NGL-Recovery Expander-Compressor Commissioning
(Case Study)

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Outline

- Commissioning Background
- Description of the NGL Process.
- Description of the NGL expanders-compressors.
- Initial startup issues, troubleshooting and solutions:
  - 0% IGV speed overshoot.
  - Decrease of the Bearing housing temperature.
- Recommendations.
Commissioning Background

- Late 2008, 1st LNG Mega-Train (7.8 MT/Y) commissioning and start-up started at Qatargas Train-4 facilities.
- The majority of the Machinery commissioning was divided into three phases:
  - Driver solo run (Uncoupled run), except for expanders-compressors.
  - Coupled commissioning run (Air run and safe-fluid run), except for expanders-compressors.
  - Normal run (Startup for duty).
- January 2009, 1st NGL expander-compressor was started.
NGL Unit Process Description

Simplified NGL Recovery Process P&ID
NGL Expander-Compressor Description

Simplified Expander-Compressor Cross Sectional Drawing
Pre-startup Checks

- NGL Expanders-Compressors were delivered with a dummy Mechanical Center Section (MCS), the duty MCS was packaged inside a preservation container under N2.

- The following adjustments and clearances were set during the duty MCS installation:
  - Expander and Compressor wheels clearances.
  - inlet Guide Vanes Close clearance (0% IGV) and Open clearance (100% IGV).
  - Actuator stoppers (Close/Open) and stroke adjustment.

- Controls tuning and final assembly checks.

- All the adjustments and clearances were recorded.
IGV Mechanism (Illustration Video Only)
IGV Mechanism

Fixed Pivot Holder Shifting (Illustration Video Only)
0% IGV Speed Overshoot

Solution:
- Addition of two dowel pins between the holder and the support preventing rotational movements.

Facts:
- Expander speed reached 87% of the total speed range at 0% IGV.
- Outlet temperature dropped from 19 to -73 deg C within 7 mn.
- There is no contractual limitation in either the speed or the outlet conditions when starting the machines with the IGV at 0%.
- API-617 Chapter 4 “Expanders Compressors” do not limit speed or the outlet conditions with the IGV at 0%.
Bearing Temperature Decrease

- Speed
- Expander Thrust Bearing Temperature
- Expander Journal Bearing Temperature
Bearing Temperature Decrease

Simplified Expander-Compressor Cross Sectional Drawing
Bearing Temperature Decrease

Solution:
- Operating procedure and an Extra Delta Pressure transmitter were added to monitor the Delta pressure across the bearing housing during pressurization.

Facts:
- Operations Procedures developed during the construction phase (machine already manufactured) extracted from the Vendor instructions.
- Vendor instructions limited to the package boundaries.
- HAZOP performed for the NGL unit, not specific to expanders.
Recommendations

- Consider maximum speed or expander process outlet limitations at 0% IGV during the engineering phase.
- Operations involvement during the early stage of the machine engineering.
- Specific Operational review and start-up HAZOP for systems involving expanders.
Thank you …