Yamal gas production center. Problems and prospects of effective development of hydrocarbon fields in arctic conditions

Speaker: general manager
of the Gazprom dobycha Nadym, LLC
Menshikov Sergey Nikolaevich
Total reserves and resources of all fields in the Yamal Peninsula:
26.5 trillion m³ of gas, 1.6 billion tons of gas condensate, and 300 million tons of oil

In the near future, pre-development of the Kharasaveyskoie field is planned. The Bovanenkovskoye field is operated by Gazprom dobycha Nadym, LLC since 2012.
Bovanenkovo is Yamal gas production center

- Medical-ambulance station "Yamal-Bovanenkovo"
- Service of departmental fire protection
- Bovanenkovo Airport
- Gym
- Residential complex for shift workers
- Hotel complex
- Airport runway

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Bovanenkovskoye oil and gas condensate field

Explored and preliminary estimated gas reserves

- About 4.9 trillion m³

Object of field pre-development (gas production facility № 2 of Bovanenkovskoye oil and gas condensate field)

Experimental low temperature separation unit with plate heat exchangers of gas production facility № 1 of Bovanenkovskoye oil and gas condensate field

CENOMANIAN-APTIAN DEPOSITS

- Gas production is planned at 115 billion m³ annually
- 3 gas production complexes

Beginning of development since 2012

Gas production at the Bovanenkovskoye field, billion m³

- 2012: 4.9
- 2013: 22.8
- 2014: 42.8
- 2015: 61.9
- 2016: 67.4

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The method of multi-layer gas field operation (cenomanian-aptian deposits)

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**Terrain of the Bovanenkovskoye oil and gas condensate field**

**STO Gazprom 2-3.2-037-2005 «Requirements for the organization and the production of drilling, development and operation of wells on the well pads of the Bovanenkovskoye field»**

### Significant indicators and characteristics

<table>
<thead>
<tr>
<th>The name of the indicator</th>
<th>Norms for the Nadym-Pur-Taz region fields</th>
<th>Norms for the Bovanenkovskoye field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of wells in well pad, pcs.</td>
<td>up to 8</td>
<td>up to 24</td>
</tr>
<tr>
<td>Number of wells in well row, pcs.</td>
<td>-</td>
<td>up to 12</td>
</tr>
<tr>
<td>Distance between wellheads, m</td>
<td>minimum 40</td>
<td>minimum 10</td>
</tr>
<tr>
<td>Distance between well row, m</td>
<td>-</td>
<td>50</td>
</tr>
<tr>
<td>Heat insulated lift pipes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Complex of underground equipment</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

**Difficult terrain of Bovanenkovskoye oil and gas condensate field and specific conditions of the field section predetermined the need to update the regulatory framework**

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## Well structure equipment

<table>
<thead>
<tr>
<th></th>
<th>Projected (import production)</th>
<th>Corrected (domestic production)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tubular goods with high hermetic threaded connection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>245×11,99 mm 55L Ks Bear (VAM TOP)</td>
<td>245×11,99 mm 55L Ks Bear (VAM TOP)</td>
<td></td>
</tr>
<tr>
<td>245×8,94 mm 55L Ks Bear (VAM TOP)</td>
<td>245×8,9 mm Д TMK GF</td>
<td></td>
</tr>
<tr>
<td>245×11,99 mm 125TL Ks Bear (VAM TOP)</td>
<td>245×12 mm Р TMK GF</td>
<td></td>
</tr>
<tr>
<td>168×8,94 mm 55L Ks Bear (VAM TOP)</td>
<td>168×8,9 mm Д TMK GF</td>
<td></td>
</tr>
<tr>
<td><strong>Insulated lift pipe 114×6,88 mm 55L JFE Bear</strong></td>
<td><strong>Insulated lift pipe 114×6,88 mm 55 TMK FMT</strong></td>
<td><strong>Insulated lift pipe 168,3×114,3 TMK FMT</strong></td>
</tr>
<tr>
<td><strong>Insulated lift pipe 168,3×114,3 JFE –HP1-110 JFE Bear</strong></td>
<td><strong>Insulated lift pipe 168,3×114,3 TMK FMT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Devices for descent and cementing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baker Oil Tools, inc.</td>
<td></td>
<td>Tyazhpressmash, OJSC</td>
</tr>
<tr>
<td><strong>Underground equipment complex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baker Oil Tools, inc., Weatherford</td>
<td></td>
<td>Izmeron, LLC; NKMZ-Grupp, LLC; Voronezhskiy mekanicheskiy zavod, FSUE; Neftegazdetal, LLC</td>
</tr>
</tbody>
</table>
Construction of tanks without shell in permafrost

Technological scheme of underground shell-less tank construction in permafrost sandy soils with building sand production

a - pilot tank configuration 300 m³;  
b - results of sonar survey of a 1400 m³ tank for drilling waste disposal;  
c - picture of tank chamber fragment
Thermostabilization of foundation soils

Evaporative circuits of vapour-liquid refrigerating plant

Condenser unit of vapour-liquid refrigerating plant

Condenser unit
Connecting pipes
Cooling vertical pipes

Pile fields for vertical steel tanks

Heat stabilizers

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Thermostabilization of wellhead zone of exploitation well

Complex solutions for thermostabilization of wellhead zones of exploitation wells for the Bovanenkovskoye field conditions

Condenser unit of vapour-liquid refrigerating plant in the wellhead zone of the gas well

Heat stabilizers along pipe rack

Well pad of Bovanenkovskoye oil and gas condensate field

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Technology of geotechnical monitoring

Stress-strain state control

Regular instrumental monitoring of ground conditions and deformations

Thermotechnical forecast

Results of thermotechnical modeling of thermal field of rocks in wellhead zone in the presence of vapor-liquid cooling units and heat insulated lift pipes

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Kharasaveyskoye gas condensate field

Explored and preliminary estimated gas reserves

about 1.3 trillion m³

Site of Kharasaveyskoye field

Masterplan of the Kharasaveyskoye field

Building owner base in Kharasaveyskoye field

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Research of exogenous processes at the design stage of the Kharasaveyskoye field

Geocryological zoning plan of the territory by degree of difficulty for construction

Sites with the most difficult geocryological conditions marked in red. The Kharasaveyskoe field is characterized by much more difficult geocryological conditions than the Bovanenkovskoe field

Kharasaveyskoye field. Evolution of dangerous geocryological processes at the sites of laying designed line structures. Scheme of sites for which technical solutions are developed for gas pipelines engineering protection (pictures with natural colors and in the infrared spectrum)

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Application of block-modular equipment and technologies at the Kharasaveyskoye field

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The transport scheme for the delivery of goods and personnel to the Bovanenkovskoe and Kharasaveyskoe fields

The Bovanenkovskoye field airport will be used not only for servicing the Bovanenkovskoye field, but also for the integrated development of all Yamal Peninsula fields.

Carrying capacity of the Obskaya-Bovanenko railway line is 7800 thousand tons per year.

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Novelty and high scientific level of technical solutions introduced in facilities construction of the Bovanenkovskoye field

1. 11 patents of the Russian Federation for inventions were received, more than 30 works were published.
2. The main provisions are documented in standards of Gazprom.
3. The practical significance is confirmed by the implementation of these decisions in the construction of a huge industrial complex - the Bovanenkovskoye oil and gas condensate field.
THANK YOU FOR YOUR ATTENTION!