about 1% of global polypropylene production;
- 26.3% of total polypropylene production in the Russian Federation;
- more than total polypropylene production in Turkmenistan, Uzbekistan, and Azerbaijan.

Feedstock: propane from the Tengiz field, free of harmful impurities, thus minimising the environmental impact.

Technologies used: Catofin (propane dehydrogenation) and Novolen (propylene polymerisation) technologies by Lummus Technology Inc.

- Similar complexes have been built in five countries (Saudi Arabia, USA, Belgium, South Korea, and China).
- 77% of equipment was manufactured in Europe, the USA, South Korea, Japan, and India.

Project cost: total project cost – USD 2,630 mln, including EPC contract – USD 1,865 mln.

Funding: USD 2 bln (loan from China Development Bank, PRC).

New jobs:
- during construction (temporary) – over 4,300;
- during operation (permanent) – 1,100.
- General contractor: China National Chemical Engineering Co. (CNCEC, PRC).

Effect of the project:
- covering Kazakhstan's domestic demand (import substitution) for polypropylene (Kazakhstan market capacity is about 50 thous. tonnes per year);
- opportunities for SMEs to make higher value-added products from polypropylene for the construction, medical, automotive, food processing, textile industries, etc.;
- new jobs in SMEs and related industries;
- the contribution to the country's GDP will be up to 1%.

Current status

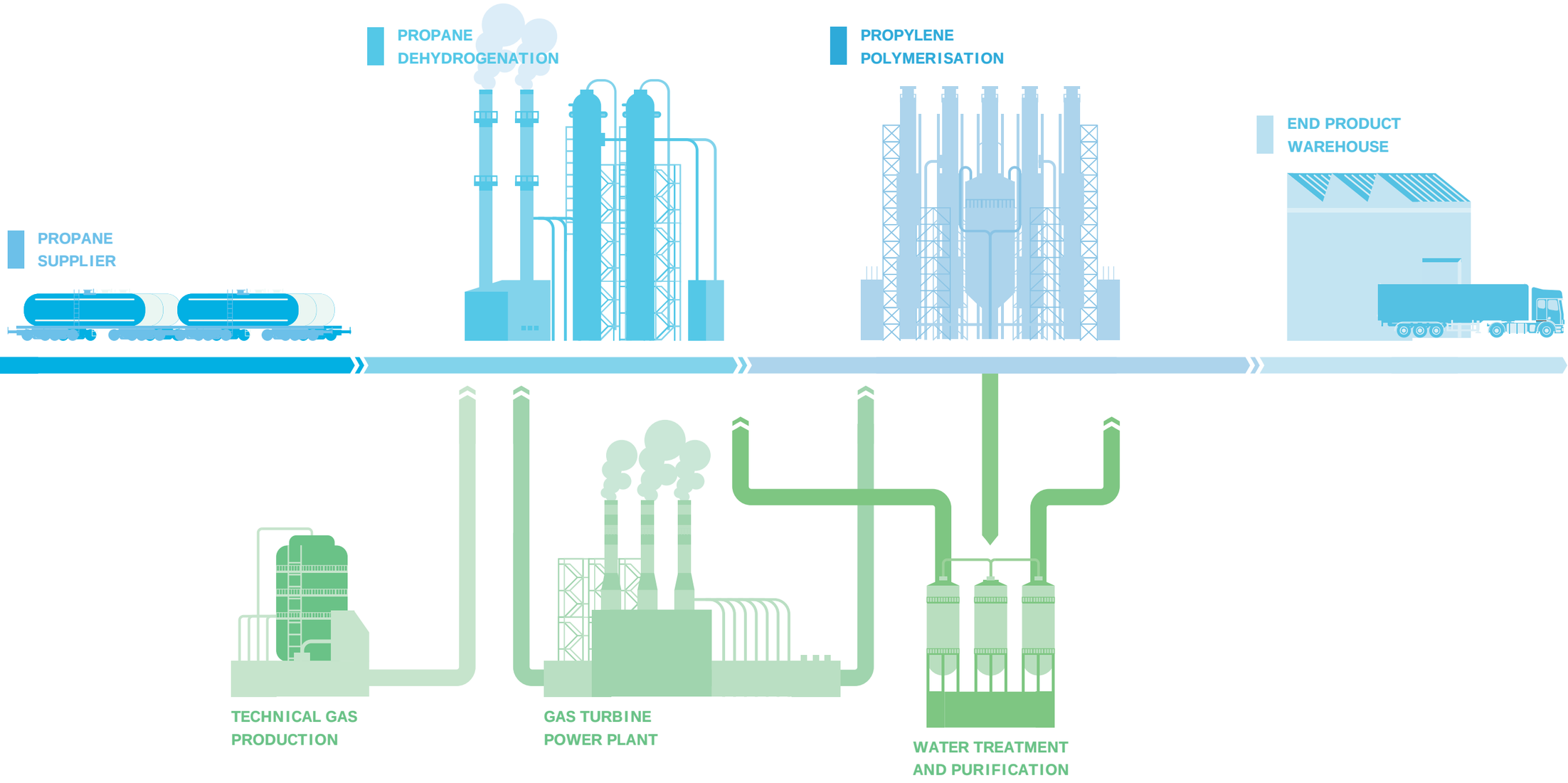
Currently, the overall progress of the project is 99.74%. Construction and installation have been completed, and off-site facilities, propane loading rack and propane storage park have been put into operation. Commissioning works are underway. The commissioning and start-up of the plant with the first batch of polypropylene is scheduled to be completed in November 2023.

