BOLTED JOINT PIONEERS IN THE ARCTIC

CASE STUDY: YAMAL, RUSSIA

Assembling steel structures is challenging work – especially at temperatures of around -50 °C. Thanks to use of three alkitronic Nova Quattro hydraulic pumps with AX4 hydraulic torque wrenches and nine HG20 manual and one alkitronic EFCip 90 electric torque multipliers, the work could be done quickly and reliably, even in the extreme Arctic cold.

THE PROJECT

YAMAL LNG is a large-scale project on the Yamal Peninsula in Northwestern Siberia. The project involves the building of a liquefied natural gas (LNG) plant with a production capacity of around 16.5 million metric tons a year. Gaseous natural gas is strongly compressed via liquefaction for subsequent shipment to Asia, Europe, and America.

THE STARTING SITUATION

Yamal is situated above the polar circle in the Ob River delta area, a wild, remote region that is frozen for seven to nine months of the year and where temperatures can go down to -50 °C in the winter. The peninsula is perfected suited to the building of a liquid gas plant for two reasons: firstly, according to the latest estimates, the largest natural gas reserves in the world are situated here, and, secondly, the geographical location is ideal.

From the Port of Sabetta, transportation to Europe is possible year-round, whereas liquid natural gas is only shipped to the countries of Asia in the summer. In the winter this northern seaway is completely covered with ice and oil transportation is impossible, even with icebreakers.

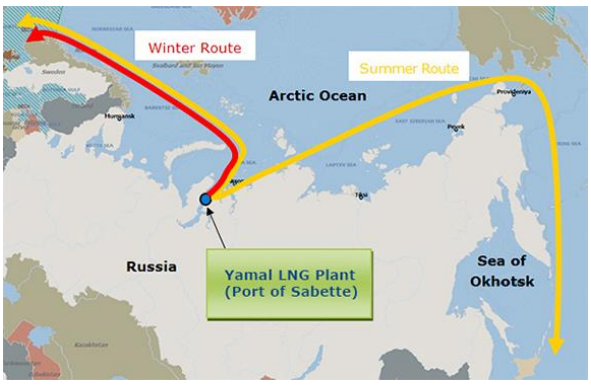

Figure 1: Trading routes to Europe and Asia

Before the oil can be shipped, it must be transported via pipelines to the port. To route the pipelines above ground over large distances, pipe bridges up to 47 meters above the ground had to be built. The harsh climatic conditions posed special challenges for both the workers on-site and the equipment. The usual machines cannot withstand the extremely cold Siberian temperatures of down to -47 °C.

Special challenges for people and equipment due to the extremely cold temperatures of -47 °C

alki TECHNIK GmbH – HRB 949 Amtsgericht Ingolstadt – Geschäftsführung: Albert Kipfelsberger, Alexander Kipfelsberger
Fon +49 8 41 97 499 0 – Fax +49 8 41 97 499 90 – Unterlettenweg 4 – D-85051 Ingolstadt – info@alkitronic.com – www.alkitronic.com

Figure 2: Sabetta on the Yamal Peninsula

THE SOLUTION

The pipe bridges were preassembled in a manufacturing facility. The energy-independent alkitronic M Type HG20 manual torque multiplier played an important role in this. In total, nine of these manual torque multipliers were used for 20 to 22 hours a day. The greatest success was achieved with an alkitronic M Type HG20 torque multiplier, with which more than 6000 bolted connections with sizes 46 and 50 were installed within 60 days. Due to the extreme cold, four employees worked in shifts to complete the project.

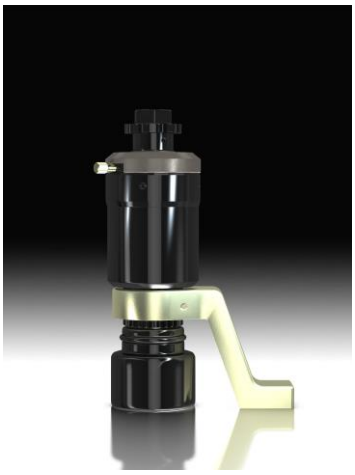

Figure 3: The gearing for the alkitronic M Type HG is manufactured using a high-precision chipless process.

