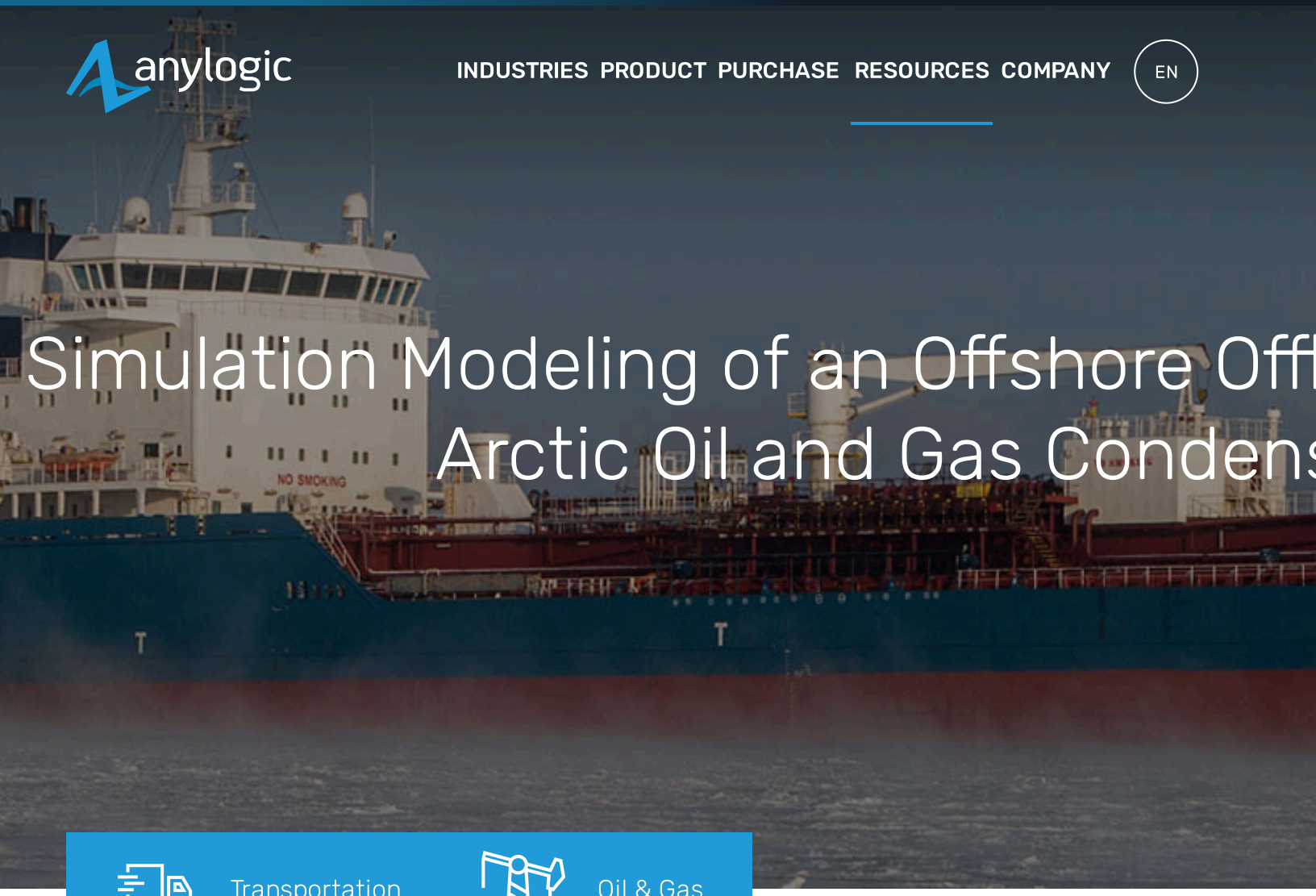


Simulation Modeling of an Offshore Off
Arctic Oil and Gas Condens

Transportation Oil & Gas

Problem

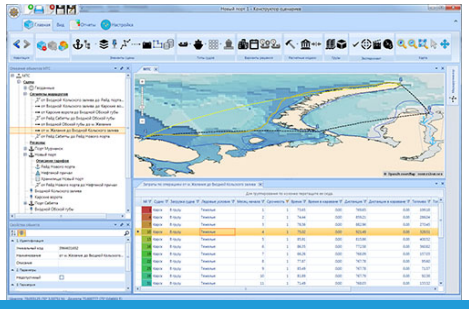
The Novoportovskoye oil and gas condensate field is located in the Yamal peninsula and owned by the fourth-largest oil production company in Russia. Oil from the field is transferred via 100km pipeline to the sea terminal at Cape Kamenny, where it is loaded into arctic tankers for further transportation. The full-size field development will start in 2016 and continue for

with drifting ice.

- Define a sufficient amount of arctic tankers and the demand for icebreaker assistance. Calculate the expenses for the tankers' fuel and freight of icebreakers in different ice conditions.
- Design a temporary scenario for oil shipment during 2016-2017, when tankers of low capacity and low ice reinforcement will be used. Major oil company plans on gradually introducing new arctic tankers of greater capacity, in accordance with the increase of cargo traffic. Consultants needed to define the system capacity during 2016-2017.
- Define the capacity of a shore-based storage facility to be sufficient for usage in ice conditions of different severity. Any storage overflow should be eliminated. Consultants needed to calculate the minimum volume of shore-based storage which will meet capacity requirements within all periods of field development. They had to take into account that the more severe the ice conditions, the more difficult it would be for tankers to provide the required rate of transportation and avoid the storage overflow.

Solution

By the order of major oil production company, experts from a state research center incorporated ship calculation modules, GIS



probabilistic weather conditions, taking into account ice channel freezing.

Tankers were modeled as independent agents moving in the bay and guided by the logic blocks of the simulation model: interactions between tankers and icebreakers, choice of tanker speed in correlation with storage fill, other tanker locations, ice conditions, and other factors.