2022 results

- On 8 November 2022, production facilities of the gas chemical complex were put into operation.
- On 7 November 2022, Samruk-Kazyna, KMG, and SIBUR signed binding documents providing for SIBUR's joining the polypropylene plant and polyethylene projects.
- In 2022, 32.3 thous. tonnes of polypropylene was manufactured.
- KPI Inc. together with the contractor, CNCEC, and the licensor, Lummus Technology, conducts comprehensive testing of process equipment/units to bring the whole complex to stable process parameters and identify bottlenecks in the operation of process units, as well as carries out performance guarantee tests to verify that the design parameters have been reached.

Expected deliverables

- creation of a petrochemical cluster in the Republic of Kazakhstan for the production of petrochemical products using feedstock from the Tengiz field;
- manufacture of export-oriented products with high added value, with polypropylene production to reach 514 thous. tonnes in 2023;
- production of polymers to diversify national industry sectors;
- headcount at KPI Inc. totals 628 employees.



PLANT OPERATION

Polyethylene

As part of Phase II of the integrated petrochemical complex construction, on 7 November 2022 KMG and SIBUR signed binding documents for joining the Polyethylene (PE) project. The move was in line with KMG's strategy to join forces with a strategic partner which is among Top 5 polymer companies in the world and has a strong track record of successfully delivering large-scale projects. Silleno, the project operator, is carrying out the transition to the FEED stage. The project's annual design capacity is 1,250,000 tonnes of polyethylene. The project is expected to be completed in 2028.

It will be required to supply feedstock (ethane) to the PE project. To this end, negotiations are ongoing with Tengizchevroil to consider building a gas separation unit with a capacity of 9.7 bln m^3 (the GSU) to create infrastructure for extracting ethane from dry gas. Preferential government funding for the GSU is also being worked out.

The PE project is implemented as part of the National Project «Sustainable economic growth aimed at improving the welfare of Kazakhstanis» and meets KMG's long-term strategic goals, which include improvement of

the value chain efficiency, business diversification and expansion of the hydrocarbon product portfolio.

One of the main objectives for KMG and the entire oil and gas industry in Kazakhstan is the processing and commercialisation of re-injected associated gas, especially at the major oil and gas projects (Tengiz, Kashagan and Karachaganak). A number of projects in this field are underway in Kazakhstan, including the processing of propane (polypropylene production), ethane (polyethylene production) and butane (butadiene production) from the Tengiz field, as well as construction of gas processing facilities at the Kashagan field.

In addition to its advantageous location close to the feedstock production facility, the key competitive advantages of the PE project include:

1. high ethane fraction content (up to 14%) in the feedstock;
2. attractive cost of feedstock;
3. lower infrastructure costs, as they are split among several projects;
4. advantageous location and access to main markets;
5. accumulated KMG experience and expertise in implementing large-scale projects of refining facilities upgrade and construction.

Polyethylene and ethylene copolymers serve as the basis for a wide range of products widely used in the national economy: gas, hot and cold liquid pipes, fittings, films of all grades (food, packaging, bags, etc.), fibres, non-woven materials, monofilaments, film threads, packaging materials, technical, household and medical items, food contact materials, toys, etc., for the manufacture of various containers of large and small size, pallets, crates, etc.

Granulated polyethylene is a non-hazardous non-toxic product. It does not produce toxic emissions at room temperature and is not harmful to human health if in contact with skin. No special precautions are required for working with it. However, small polymer dust when breathed in and entering the lungs can cause sluggish fibrotic changes in the lungs. Due to its low conductivity, polyethylene can generate static electric charges.

When in a stable state, polyethylene is not harmful to the environment as it does not form toxic compounds at ambient temperature when exposed to atmosphere or wastewater where other substances or factors are present. Polyethylene and the additives it contains are known to cause no damage to the ozone layer.

The Company plans to supply finished products to both domestic and international markets. The capacity of Kazakhstan's domestic market is estimated at about 180.000 tonnes of polyethylene per year, with an expected annual growth rate of 4% on average. Target export markets include the CIS, China, Turkey, and Europe, where the consumption of polyethylene, including imported one, is also expected to go up. Located at the crossroads of transport corridors connecting Asia and Europe, Kazakhstan has a favourable trade, economic and strategic position.

To date, a feasibility study for the PE project has been prepared to international standards, with design and estimate documentation expected to be developed this year.

The Company has entered into licence agreements with Chevron Phillips Chemical and Univation Technologies, global leaders in this field, to use MarTECH® ADL and UNIPOL™ PE Process for manufacturing a wide range of products, including premium high-density polyethylene which is in consistently high demand worldwide.

Given its technical complexity, high capital intensity and a number of other factors, the PE project is planned to be implemented in partnership with other industry players, creating positive synergies for all its participants.

The pattern of the PE project financing is under development and involves a combination of borrowings and the Company's own funds.

The PE project is at an early stage and the final investment decision on it will take into account all objective factors, including payback and economic feasibility. To assess economic feasibility, KMG has minimum return and payback requirements for investment projects.

The PE project has significant social and economic benefits for the country as it will help maintain social stability in the region and create new jobs. In particular, about 8.000 jobs will be created during the construction and 875 permanent jobs – during the operation. The project is estimated to contribute 1.2% to the national GDP.

If approved, the PE project will improve the efficiency and diversification of the Company's business, as well as the competitiveness of the country's economy as a whole due to the production of advanced and high-margin products.

SERVICE PROJECTS

KMG coordinates service projects by maintaining current production levels, implementing new projects, and improving competitiveness as well as takes into account its leading role in maintaining social stability in the regions of its footprint. It should be noted that oilfield services are a socially sensitive sector. As some oilfield services are unprofitable, this inevitably leads to extra costs resulting from the need to retain employees regardless of current operational needs and meet all obligations under the collective bargaining agreement: benefits, medical insurance premiums, and upskilling costs.