LNG16

X-pert Center

Single Shaft Turbocompressor for BOG Recovery in LNG Terminals

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Let´s talk about a paradigm switch …
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LNG Receiving Terminals
Situation have changed plus Progress in Advanced Technology

Worlwide increase in LNG demand leading to:

- LNG tanker sizes are increasing – this results in an increased maximum BOG volume rate at LNG Receiving Terminals during **SHIP UNLOADING**.

- LNG send out rates are increasing and often totally compensate BOG volume during **HOLDING** – the **GAP** between max. and min. BOG flow is becoming larger.

- Todays LNG storage tanks are most often of full containment design which allow for pressure fluctuations inside tanks.

- Todays BOG single shaft centrifugal compressor design are customized for start/stop operation – featuring variable Inlet Guide Vanes (IGV) and heated seal carriers.

- The combination of above facts implementing a change of compressor concept.
Over 30 years experience with BOG handling at LNG export plants as a market-leader …

Siemens has developed an innovative concept for LNG import terminals.

- This concept features a single-body, single-shaft, multi-stage, centrifugal compressor optimized for small and medium BOG volume flows and capable of automatic start/stop operation from ambient as well as from cold conditions with no cool-down required.

- This concept opens the door for the paradigm switch to maintenance-free, safe, economic and environmentally friendly BOG handling within Liquefied Natural Gas (LNG) import terminals (onshore as well as offshore), improving significantly the Total Cost of Ownership (TCoO)
Simplyfied BOG Generation Profile along the LNG chain

Chart 6

BOG Volume / Massflow

LOADING Mode

HOLDING Mode

UNLOADING Mode

Production | Transport | Regas | LNG Chain

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BOG Turbocompressors
(two casing vs. single casing)

Todays LNG Plants

- 1 bar
-160° C
- 7 – 10 bar
- 22 – 41 bar g
- Fuel Gas System

Early LNG Plants and Todays LNG Receiving Terminals

- 1 bar
-160° C
- 6 – 10 bar
- Recondenser or Fuel Gas System

Siemens world market leader for cryogenic temperature BOG applications for LNG Loading Plants

New market for LNG Receiving Terminals (onshore and offshore) applying same technology as for LNG Loading (Export) Plants
Simplified Flow Schematic
The onboard BOG recondensing concept

- BOG at 1 bar
- BOG at 8 bar
- LNG at 8 bar: -162 °C (-260 °F)
- LNG Storage Tank
- 1st stage LP Pumps
- 2nd stage HP Pumps
- To Vaporizer and Gas Pipeline
- Desuperheater
- Suction Drum
- BOG at 8 bar
- BOG Compressor
- TC
- IGV setting -10° to +75°
- Recondenser
- 1st stage LP Pumps
- 2nd stage HP Pumps
- FC
- To Vaporizer and Gas Pipeline

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Compressor selection for import terminals

BOG handling concepts

Concept A
- 1 x 100%
- 2 x 50% or 3 x 33%

Concept B
- 2 x 50%

Concept C
- 2 x 50%

Concept D
- 1 x 100% hybrid concept

Increasing LNG sendout / ship size

UNLOADING Mode

HOLDING Mode
Application range of different compressor types

Integrally geared type
BOG references range
for LNG Carriers

BOG volume flows

Siemens single shaft
BOG references range

Reciprocating

Screw / Rotary vane / Roots

Turbo radial

Turbo axial-(radial)
Among all possible compressor designs, the single-shaft concept ensures highest reliability and availability.
Special Design Features
Single shaft turbo compressor for cryogenic temperature BOG

Single shaft BOG compressor cross sectional drawing

- Oil heated Seal Carrier
- Dry Gas Seal
- 3D Impeller
- Inlet Guide Vane Unit (IGV)
IGV Animation
BOG single shaft Turbocompressor Layout
Compact single lift package concept

- step-up gear
- compressor
- seal gas panel
- oil unit
- electric drive motor
- single lift baseplate

L x W x H [mm]: 9,500 X 3,000 X 3,000
weight [kg]: 55,000
Conclusion
Why optimize the compressor concept?

- Single shaft turbo compressor guarantees highest reliability and availability plus maximum safety
- No spare units required
- Virtually maintenance free
- Lowest weight, minimum footprint (ideal for offshore)
- No gas to atmosphere – low noise 85 bD(A)
- Easy erection and installation due to fully piped, wired and tested single lift compressor packages
- Improving significantly the Total Cost of Ownership
Our competence drives your profit …

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