Implementing Operational Excellence at GLWA Biosolids Dryer Facility

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Agenda

- GLWA/NEFCO Biosolids Dryer Facility (BDF) Background
  - Water Resource Recovery Facility
  - BDF construction & startup
  - Drying process

- Operational Excellence
  - General Principles
  - Implementing at BDF
GLWA WRRF and BDF Facts

- Service area: 1,079 square miles.
- Serves 40% of MI population - Encompasses Detroit and 76 neighboring communities ~ 3 million people
- One WRRF in the system.
  - Average Daily Flow – 642 MGD
  - Wet Weather Capacity – 1700 MGD
  - Average Biosolids Production – 450 DTPD
  - Peak Biosolids Production – 850 DTPD

*Great Lakes Water Authority officially began operation January 1, 2016*
Drivers for the Biosolids Drying Project

- ACO required peak biosolids capacity = 850 dtpd.
- Little sludge storage at the plant.
- Limited landfill space and offloading capacity.
- Compliance with MACT 129 emission limits by March 2016 required upgrades to MHIs.
- Complex I MHIs from 1940s – at the end of their useful life.
- Desire for a sustainable product.
Existing Solids Processes at the WRRF

- Primary Sludge
  - Gravity Thickening
  - Thickened Sludge Storage
  - Dewatering
    - Centrifuges/BFPs
    - Incineration
      - Ash Disposal
        - MHI Complex I
        - MHI Complex II
    - Off-Load Facility
      - Lime Stabilization
        - Land Application
        - Landfill
  - Ash Disposal
    - MHI Complex II
  - Landfill
  - MHI Complex I
  - MHI Complex II

- Secondary Sludge
  - Gravity Thickening
    - Thickened Sludge Storage
  - Lime Stabilization
  - Land Application
  - Landfill
Selected Technology Option – Thermal Drying

- Primary Sludge
- Secondary Sludge
- Gravity Thickening
- Gravity Thickening
- Thickened Sludge Storage
- Dewatering
  - Centrifuges/BFPs
- Complex II MHIs
  - Incineration
- Off-Load Facility
  - Lime Stabilization
- Land Application
  - Landfill
- MHI Complex I
- MHI Complex II

New Biosolids Drying Facility

Dewatering + Thermal Drying
Located across the street from the WRRF.

Four dryer trains 316 dtpd firm capacity (440 dtpd peak).

Dewatering included in the facility.
Plant Startup

- Demonstration testing occurred in Fall/Winter 2015
  - Close communications and partnership between GLWA and NEFCO for inventory management
  - Culminated in running 4 dryers concurrently for 5 days

- Full scale operations began February 16, 2016
  - Daily sludge processed averages about 250 dry tons with peak of 450
  - Product shipped to Michigan, Ohio, and Ontario
Thermal Drying Technology

- Class A EQ Product with multiple outlets.
- Proven Technology
- Nutrients in biosolids remain available after drying – product suitable for beneficial use
- Nutrients in biosolids not water soluble – No runoff
- No additional need for bulk chemical addition to stabilize cake
The Drying Process

Solids System Components

Air Handling & Emission Controls
Plant Construction & Startup – Now What?
Using Manufacturing principles from the 20th century to establish Operational Excellence at the BDF in 2015.
Operational Excellence Starts with People

NEFCO employed several tactics to identify potential candidates:

- General Paid Job Board Postings (CareerBuilder, LinkedIn, etc.)
- Specific Job Board Postings (Hireavet, MWEA, MITalent, etc.)
- Classified Advertisement Websites (Craigslist, etc.)
- Direct Mailing Service - 5,000 Postcards (career fair advertising within 50 miles)
- Radio (iHeart radio)
- Newspaper (Detroit Free Press)
- Michigan Works (Southgate)
- NEFCO Website
Over 100 People Attended Our Job Fair
Selection Criteria/Process

- Job Fair utilized NEFCO employees from corporate and other plants to quickly screen applicants and move to progressively more detailed interviewing rooms.

