**2026 Spring Biosolids Symposium**

**March 17, 2026**

# Class A Sludge Management and Monitoring

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Wisconsin Wastewater Operators Association

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# Presentation Outline

- Sludge Classifications (NR 204)
- Potential Sampling Points and Permitted Outfalls
- Sludge Management Plans
- Handling Dust Considerations
- Land Application Considerations

*The intent of this presentation is not a review of compliance, but rather to highlight considerations for operators in managing sludge. We encourage all operators to work with their local WDNR engineer to confirm compliance with their WPDES permit and land application program.*

# Review of NR 204 Establishes Discharge Standards, Monitoring, Record Keeping and Reporting Requirements for Domestic Sewage Sludge

## Chapter NR 204

## DOMESTIC SEWAGE SLUDGE MANAGEMENT



*"The beneficial use of sewage sludge and its recycling to the land as a fertilizer or soil conditioner is encouraged, rather than disposing of sludge through incineration or landfilling." [NR 204.01]*

# Metals Concentrations Are the First Categorical Sludge Requirement Before Sludge May be Applied to Land

**Table 1**
**Ceiling Concentrations**

| Pollutant | Ceiling concentrations (milligrams per kilogram—ppm) (dry weight) |
|---|---|
| Arsenic | 75 |
| Cadmium | 85 |
| Copper | 4300 |
| Lead | 840 |
| Mercury | 57 |
| Molybdenum | 75 |
| Nickel | 420 |
| Selenium | 100 |
| Zinc | 7500 |

- No land application if above ceiling
  - Landfill or incineration

**Table 3**
**Pollutant Concentrations**

| Pollutant | Monthly average concentrations (milligrams per kilogram—ppm) (dry weight) |
|---|---|
| Arsenic | 41 |
| Cadmium | 39 |
| Copper | 1500 |
| Lead | 300 |
| Mercury | 17 |
| Molybdenum | Deleted Until EPA Revises |
| Nickel | 420 |
| Selenium | 100 |
| Zinc | 2800 |

- Sludge considered “high quality” if meeting all concentration limits
- Exempt from meeting cumulative loading limits

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# Class B Versus Class A Determination is Based on Pathogen Densities and Treatment Processes

**Table 6**
**Class B**

| Parameter | Unit | Limit |
|---|---|---|
| Fecal Coliform | MPN or CFU/g TS | 2,000,000 |
| OR ONE OF THE FOLLOWING PROCESS OPTIONS | | |
| Aerobic Digestion | Air Drying | |
| Anaerobic Digestion | Composting | |
| Alkaline Stabilization | PSRP Equivalent | |

- No land application if Class B conditions are not met

**Table 5**
**Class A**

| Parameter | Unit | Limit |
|---|---|---|
| Fecal Coliform | MPN/g TS | 1000 |
| or | | |
| Salmonella | MPN/4g TS | 3 |
| AND, ONE OF THE FOLLOWING PROCESS OPTIONS | | |
| Temp/Time based on % Solids | Alkaline Treatment | |
| Prior test for Enteric Virus/Viable Helminth Ova | Post test for Enteric Virus/Viable Helminth Ova | |
| Composting | Heat Drying | |
| Heat Treatment | Thermophilic Aerobic Digestion | |
| Beta Ray Irradiation | Gamma Ray Irradiation | |
| Pasteurization | PFRP Equivalent Process | |

- Pathogen densities must be met immediately after treatment AND at time of disposal

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# Vector Attraction Reduction Must Also Be Satisfied Prior to Land Application of Sewage Sludge

One of these must be met to be considered exceptional quality

Focus of today's presentation

**Table 7**
**Vector Attraction Reduction**
**(One of the following shall be satisfied)**

| Option | Limit | Where/When Requirements Must Be Met |
|---|---|---|
| Volatile Solids Reduction | ≥38% | Across the process |
| Specific Oxygen Uptake Rate | ≤1.5 mg $O_2$/hr/g TS | On aerobic stabilized sludge |
| Anaerobic benchscale test | <17% VS reduction | On anaerobic digested sludge |
| Aerobic benchscale test | <15% VS reduction | On aerobic digested sludge |
| Aerobic Process | >14 days, T >40°C and avg T >45°C | On composted sludge |
| pH adjustment | >12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours) | When applied or bagged |
| Drying without primary solids | >75 % TS | When applied or bagged |
| Drying with primary solids | >90 % TS | When applied or bagged |
| Equivalent process | Determined by the department | Varies with process |
| Injection | — | When applied |
| Incorporation | — | When applied |

