Deep offshore gas fields: a new challenge for the industry

Emil Gyllenhammar
Aker Solutions
The challenge

- Remote gas fields in offshore depths of up to 3000 m
- Far away from the nearest coast
- Little or no oil and gas infrastructure

**Finding cost effective field development strategies**

Subsea processing opens up new possibilities
Subsea processing toolbox

- Currently three separable categories of subsea processing exists in operation. The categorization is based on what the main purpose of the system is:

  - Subsea boosting
  - Subsea separation
  - Subsea raw seawater injection (pressure support)

  - Vision: Subsea gas dehydration and CO2 removal

  - Pumping
    - Separate gas and liquids into separate pipelines (production boosting)
  - Compression
    - Produced water re-injection (de-bottlenecking)
Stand-alone subsea solutions for gas fields

Autonomous subsea field development solution

- No surface facilities
- Tie back to shore / a surface facility far away $\rightarrow$ subsea compression needed

- Power generation
- Control
- All-electrical control system
- Subsea processing
- Subsea chemical storage
Long tie-backs and distance dependent cost

Field development CAPEX

At a certain distance the cost of pipelines and umbilical will dominate
Hybrid subsea/floater solutions for gas fields

- Support from a small surface facility with reduced topside size, complexity, manning and cost compared to a conventional processing platform/FPSO
DEPTH® for Gas Fields – case overview

DEPTH® (Deep Export, Production and Treatment Hub) for Gas Fields is a joint effort between Total and Aker Solutions with the aim of identifying cost effective subsea field development solutions with long distance tie-backs to shore for deep offshore gas fields.

- Gas field: 500MMScf/d (CGR=40)
- 300 km step-out
- 2500m water depth
- No surface facilities - tie-back to shore
Subsea compression in DEPTH

Two options for the installation of subsea compression:

1. Subsea compression installed late life / when minimum flow is reached to increase production

2. Subsea compression installed from day one to reduce pipeline size and cost
Åsgard Subsea Compression – On Stream

Contract AWARD
Dec 2010

Template

Manifold station

Topside module

System integration test

Installation

Compressor module test

First Gas
17th Sept 2015
“operates like a Swiss watch”
Subsea gas dehydration in DEPTH

Removing both free water and water solved in the gas:

- Remove the need for continuous MEG injection from shore
- Reduce pipeline material requirements and avoid corrosion
- Reduce pressure drop and increase turndown flexibility

Technologies not requiring glycol for dehydration

**Adsorption**
- Water removal using beds of solid desiccants
- Batch process
- No chemical required
- Require regenerations of the solid desiccants

**Membrane**
- Water removal with selective membrane
- Continuous process
- No chemical required
- Low pressure drop

**Supersonic separation**
- Water removal with low temperature
- Continuous process
- No chemical required
- High pressure drop

Detailed screening of technology, system design and technology qualification planning performed
Conclusion

■ Subsea processing offers alternative development options for deep offshore gas fields with cost saving potential

■ With subsea compression installed and operating; it can now also applied in greenfield developments from day one to reduce pipeline cost

■ Subsea dehydration removes the need for continuous MEG injection and offers advantages in pipeline operability and material cost