McAlpine Creek Combined Heat and Power
Startup and Lessons Learned

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November 2017
Agenda

- Project History
- Operations to Date
- Construction Lessons Learned
- Conclusions
Project History
Background

- Charlotte and Mecklenburg County
- Over 775,000 Customers
- 5 Treatment Facilities
McAlpine Creek WWMF

- Largest Facility at 64 mgd
- Receives Primary Sludge and WAS from Sugar Creek WWTP
- Also has capability to receive flow from Sugar/ Irwin
Energy In Wastewater

WERF ENER1C12 A GUIDE TO NET-ZERO ENERGY SOLUTIONS FOR WATER RESOURCE RECOVERY FACILITIES
Implementation History

- 2009: North Carolina Solar Center Biogas Study
- 2010: CDM Smith Biogas Utilization report
- 2011: The Intern Started
- 2012: The Intern Study (i.e. lots of phone calls to ORCs/ Chiefs)
  - (Fall) Attempted DBOF/ESCO: Limited Interest
- 2013: Considered Alternatives and Cost Paybacks
- 2014: (Winter) RFP CLT Water Purchased Cogeneration Engine
  - (Summer) NCDEQ CWSRF Loan Funding Approved
- 2015: Final Design and Bidding
- 2016: Construction Begins
March 2017 – Construction Complete!
Main Project Components

- Anaerobic Digester Gas Piping System
- Gas Conditioning System
- 1 MW Cogeneration Engine
- Hot water system
- Electrical improvements with Duke Energy
Completed Construction – Hot Water and Digester Gas Piping
Completed Construction – Gas Treatment System and Hot Water Loop Pumps
Completed Construction – Cogeneration Engine
Completed Construction – Duke Energy Interconnect
Completed Construction – Drone Images
Operations to Date
Operational History

- Official Startup March 10, 2017
- “Sell All” Agreement with Duke Energy
- First few months: working out bugs, completing training
- August – throttle actuator repair
- September – down for 2000 hour maintenance check
- October – Gas quality issue
Operational History (cont)

- 2000 hour maintenance check in September 2017
- Gas Treatment System – Siloxanes Non-Detect after first 6 months of operation
- Passed Stack Test for Air Quality Permit (40CFR 60, JJJJ)
Revenue History to Date

TOTAL NET REVENUE TO DATE = $102,048
Construction Lessons Learned
LESSONS LEARNED

- Combating fears: Cost prohibitive, Enough gas, does not impact permit compliance
  - SRF Loan – Lower Interest, increased loan amount
  - Gas quality better than anticipated and better that engine design
  - Low Heating Value of 600+ BTU/scfm vs. 410 BTU/scfm GE design
  - Improved anaerobic digester gas flow metering – trending gas quality over time

Technical Information

**Proline Prosonic Flow B 200**
Ultrasonic flow measuring system
The device for accurate, reliable biogas measurement under variable process conditions
LESSONS LEARNED

- System Control – Automation vs. Manual
  - Site specific needs
  - Initial manual operation and manual restart
  - Automation features built in for remote control and monitoring
  - Better coordination with GE upfront on number and type of signals (hardwired vs. ethernet)
LESSONS LEARNED

- Working with the Electrical Service Provider
  - Power Purchase Agreements: Negotiating varies
  - Power Utility holds most of the cards – constant communication is needed to minimize surprises.
  - Testing Standards and Startup Requirements
    - Engine Manufacturer preferred transformer configuration
    - IEEE 1547 Single Phase Open Test Requirement
    - Required additional monitoring equipment by Change Order
LESSONS LEARNED


CONSTRUCTION ISSUES SUMMARY

To: Mr. Michael C. Dougherty
Company: Southeastern Consulting Engineers, Inc.
Phone: (704) 523-6045
Fax: N/A

From: Danny Traigle
Company: MET Laboratories Inc.
Phone: 919-481-9319 (or 800-321-4655)
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Date: February 22, 2017
Pages including this page: 3

Reference: Issues Summary – Project SAFN8814

Current Project Status: Inactive
- Awaiting your written response to the following issues
LESSONS LEARNED

- Better alignment of engine pre-purchase and final design
  - Engine stored onsite while final design was completed
  - Extended warranty
Team Effort to Complete NC First WWTP CHP Project!

- CLT Water Engineering and Operations
- CDM Smith
- Southeastern Electrical Consultants
- State Utility Contractors, Inc
- J.T. Yates Electric Service, Inc
- CITI

- NC ACEC Award Winner 2017!
Questions?