The precision ratchet prevented slippage during use and thus ensured highly effective working and short assembly times. The robust and technically sophisticated design of the manual torque multiplier also ensured a high operational safety.

**Robust, precise, and safe –
the high-precision chipless process enables maximum loading with minimum wear**

Preassembly in the manufacturing facility took place on mobile frames. The alkitronic EFCip 90 electric torque multiplier was used to disassemble the frames. Maintenance-free, low-wear, and brushless synchronous motors with excellent efficiencies are used in the EFCip models; thus, the models have impressively low operating costs. In contrast to ratcheting drive tools, the models in the EFCip series rotate continuously during operation. This results in a continuously higher bolted joint quality. With the help of the EFCip 90, the work in Yamal could be completed three times as fast as was previously the case without alkitronic tools.

**Disassembly with the alkitronic EFCip 90
three times as fast**

To build the pipe bridges outside in the extreme cold, three extremely robust hydraulic pumps of type alkitronic Nova Quattro were used with the extremely flat alkitronic AX4 hydraulic torque wrenches (sizes 41, 46, 50, 55, 65, and 75). A special oil in the pump ensured the functionality down to an outside temperature of -43 °C.

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An additional insulation box prevented freezing in even colder conditions. Thus, it was also possible to work at temperatures of down to -47 °C without any problems.

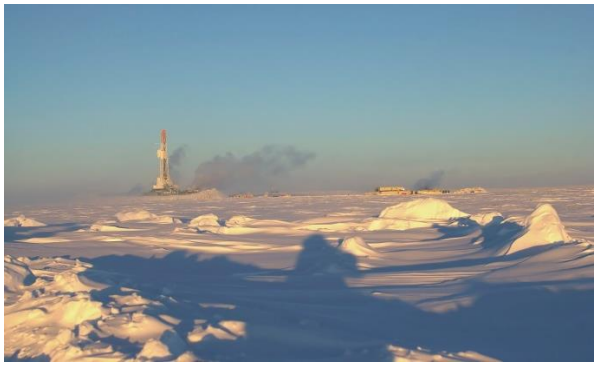

Figure 4: Working at temperatures of down to -47 °C in the Arctic

“What was especially remarkable was that hydraulic lifts could no longer be used due to the frost because the oil froze, but the alkitronic Nova hydraulic pump still held up for another 20 to 22 hours. It is truly indestructible,” said Larissa Enns, Export Manager at alkitronic.

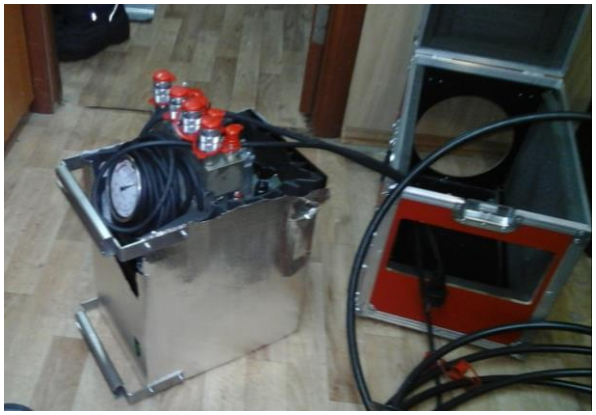

Figure 5: alkitronic Nova pump with additional insulation box

In addition to the extremely robust solutions from alkitronic, timely servicing and maintenance on-site at two-week intervals provided for minimal downtime. For this, an alkitronic partner personally provided special training to the workers in Yamal and a replacement parts warehouse was set up right at the location.

