Optimizing MEG Recovery Systems on Long Subsea Tiebacks

Patrick Wan,
Senior Flow Assurance Engineer
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Session Outline

- Overview
- Flow Assurance and MEG Design
- MEG Management
- Summary
Various flow assurance challenges associated with a long deepwater subsea tie-back of a gas-condensate field
  • Hydrate management

Most long subsea tiebacks (> 30km) in cold waters tend to be un-insulated and require hydrate inhibition

Continuous hydrate inhibition using MEG or LDHI
  • LDHI injection for low water production systems
  • MEG injection for high water production systems
MEG can be recovered at the host facility (low losses) and recycled. Depending on the location of the host facility (onshore / offshore), the slug catcher size and MEG storage requirements become important design factors (weight and space) for offshore facilities.
Flow Assurance (relative to MEG Design)
- Lean MEG flow from topside to wellhead
- Rich MEG flow from wellhead to inlet separator / slug catcher

Hydrocarbons Process Group (relative to MEG Design)
- Rich MEG from inlet separator / slug catcher to MEG Regenerator
- Lean MEG from MEG Regenerator to Lean MEG injection Pump
Important for FA and HC Process Group to work together

- Optimization of Lean/Rich MEG flows/composition
- Total solution for hydrate prevention and MEG system design

For more information:

- OTC 24177 - Flow Assurance Impacts on Lean / Rich MEG Circuit Chemistry and MEG Regenerator / Reclaimer Design
Piggable loop pipeline configuration was employed
  • To cater for turndown flow rates
  • Provision for depressurization either side of a hydrate blockage
  • Inspection pigging etc.
Initially, depending on requirement, a single flowline can be used for production and the other as a gas recycle line.

Gas recycle facility in order to maintain high flow rates/velocities in the single production line and hence limit liquid holdup in the production line.
Deep water gas field development, hydrates will form in the presence of free water at low temperatures and high pressures.

Hydrate blockages can result in long downtimes.

Rely on continuous hydrate inhibition (MEG) for hydrate prevention.
MEG injection rates

- Increases with higher produced water rates
- Increases with higher SITHP
- Increases with higher degree of hydrate depression

MEG design rates could be based on early / late life production scenarios
 Slug catcher receives the well fluids
- Gas – gas dehydration
- Condensate – condensate stabilization
- Water (with injected MEG) - sent to the Rich MEG vessel for recovery

During periods of low flow (turndown), flowline liquid holdups will increased

There may be periods of Rich MEG starvation until new steady state conditions are established (at turndown)

The starvation period is important in terms of lean MEG storage
- Continuous lean MEG injection during starvation period
- No Rich MEG supply (starvation period) for recovery.
Arrival Liquid Rate and Aqueous (Rich MEG) Rate following Turndown to 25% Normal Production Rate (Without Gas Recycle)

- Arrival Aqueous (Rich MEG) Rate
- Arrival Liquid Rate
- Lean MEG Injection Rate

- Initial State Normal Production
- 5 days
- 40 days Rich MEG Starvation
- 18,000 bbl Lean MEG
Arrival Liquid Rate and Aqueous (Rich MEG) Rate following Turndown to 25% Normal Production Rate (With Gas Recycle)

- Arrival Aqueous (Rich MEG) Rate
- Arrival Liquid Rate
- Lean MEG Injection Rate

2 days Rich MEG Starvation
95% Reduction

900 bbl Lean MEG
Almost 90% Reduction

No Liquid Starvation
By re-circulating gas during turndown conditions via one flowline and producing through the other flowline the liquid holdups do not increase significantly during turndown.

This reduces the effects of rich MEG starvation periods, thus reducing lean MEG storage requirements during turndown.
Arrival Rates Without Gas Recycle

Arrival Liquid Rate and Aqueous (Rich MEG) Rate during Ramp Up from 25% Normal Production Rate (Without Gas Recycle)

- Gas Production Rate
- Arrival Liquid Rate
- Arrival Aqueous (Rich MEG) Rate
- Rich MEG Processing Capacity
- Separator Liquid Draw Off Rate

3 days Ramp Up Time

30,000 bbl Rich MEG Surge
Arrival Liquid Rate and Aqueous (Rich MEG) Rate during Ramp Up from 25% Normal Production Rate (With Gas Recycle)

1.5 hours Ramp Up Time
98% Faster Ramp Up

1,800 bbl Rich MEG Surge
Almost 95% Reduction
Arrival Rates at High / Low Gas Recycle Rates
When flow is ramped up to normal design rates, ramp up slugs are generated.

- May trip process on high liquid levels

Water draw-off rate tends to be based on the MEG + water processing capacity.

To avoid large surge volume in the slug catcher or high liquid processing capacity during flow ramp-up, ramp-up period would need to be over a much longer time.

Alternatively, a larger rich MEG receiving vessel or some temporary storage can be considered for high liquid draw-off rates for the water / MEG phase from the slug catcher during ramp ups.
There are a number of benefits of employing gas re-circulation during low flow rate periods to limit liquid holdups in flowlines for a looped configuration.

- Help optimize slug catcher size
- Help optimize MEG storage requirements
- Allow for faster ramp-up rates from turndown period
- Reduce / eliminate the severity of slugging during turndown / ramp up
Thank you