Special Feature

MOL Opens Up a New Sea Route for LNG Trade
—Joining the Yamal LNG Project

The Yamal LNG is a project that ambitiously makes use of the world’s first Arc7 class ice-breaking LNG carriers to transport liquified natural gas (LNG) from the plant in Russia’s Yamal Peninsula to markets around the world. The project continues to run smoothly, with our first of three vessels having been in operation over a year since March 2018, and the second one since October of the same year.

This section will describe the MOL Group’s bold venture into unknown territory, namely, entering the Northern Sea Route for LNG transport.

Due to growing concern over global warming, more emphasis is being placed on natural gas as a source of clean energy. As a result, worldwide demand for LNG is on the rise. Although roughly 30% of the world’s undiscovered natural gas reserves are said to be beneath the Arctic Circle, the lack of proper means of transport has limited the full use of these resources. The Yamal LNG project became the first one to break through this situation.

The Yamal LNG project is a large-scale LNG production and export project jointly owned by Russia-based Novatek, France-based Total, and China-based China National Petroleum Corporation (CNPC). The project, which began operations in December 2017, enabled year-round LNG transport from Russia’s Yamal Peninsula to markets around the world by utilizing the world’s first Arc7 class ice-breaking LNG carriers. Leveraging our expertise of LNG carriers garnered from years of experience, we signed a long-term charter contracts for three Arc7 class ice-breaking LNG carriers and four conventional-type LNG carriers, and are now responsible for part of the overseas shipping for the project.

Ice-breaking and ice-resistant carriers are assigned an “ice class” based on their ice-breaking capabilities and degree of ice resistance as determined by hull strength and onboard equipment. There are nine classes determined by the Russian Maritime Register of Shipping: Ice1 to Ice3 and Arc4 to Arc9, with higher numbers denoting higher ice-breaking capabilities and a higher degree of ice resistance.

The Yamal LNG Project

The most defining characteristic of the marine transport aspect of the Yamal LNG project is the use of Arc7 class ice-breaking carriers to open up the Northern Sea Route for LNG transport. High-spec ice-breaking carriers made it possible to pass through thick-ice eastbound sea routes in the summer, in addition to year-round use of the westbound sea routes where the ice is relatively thin. Most importantly, transport to East Asia, which requires 35 days going westbound through Europe and the Suez Canal, is now possible in a considerably shorter time period of about 10 days by navigating eastbound. Establishment of the Northern Sea Route for LNG transport has major merits, including a significant reduction in CO2 emissions and lower transport costs, both a result of the shorter passage.

The LNG Transport Route from Yamal

Potentiality of the Arctic

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LNG production capacity of Yamal and other Novatek-related LNG projects

<table>
<thead>
<tr>
<th>Year</th>
<th>Volume</th>
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<tbody>
<tr>
<td>2017</td>
<td>5.5 million tons</td>
</tr>
<tr>
<td>2018</td>
<td>16.5 million tons</td>
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<tr>
<td>2019</td>
<td>18.0 million tons</td>
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Yamal LNG Project

<table>
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<tr>
<th>Operator</th>
<th>Yamal LNG</th>
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<tbody>
<tr>
<td>Production volume</td>
<td>17.4 million tons/year (3 trains of 5.5 million tons plus 2 trains of 0.9 tons)</td>
</tr>
<tr>
<td>Transport</td>
<td>Ice-breaking LNG carriers (Ice class Arc7): 15 (including three co-owned by MOL and China COSCO Shipping)</td>
</tr>
<tr>
<td></td>
<td>Conventional-type LNG carriers: 11 (including four co-owned by MOL and China COSCO Shipping)</td>
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MOL REPORT 2019
Entering the Unchallenged Route

The Yamal Peninsula, which means “the end of the world” in the local language, is an extrememly cold land with air temperatures reaching -40°C in winter. The key issue was how to facilitate year-round transport of LNG from this place closed off by permafrost to Asia and Europe.

