La Rosita Generation Plant Perspective

LNG Plant Commissioning

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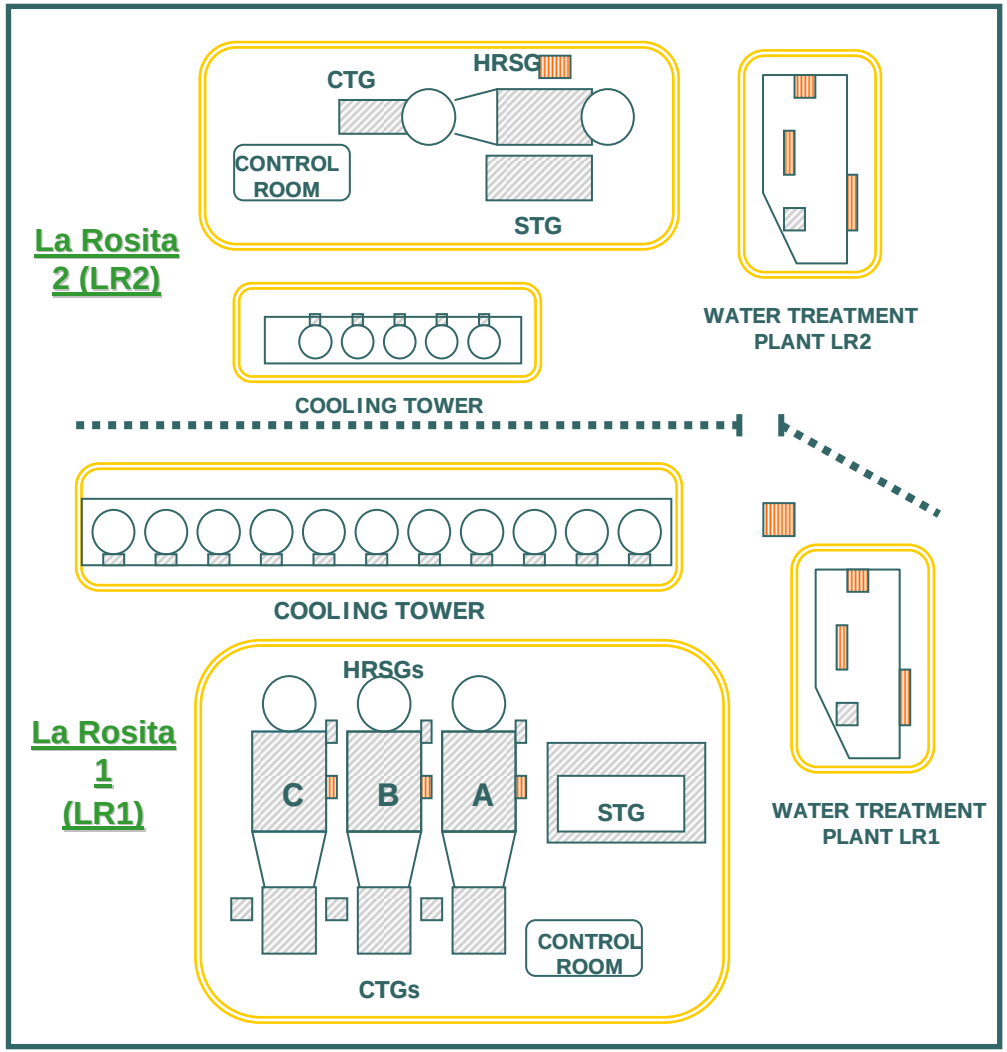
CENTRAL LA ROSITA

The La Rosita Facility

- An Intergen plant, located just west of Mexicali, Mexico
- LR1: 3 x 1 combined cycle
- LR2: 1 x 1 combined cycle
- Siemens 501F CTGs, gas fired



Discussions with Siemens

- Potential LNG supply quality info provided
- Pipeline quality specifications provided
- Initial Siemens recommendation is to install a “Integrated Fuel Gas Characterization (IFGC) System” to reduce or eliminate:
  - Power Fluctuations
  - Combustion dynamics
  - Flashback
  - Emissions variations
- Challenge was to get Siemens comfortable with the fact that differences in make-up of the LNG supplies would be adjusted (via N2 injection) to meet the pipeline specifications.