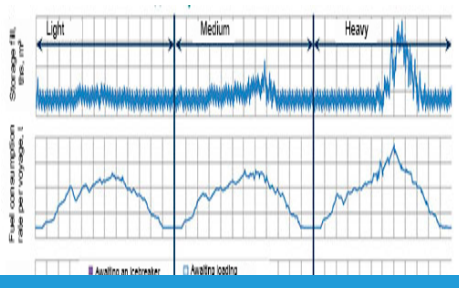
Using GIS technology inside the simulation model allowed them to do an analysis of a transportation system sensible to geographic factors, including bathymetric conditions, navigating channels, protected waters, and shore line.

Since ice channel conditions significantly influence ship traffic, the state center experts added to the model the following parameters:

- Characteristics and number of tankers in the channel
- Time after last pass
- Air temperature
- Wind and wave conditions
- Terms for canal laying

Result

Based on multiple model runs, the state center experts defined the optimal storage volume to be sufficient in ice conditions of different



tanker traffic, and storage fill. No analytical tool can consider these kinds of dynamic factors.

changing parameters in different ice conditions

In the course of the modeling project, the state research center experts also developed best practices to eliminate the risk of storage overflow. The model also showed the optimal amount of channels in land-ice for different ice conditions, approximate dates of canal laying, and the volume and terms for icebreaker support for tankers. Analytics defined the dynamics of outwards pilotage, expenses for fuel, and icebreaker support in various scenarios during all periods of field development. The model also helped plan operations during the temporary usage period of small tankers of low ice-class.

Similar case studies

MORE CASE STUDIES

download free simulation software

AnyLogic Cloud

anyLogistix supply chain software

blog

use of simulation

agent-based simulation

discrete event simulation

system dynamics

material handling library

manufacturing optimization

manufacturing capacity planning

epidemiology simulation

predictive modeling in healthcare

pharmaceutical simulation

optimizing airport processes