The revolutionary project that solved this crucial issue really began picking up steam in 2011. In 2013, Novatek, Total, and CNPC learned up to materialize the plan of exporting LNG from a base at Sabetta port in the Eastern Yamal Peninsula. They called out for international marine transport companies who were willing to take part in the project. Due to the staggering amount of technical difficulty compounded by the political risks attached to the project, some companies were hesitant to be involved, but we, based on risk assessments honed over many years of business, judged that it was manageable. Ultimately, it was determined that a joint venture of MOL and China COSCO Shipping would own and operate three out of the 15 ice-breaking LNG carriers committed to the project, and accordingly shipbuilding orders for these ships were placed with Daewoo Shipbuilding & Marine Engineering Co., Ltd in 2014. Out of all the marine transport companies in Japan, we were the only one participating in this project.

Overcoming Obstacles with Comprehensive Strength from Years of Experience

We faced a variety of obstacles in executing this unprecedented project, such as construction of special ships, training of the crew, and financing. For the ship construction, this project required the world’s first LNG carriers capable of breaking through ice up to 2.1-meters thick on its own, without the assistance of a separate ice-breaking ship.

Crew training was another issue. Navigation through polar waters requires compliance with the Polar Code,* which includes requisite training for crew members. At that time, none of our seafarers had polar sailing experience. Training, therefore, required a different funding structure than we initially planned. However, we were able to achieve it by utilizing our deep well of financing experience across a range of projects. It was our experience, expertise in shipbuilding partnerships, accumulated throughout many years of taking on challenges, that enabled us to overcome these various obstacles. Without a doubt, the success in this project was the fruit of our comprehensive capability as a Marine Transport Company.

In December 2017, construction of our first ship was completed. The ship was christened the VLADIMIR RUSANOV, after the early 20th century Russian Arctic explorer and geologist. With the same trailblazing energy of its namesake, the VLADIMIR RUSANOV began operation in the Arctic Ocean in March 2018.*

Applying Accumulated Expertise to Bigger Challenges

Since the beginning of operation over one year ago, the VLADIMIR RUSANOV has been keeping good working order with no major trouble, and has been accumulating new accomplishments. Further progress is on the horizon, with the VLADIMIR RUSANOV completing its first loading operation at Sabetta port and conducting extensive training for the crew. At the Makarov Training Centre and Sovcomflot Training Centre in St. Petersburg, Russia, our crews acquired the necessary knowledge for ice navigation, including the characteristics of ice, and usage of ice charts. In addition, we completed a practical training program for ice navigator maneuvers utilizing simulators at these facilities.

Special Specifications for the Ships

One important feature of the ice-breaking LNG carriers is the double-acting ice-breaking system,* typically, the ship will navigate ahead through open water and thin ice, but when facing thick ice, it will turn 90° using the double-acting ice-breaking system and proceed astern. By going astern, it can navigate through thicker ice up to 2.1 meters, up to 1.5 meters with the bow ahead, because the stern is heavier and its shape is better suited for breaking ice. This is the first time that this technology has been adopted in an LNG carrier, and it plays an important role in the safe operation of the ship.

Specialized Training for Navigating the Northern Sea Route

The Polar Code, a set of international standards for shipping in polar regions, is in place to ensure ship safety and environmental conservation. As we placed the highest priority on safety measures for our ship crew, we gave training to a broader range of crew members, not just the ones required by the code. Below are a few examples of such training.

On-Land Training for Icy Waters

At the Makarov Training Centre and Sovcomflot Training Centre in Saint Petersburg, Russia, our crew members acquire essential knowledge for ice navigation, including the characteristics of ice, and usage of ice charts. In addition, we completed a practical training program for ice navigator maneuvers utilizing simulators at these facilities.

