

# Emerson improves startup, availability, and throughput of LNG Mega-trains

## RESULTS

- Faster and more effective startup
- Increased yield and throughput after handoff to Operations
- Increased availability by stabilizing process units
- Increased safety with fast-responding emergency loops



## APPLICATION

Automation and startup of LNG Mega-trains

## CUSTOMER

LNG producer; Emerson served as the customer's Main Instrument and Controls Contractor (MICC)

## CHALLENGE

The customer needed to achieve flawless startup faster; and throughput and availability of the LNG trains needed to be optimized by improving performance across the facility. Areas of focus included utilities, the cryogenic unit, the NGL recovery unit, the fractionation unit, and common facilities like the sulfur recovery unit.

## SOLUTION

The Emerson team used their extensive process experience, along with tools built into the DeltaV digital automation system and Emerson's EnTech™ Toolkit to identify and solve startup challenges at the site, and to enable increased yield and throughput when handed over to Operations.

### **Tuning the heat recovery steam generator (HRSG) frees operator**

**time:** The Emerson team used the Entech™ tool kit to tune the drum level controller on the HRSG so operators could run it in AUTO/CASCADE for the first time, freeing them to concentrate on throughput of the profit-making cryogenic and fractionation areas of the plant.

*The customer needed Emerson's team of focused, dedicated experts to help achieve flawless startup faster, and free up staff to concentrate on core startup activities. The Emerson team improved key control loop performance and maximized the number of loops running in auto, enabling increased yield and throughput when handed over to Operations. The team also captured "Lessons Learned" to be used as baseline data for similar trains and standard procedures for future startups.*

**Tuning de-aerator controls increases availability:** The team used the Toolkit to decouple the flow from pressure, and to tune the level control for non-oscillatory response. No further operator attention is required now that the pressure and level controllers are in AUTO and the flow is in CASCADE.

**Lambda tuning decouples interactions, speeds startup:** While starting up the cryogenic units, the flow and pressure tended to interact and be kept in Manual. As a result the startups took several hours longer than necessary and required extra operator attention. Emerson's Lambda Tuning method provided an explicit way to decouple interactions and enable keeping controllers in AUTO/CASCADE.

**Optimizing valve positioner parameters increases life of heat exchangers:** AMS Suite was used to enable two critical cryogenic unit control loops to run in AUTO. While online, AMS Suite optimized the loop's smart positioner parameters without moving the control valves, significantly improving the performance of the valves. By reducing temperature variations, this increased the life of the cryogenic heat exchangers.

**Smoothing mode-changes stabilizes NGL Recovery Unit:** This mitigated condenser damage by minimizing thermal shocks that had happened due to repeated starts and stops of the unit. It also stabilized its operation by smoothing transition from Joule-Thompson mode to turbo-expander mode.

**Tuning fractionation unit allows increased yield and reduce fuel consumption:** The team diagnosed and tuned the fractionation unit to operate in AUTO/CASCADE, minimizing operator intervention and operating with steady flows and temperatures to allow increased yield and reduced fuel gas consumption.

**Increasing speed of response of gas pressure flare loops increases safety, stability:** The team found slow and/or oscillatory tuning of several gas pressure loops that operated flare valves in various units of the plant. These loops were difficult to tune by "educated guessing" or with auto-tuner algorithms, but Emerson's EnTech Toolkit handled them easily, increasing the speed of response of these loops by a factor of 20 to 100 for safe, stable operation of the plant during emergencies that required flaring.

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