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# Higher Quality Sludge in All Three Categories Must Be Satisfied to be Considered EQ Sludge

**Table 3**
**Pollutant Concentrations**

| Pollutant | Monthly average concentrations (milligrams per kilogram—ppm) (dry weight) |
|---|---|
| Arsenic | 41 |
| Cadmium | 39 |
| Copper | 1500 |
| Lead | 300 |
| Mercury | 17 |
| Molybdenum | Deleted Until EPA Revises |
| Nickel | 420 |
| Selenium | 100 |
| Zinc | 2800 |

**Table 5**
**Class A**

| Parameter | Unit | Limit |
|---|---|---|
| Fecal Coliform | MPN/g TS | 1000 |
| or | | |
| Salmonella | MPN/4g TS | 3 |
| AND, ONE OF THE FOLLOWING PROCESS OPTIONS | | |
| Temp/Time based on % Solids | Alkaline Treatment | |
| Prior test for Enteric Virus/Viable Helminth Ova | Post test for Enteric Virus/Viable Helminth Ova | |
| Composting | Heat Drying | |
| Heat Treatment | Thermophilic Aerobic Digestion | |
| Beta Ray Irradiation | Gamma Ray Irradiation | |
| Pasteurization | PFRP Equivalent Process | |

**Table 7**
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**(One of the following shall be satisfied)**

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| Drying without primary solids | >75 % TS | When applied or bagged |
| Drying with primary solids | >90 % TS | When applied or bagged |
| Equivalent process | Determined by the department | Varies with process |

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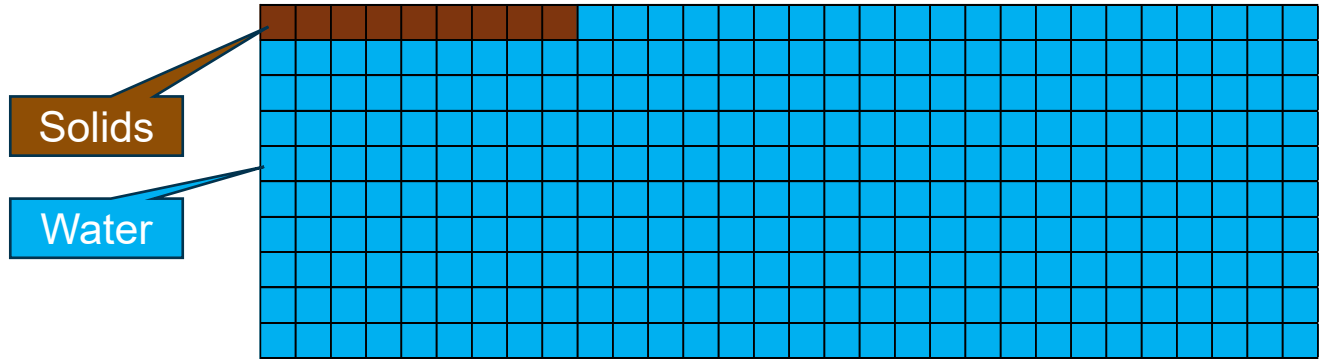
# EQ Sludge Reduces Some Restrictions When Disposing of Sludge

- State boundary restrictions (imported sludge)
- Land application site evaluation information report
- Bulk sludge land application records report
- Notification reports
- Site approval
- Operational and site or field requirements