Siemens Fuel Gas Specifications for W501F frame machines

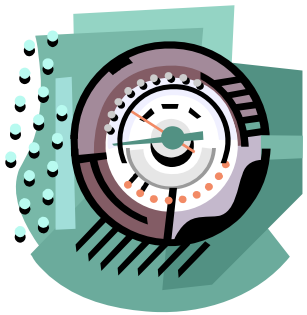
- Wobbe Index – what is it? The relationship between the heating value and the specific gravity of the gas (fuel), stated in Btu/scf.

$$**\text{Wobbe Index} = \frac{HHV}{\sqrt{\text{specific gravity}}}$$

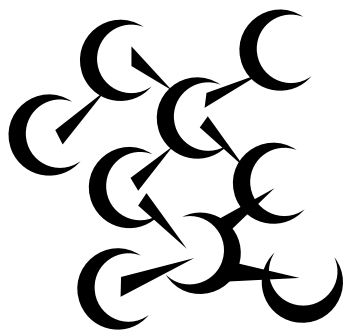
- Without hardware or equipment modifications, the Siemens specification for variation in the Wobbe Index is +/- 3% of 1356 Btu/scf (1396.7 – 1315.3), which is the average value for gas in the US.
- Additional limits apply to other gas components.

Siemens Fuel Gas Specifications for W501F frame machines

- Limits on physical properties:
  - Pressure
  - Temperature
  - Moisture



- Limits on chemical components:
  - Olefins
  - Oxygen
  - Higher hydrocarbons
  - Hydrogen



Fuel Composition Variation – Potential Effects

- As Wobbe Index and higher hydrocarbon concentrations increase:
  - NOx emissions 
  - CO emissions 
  - Flashback potential 
  - Dynamics 

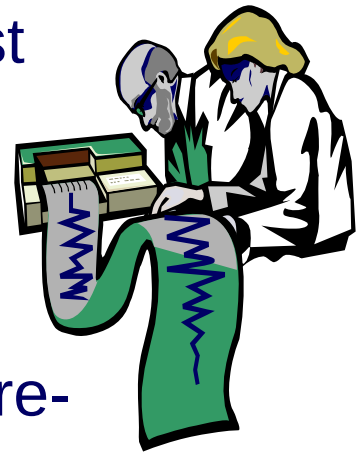
Tuning Parameters can be optimized for a given fuel; but this is challenging if there is frequent variation of fuel characteristics.

Site Decision Process

- Pipeline specs for LNG were within Siemens limits; therefore, no modifications or tuning adjustments should be necessary.
- Consulted with the neighboring TDM (Sempra) plant and confirmed that they had not and did not plan to install any mechanical modifications to their machines.
- A CFE plant located near the LNG terminal shared that they were putting in modifications to their fuel gas monitoring and control systems; however, their machines use a different combustion technology than that of the La Rosita or TDM machines.
- As an indication of changes in composition, we decided to install pre-SCR emissions monitoring equipment to detect any significant fluctuation in NOx concentrations.

During LNG Plant Commissioning

- Siemens engineer on-site to monitor dynamics and combustion characteristics; and available to adjust tuning if required.
- Monitored / collected data on gas composition from two on-site GCs.
- Monitored / collected data from two pre-SCR emissions monitoring systems.
- Compared gas quality, emissions rates and MW load of the units.



What happened? Data Collected:

- Siemens report regarding combustion monitoring during LNG commissioning states: "There were no flashback events [and]…emissions levels were well within Siemens specification." They also note that "LNG composition was not stable during the …tests."
- CG records showed methane levels oscillating between 92-96%, and an increase in the heat content of the fuel (approximately 2.0-2.4%) during LNG use.
- No increases of NOx emissions were noted by CEMS (post SCR), no noticeably higher NH3 injection rates were seen, and no significant variation from normal concentrations were noted out of the CTGs (pre-SCR).

Any problems?

- We saw some instrumentation problems in one of the units attributed to moisture condensation in combustion dynamics sensing lines, suspected to be due to a higher moisture content in the LNG.
- Following the testing, that same unit experienced gas fuel valve strainer fouling with sand and grit for a few start-up cycles, potentially attributed to the flow reversal in the gas line during the LNG commissioning process (this was not confirmed).
- Ultimately, there were no noticeable operational or combustion problems noted due to the use of the LNG fuel, apart from minor load fluctuations.

Future Considerations…

- Continued communication with LNG terminal regarding future operations
- Work with Siemens to resolve sensor line condensation problem (install different configuration or type of equipment)
- Finalize installation of pre-SCR emissions monitoring equipment

Thank you.

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