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Building Connections

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INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Integrating Renewable Energy & Advanced Control Solutions

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Renewable Gas as the Answer

Nashua Wastewater Treatment Plant, Nashua-NH

Renewable Gas based generation has several challenges

- Inconsistent volume or flow
- Inconsistent gas quality or heat content
- Moisture and low-BTU content induced “knocking” in the generation unit

Renewable Gas Initial Project Issues

Renewable Gas had been tried before but ran into some challenges:

- Unit could only run when sufficient consistent volume of digester gas was produced
- Low-BTU content caused engine to “knock” excessively, which led to high maintenance costs
- Fuel content and quality varied as the pressure tank got lower in level, meaning the system needs constant supervision

Unit to be replaced

Gas Flow Control Implemented as Pressure-Based control with Operational Stages

Flow control was needed to ensure the continuous generation could be on-line not requiring constant supervision. This was accomplished in by:

- Selecting multiple smaller generators to better allow staged loading
- Using digester gas (DG) header pressure as the ultimate primary variable
- Units are fired only to consume gas, represented as pressure increasing, with multiple stages and variable loading

Gas BTU Content Control

BTU control was required to keep a minimum BTU content in the fired gas stream. This was accomplished in by:

- Adding a boosting and blending skid which would “sweeten” the DG with natural gas (NG) injection
- Using a density-based BTU flow transmitter which has a fast signal-feedback
- Careful tuning of the system to avoid high or rapid BTU changes and avoid hysteresis

Engine “Anti-Knocking” Control

Even with the items above, engine knocking can still occur

- Small variations in BTU content can still occur and cause the engines to mis-fire, causing high maintenance costs
- Advanced controls were employed to sense the “knocking” condition of the engine, and automatically de-rate the engine to a lower level
- Control system would continue operation seamlessly, now at the reducing (de-rated) engine output, without requiring operator intervention

Key Take-Aways from the Project

Study and analyze gas production and gas content up front

- Understand it varies daily, monthly, and seasonally

Integration is a key component

- A good energy production from renewable gas requires you control
  - Flow control with pressure-base
  - BTU control with gas blending
  - Anti-knocking engine control

Q&A

Thank You!

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