# Volume Reduction Remains the Primary Driver for Biosolids Drying

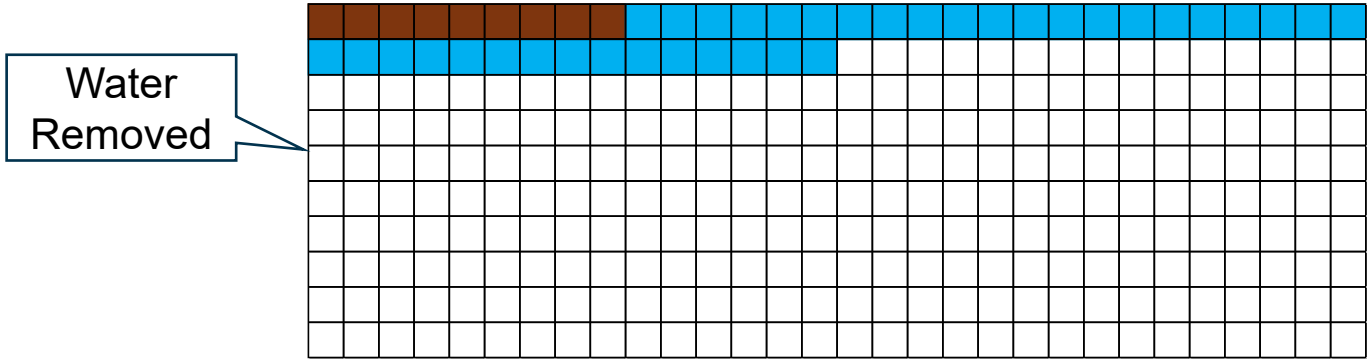
Liquid sludge (3% TS)

- 3,000 ton/yr
- 90 dry ton/yr



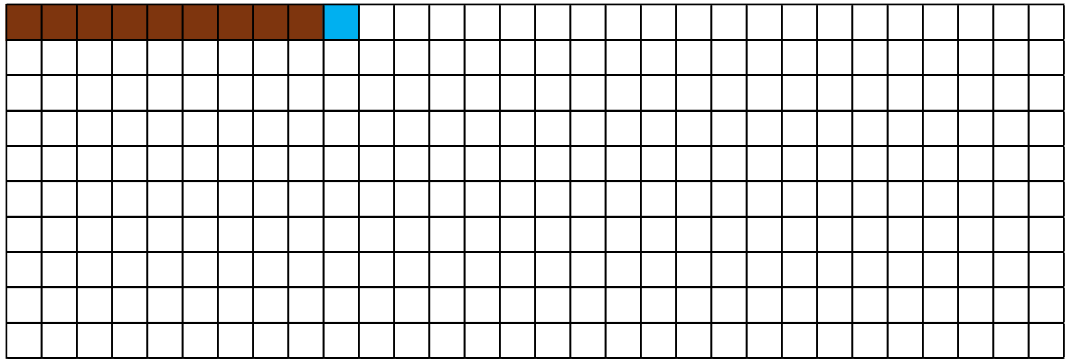

Dewatered sludge (20% TS)

- 450 ton/yr (85% reduction)
- 90 dry ton




Dried biosolids (90% TS)

- 100 ton/yr (97/78% reduction)
- 90 dry ton



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# Overview of Biosolids Drying Process

Anaerobic digesters (Stevens Point, WI)

Dewatering centrifuges (Fond du Lac, WI)

Dewatered cake hopper (River Falls, WI)

Biosolids dryer (River Falls, WI)

Dried biosolids storage silo (River Falls, WI)

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# Anaerobic Digested Sludge (*Outfall 002*)

- Class B liquid sludge
- ~2.5% total solids
- Sample from digester effluent sample ports
- Note that additional outfalls may be permitted if mechanical thickening is installed or land application is being taken from a separate sludge storage tank

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# Dewatered Cake (*Outfall 003*)

- Class B dewatered sludge
- ~16-25% total solids
- Sample from conveyor drop points or dewatered cake hopper piping

# Dried Biosolids (*Outfall 004*)

- Class A heat-dried biosolids
- 90% total solids
- Sample from dryer discharge immediately after treatment

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# Dried Biosolids Storage Silo (*Outfall 005*)

- Class A heat dried biosolids
- 90% total solids
- Sample from storage silo discharge