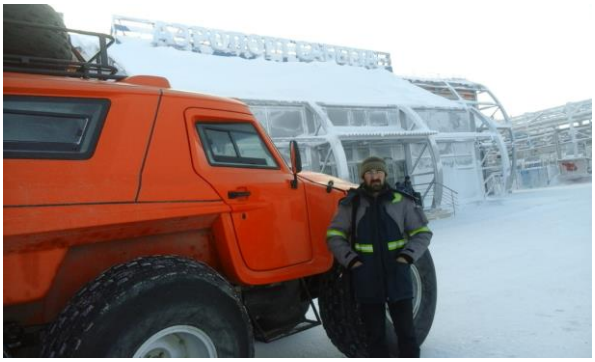

Figure 6: Rustem Waliullin (employee at alki-Ural, alkitronic partner in Russia) conducted the on-site training.

The international project in Yamal shows that especially harsh conditions require special technologies and that alkitronic tools can work extremely reliably and yield high-quality results, even in extreme conditions.

MORE INFORMATION

If you have any questions on alkitronic products or applications or are interested in partnering with us, please visit our website at www.alkitronic.com or contact us.
Our employees and partners at home and abroad can offer you uncomplicated and reliable customized solutions to your problems.

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SPECIFICATIONS FOR ALKITRONIC TOOLS USED IN THE PROJECT

ALKITRONIC M Type HG20 MANUAL TORQUE MULTIPLIER

- ✓ The high-precision chipless process used to manufacture the components of the alkitronic gearing allows for maximum loading with minimum wear.
- ✓ Low risk of failure: The integrated shear pin prevents overloading.

ALKITRONIC NOVA HYDRAULIC PUMP

- ✓ High pump outputs through smart electronic controller and powerful motor.
- ✓ Simple automatic operation for all cylinder sizes with no manual presetting.
- ✓ Manual or automatic operation with ergonomic remote control.
- ✓ Minimal upkeep costs due to maintenance-free brushless synchronous motor.
- ✓ No adjustments necessary for connection to all international power grids.

ALKITRONIC AX HYDRAULIC TORQUE WRENCH

- ✓ Work with comfortable and safe flexible couplings, which can be individually pivoted by 360°.
- ✓ Reliable loading up to a max. operating pressure that is a factor of four higher.
- ✓ Robust fine-toothed ratchet for high torque precision and maximum stroke of 28°.
- ✓ Precision-constructed drive element.
- ✓ Specifications:
  Prerequisite for exact reproducibility of given torques is an operating pressure of max. 700 bar. Torque repeatability: ± 3%.
- ✓ Product Information:
  For fast, reliable operation of the hydraulic torque wrenches, we recommend our alkitronic NOVA hydraulic pump. Operating pressure up to 700 bar, for use in all power grids (100–253 V/45–66 Hz).

ALKITRONIC EFCip ELECTRIC TORQUE MULTIPLIER

- ✓ Innovative motor protection with automatic shut-off for ensuring bolted joint quality
- ✓ Smart processor-controlled shut-off electronics for continuously exact reproduction of preselected torque
- ✓ Bevel gears with optimized efficiency and outstanding running characteristics (alkitronic® ECWip models)
- ✓ Extraordinarily robust motor housing made of cast aluminum

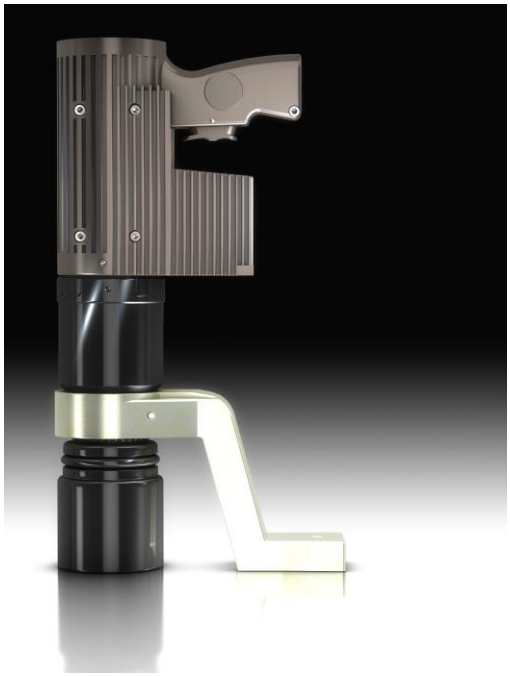

Figure 7: alkitronic EFCip

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