- Utilize “targeted” or “selection interviewing” strategies that are behaviorally based and ask for specific examples and experiences based on the premise that past performance predicts future behavior.
  - Value “what you can do” and “how you do it” equally
  - Building a culture of “Dignity and Respect”

- Final Hire Recommendation following Behavioral Screening/General Aptitude Tests
Plant is Built, People are Hired Now What?
Standardize – Create the Foundation

- Operations – Standard Operating Procedures (SOPs)
- Maintenance – Standard Equipment Maintenance Procedures (SEMPs)
  - Draft from Operations & Maintenance Manuals (O&Ms)
  - Input from existing NEFCO plant operators
  - Review with Equipment Builder During Initial Training
  - Include pictures whenever practical
  - Train to the SOPs & Continuously Improve

- Staff/Administration – business processes standard work
  - Input from other NEFCO Plants
  - Table Top Simulations

Over 100 documents written before start up.
5S – Not Housekeeping - Mindset

5S is the organized, relentless, never ending effort to remove all physical waste out of the work place, set things in order, inspect it constantly, and have a culture that promotes, endorses and rewards all of the above, from management to the shop floor.

- Sort
- Set in Order
- Shine
- Standardize
- Sustain
5S – Establishes Professional Mindset

- A place for everything and everything in its place, clean and ready for use
- Organizing the workplace for safe, efficient, standardized operations
- Not just a clean up campaign
- Many benefits associated with 5S principles - safety, quality, efficiency, control, cost, etc..
How to Confirm Standards Are Maintained?
Confirmation Checks – Go to the Floor with Purpose

CHECK – the most frequently overlooked part of PDCA

- Don’t just walk through the plant. Walk and “See” with Purpose.
- Confirm that the projects and standards already established are maintained.
- Provide feedback to help ensure that the standards “mindset” is established.
- Inquire and discuss “why” the standards are not maintained.
- Identify new Continuous Improvement opportunities.
Confirmation Checks – the NEFCO Process

- Six (6) Staff Members alternate Confirmation Check Areas Each Week
- Each Area Contains ~25 Checks or ~150 total items
- Different “set of eyes” each week helps identify new opportunities
- During Confirmation Checks, each person identifies 3-5 new 5S Opportunities
- Action Registers Are Maintained
- Total Time Required – 15-30 min/week
What items are included in Confirmation Checks?

- **Key Safety Compliance Items**
  - Safety Management System
  - Emergency Action Plan
  - LO/TO
  - Global Harmonized System
  - Spill Prevention

- **Red Flag Statements**
  - We're suppose to….
  - I think we……
  - We should be…..

- ** Anything that requires reinforcement to establish natural behaviors**
  - Are roof drains clean & clear?
  - Ask one person if they know where the power outage SOP is located?
  - Verify outside contractor LO/TO is 100% complete and accurate.
  - Verify 1-2 items are properly filed in SDS books.
  - Verify 3 parts in CMMS are in the right location and at the right quantity.
Reliability Centered Maintenance
The Journey Begins

Computerized Maintenance Management System (CMMS)

- Completely Paperless
- 100% Access with Tablets
CMMS (eMaint) – Contribution to Reliability

- Ease of interface
- Customized Dashboards
  - Corrective/PM ratios
  - Overdue Work Orders
  - MTTR/MTBF
- Triggers Events (annual fire drills, inspections, etc.)
- Document Manager – utilized for Quality Mgt System
- Purchase Order System
- Parts Management
- Work Order/PM Ownership
  - Each Mechanic “Owns” a zone and specific PMs
## Asset Management Plan Pillars

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<th>2. Asset Inventory Management</th>
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<td>4. Asset Failure Mode Analysis</td>
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<td>7. Determination of Levels of Service (LOS)</td>
<td>8. Determination of Business Risk (“Criticality”)</td>
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<td>11. Leverage CMMS for Asset Management</td>
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