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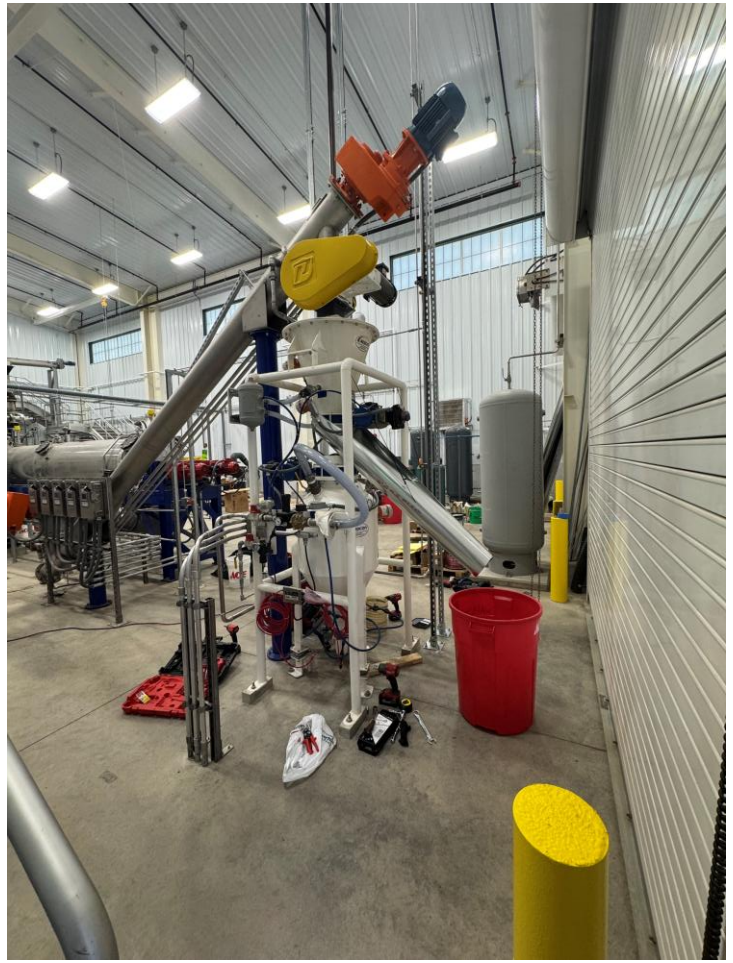
# Dried Biosolids Dust (*Outfall 006)*

- Class A heat dried biosolids
- 90% total solids
- Sample from dust collector

# Dried Biosolids Emergency Outfall (*Outfall 007)*

- Class A heat dried biosolids
- 90% total solids
- Used if storage silo is out of service



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# Sludge Characterization and Sampling Requirements

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# For Each Outfall, Your Permit Will Identify Sampling Requirements for Lists 1, 2, 3, and 4

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Nickel Dry Wt | Ceiling | 420 mg/kg | Quarterly | Composite | |
| Nickel Dry Wt | High Quality | 420 mg/kg | Quarterly | Composite | |
| Selenium Dry Wt | Ceiling | 100 mg/kg | Quarterly | Composite | |
| Selenium Dry Wt | High Quality | 100 mg/kg | Quarterly | Composite | |
| Zinc Dry Wt | Ceiling | 7,500 mg/kg | Quarterly | Composite | |
| Zinc Dry Wt | High Quality | 2,800 mg/kg | Quarterly | Composite | |
| Nitrogen, Total Kjeldahl | | Percent | Quarterly | Composite | Sample only if sludge will be land applied, not landfilled. |
| Nitrogen, Ammonium ($NH_4$-N) Total | | Percent | Quarterly | Composite | Sample only if sludge will be land applied, not landfilled. |
| Phosphorus, Total | | Percent | Quarterly | Composite | Sample only if sludge will be land applied, not landfilled. |
| Phosphorus, Water Extractable | | % of Tot P | Quarterly | Composite | Sample only if sludge will be land applied, not landfilled. |
| Potassium, Total Recoverable | | Percent | Quarterly | Composite | Sample only if sludge will be land applied, not landfilled. |

| Other Sludge Requirements | |
|---|---|
| **Sludge Requirements** | **Sample Frequency** |
| **List 3 Requirements – Pathogen Control:** The requirements in List 3 shall be met prior to land application of sludge. | **Annual** |
| **List 4 Requirements – Vector Attraction Reduction:** The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4. | **Annual** |