At-Sea Training for Icy Waters

The Polar Code requires that captains and first officers have a minimum of two months of experience aboard a vessel operating in a polar region. We managed to meet this requirement thanks to the cooperation from other companies. Our captains and first officers were given the opportunity to board ships transporting modules and materials for construction of the LNG plant in Sabetta of the Yamal LNG project, which were operated by two Dutch module ship and heavy carrier operating companies, and also atomic ice-breaking ships operated by Russian State shipping company Atomflot.
I am very proud that we are making important milestones in the Yamal LNG project, which is the very first to transport LNG from the Arctic Circle to the rest of the world. I strongly believe that this project has major social significance in a sense that it made year-round transport of the previously difficult-to-access natural gas locked in the Arctic Circle possible and that use of the eastbound Northern Sea Route greatly reduced transit time and the amount of CO2 emissions. One of the key reasons why we got selected for the project was our experience and performance as a marine transport company boasting the world’s largest fleet of LNG carriers with a track record of safe operations. I like feel our attitude to actively having taken part in new overseas projects and the fact of having built mutual trust-based relationships with worldwide partners were taken positively.

To take on this new challenge, there were initially some concerns over the risks within the Company. However, we conducted independent risk assessments on the Northern Sea Route, identified each risk from every aspect including safety, financial, and political factors, and thus established fully thought-out countermeasures for each risk. We were able to participate in this project because we finally had everyone on the same page after communicating closely with those within the Company who were skeptical, explaining the feasibility of the project properly and carefully, and earning their understanding.

Be that as it may, as one would expect with an unprecedented project like this one, we faced considerable difficulties along the way. However, with any issue we faced, we were able to eventually overcome it by utilizing our accumulated knowledge and sometimes leveraging our networks of outside partners. As an example, we had previous experience working as partners with China COSCO Shipping, our joint venture partner in this project, and with Daewoo Shipyards & Marine Engineering, the company responsible for shipbuilding. These existing trust-based relationships were a major help in moving the project forward. As another example, we were able to leverage our Group connections and received cooperation from outside companies to secure opportunities for our crews required special training for the Northern Sea Route operations. Execution of an LNG transport project requires all aspects of a marine transport company, including risk assessment before participation, negotiations until concluding the charter contract, supervision of shipbuilding, financing, post-construction ship management, and safe operation of the ship. Accomplishing this project, despite many issues we had to overcome, is truly the result of the comprehensive strength we have fostered up to this point. Fortunately, our first ship, the VLADIMIR RUSANOV, has been running well without any major issues. In addition, our second ship began operation last year and our third will be delivered this summer. Operating the world’s first ice-breaking LNG carrier gives us a feeling that we are making history at this very moment. The project is off to an amazing start, but it is just the start. With the utmost care and attention, we will strive for safe navigation and work to create a presence in the Northern Sea Route to be recognized as the top player.

Robert O Valentine
Master / VLADIMIR RUSANOV

The success of the voyage is the direct result of the hard work and efforts of all crew members involved. Over its first year, the VLADIMIR RUSANOV provided service eastward sailing to Asia, and ship-to-ship LNG Transfer operation, we occasionally faced extreme bad weather and ocean conditions. However, thanks to our well-trained crew members who came to fulfill their duties and the well-designed special equipment onboard such as ice radar, we managed to overcome these challenges. Overall, these voyages were extremely meaningful experience in which we were able to utilize and confirm the effectiveness of our training and the project functionality of the equipment onboard the vessel.

In closing, I am extremely proud of the fact that I was able to fulfill my duties as a member of this exceptionally challenging and groundbreaking project. The success of the voyage is the direct result of the hard work and efforts of all crew members involved.

Yuta Orito
Coordinator, LNG Carrier Project Team
Technical Division, Technology Innovation Unit
Mitsui O.S.K. Lines, Ltd.

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This Groundbreaking Project Would Not Have Succeeded without the Hard Work of All Its Crew Members.”

“The Project progressed smoothly because we dealt with problems before they appeared.”

Stories from Key Members

Kazuya Hamazaki
General Manager
Energy Transport Business Unit, LNG Carrier Division
Mitsui O.S.K. Lines, Ltd.

For Our Sustainable Growth

Special Feature