

Hybrid Heating Value Control for LNG Regasification

CHALLENGE

In Japan, city gas must meet a strict standard heating value. At LNG terminals, natural gas is produced by vaporizing stored LNG and injecting LPG to adjust the heating value before supplying gas to pipeline networks. The challenge arises because multiple feed gas streams with varying flow rates and compositions—including nitrogen inert content—are blended together. Sudden changes in feed ratios and compositions make it difficult to maintain a constant product gas heating value of 45 MJ/Nm³ using conventional measurement and control methods.

SOLUTION

A hybrid heating value measurement and control system was developed and implemented. The system combines:

- A thermal conductivity calorimeter for real-time heating value measurement
- A gas chromatographic calorimeter to correct measurement bias caused by inert gases such as nitrogen

The gas chromatographic calorimeter updates the bias error between the two instruments every five minutes, ensuring accurate and responsive heating value measurement. To validate the control strategy, a CHEMCAD dynamic simulation based on material and energy balances was conducted. The simulation was used to evaluate measurement accuracy, control stability under fluctuating feed conditions, and to determine optimal control parameters prior to plant startup and commissioning.



- **Industries:** Energy / LNG Regasification and City Gas Supply
- **Region:** Japan
- **Project Type:** LNG terminal natural gas supply and heating value control

RESULTS

CHEMCAD dynamic simulation confirmed that the hybrid measurement system could maintain stable heating value control even during rapid changes in feed gas flow rates and compositions. Simulation results demonstrated smooth control behavior of the product gas heating value around the 45 MJ/Nm³ target. During actual plant operation, the automatic bias correction performed every five minutes successfully compensated for measurement deviations, resulting in stable and reliable heating value control.

TANGIBLE BENEFITS

- Consistent compliance with city gas heating value standards
- Improved accuracy of heating value measurement despite inert gas variations
- Enhanced stability of plant operation under dynamic feed conditions
- Reduced commissioning time by applying optimized control parameters identified during Factory Acceptance Testing (FAT)
- Lower operational risk during startup and load changes

FIGURE 1 - Process Flow Scheme for LNG Terminal and Regasification

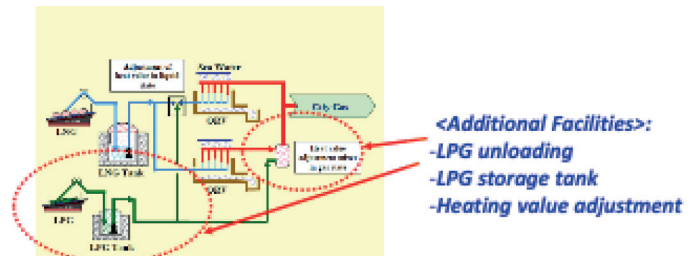


FIGURE 2 - Concept of Hybrid Heating Value Measurement System

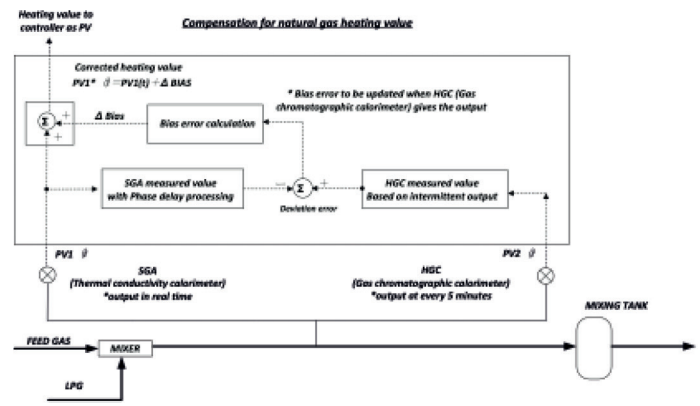


FIGURE 3 - CHEMCAD dynamic model showed reliable control of mixed gas heating value