- List 1 – Total Solids and Metals
- List 2 – Nutrients (TKN, Ammonia, Phosphorus, etc.)
- List 3 – Pathogen Control (Confirming Class A or B)
- List 4 – Vector Attraction Reduction

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# Permits Have Started to Implement Sampling and Reporting Sludge Samples for PFAS

- Later presentations on today's agenda cover this in more detail
- Refer to your current permit and most recent WDNR interim strategy guidelines

# Operations for Class A Compliance

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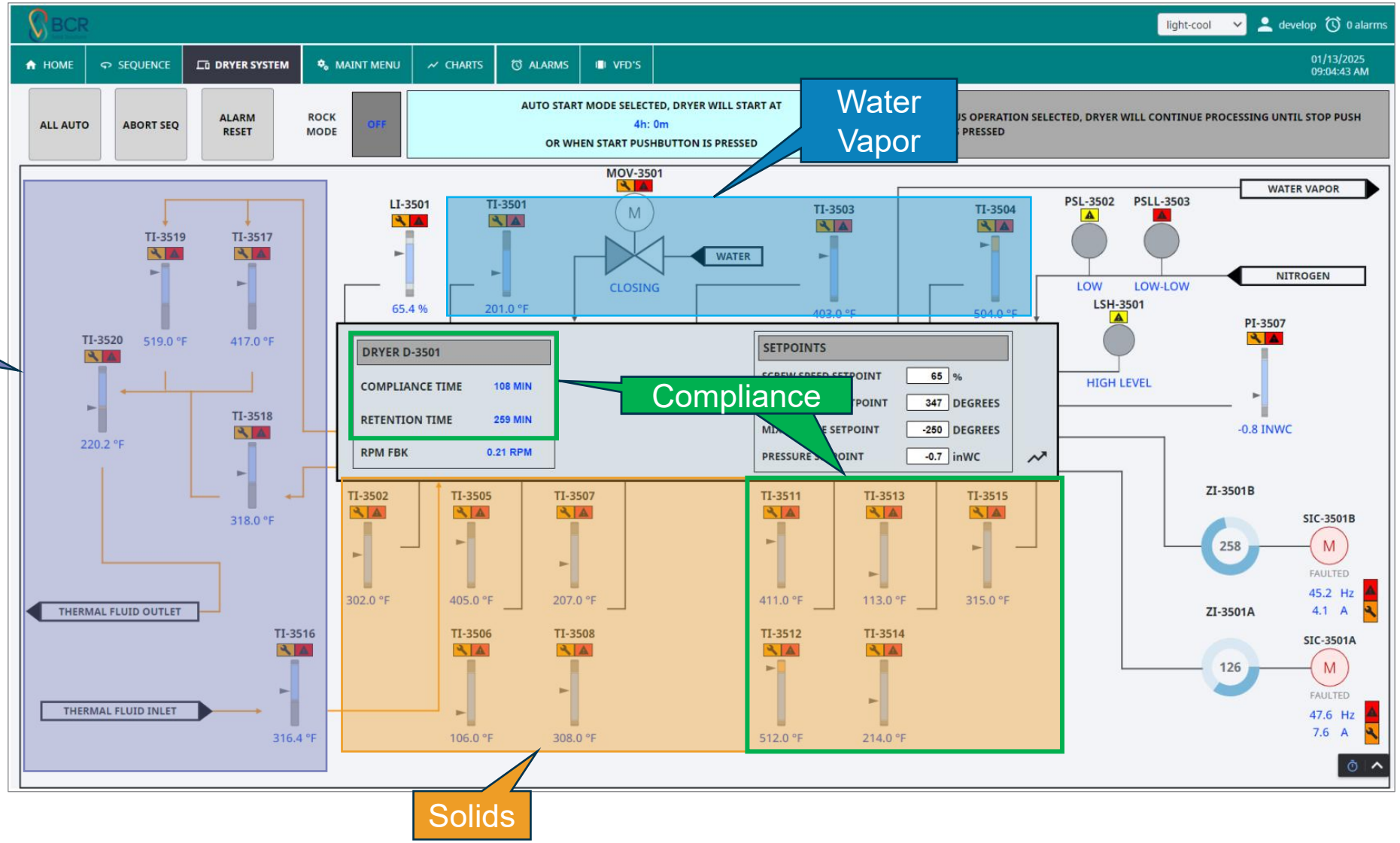
# Understanding the System's Monitoring Process Is Critical to Demonstrating Class A Compliance

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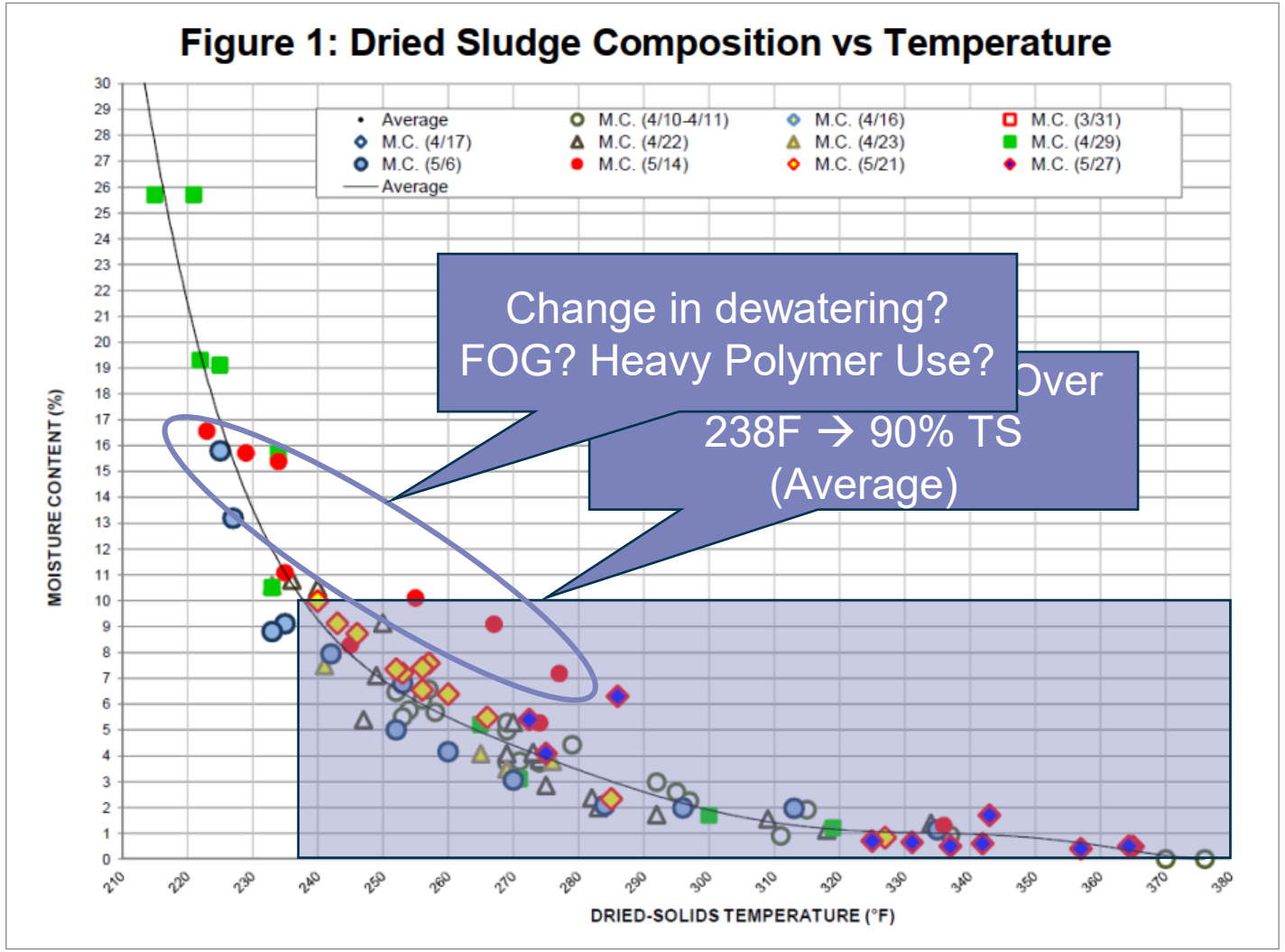
# Dried Sludge Discharge Temperature Correlates to Moisture Content

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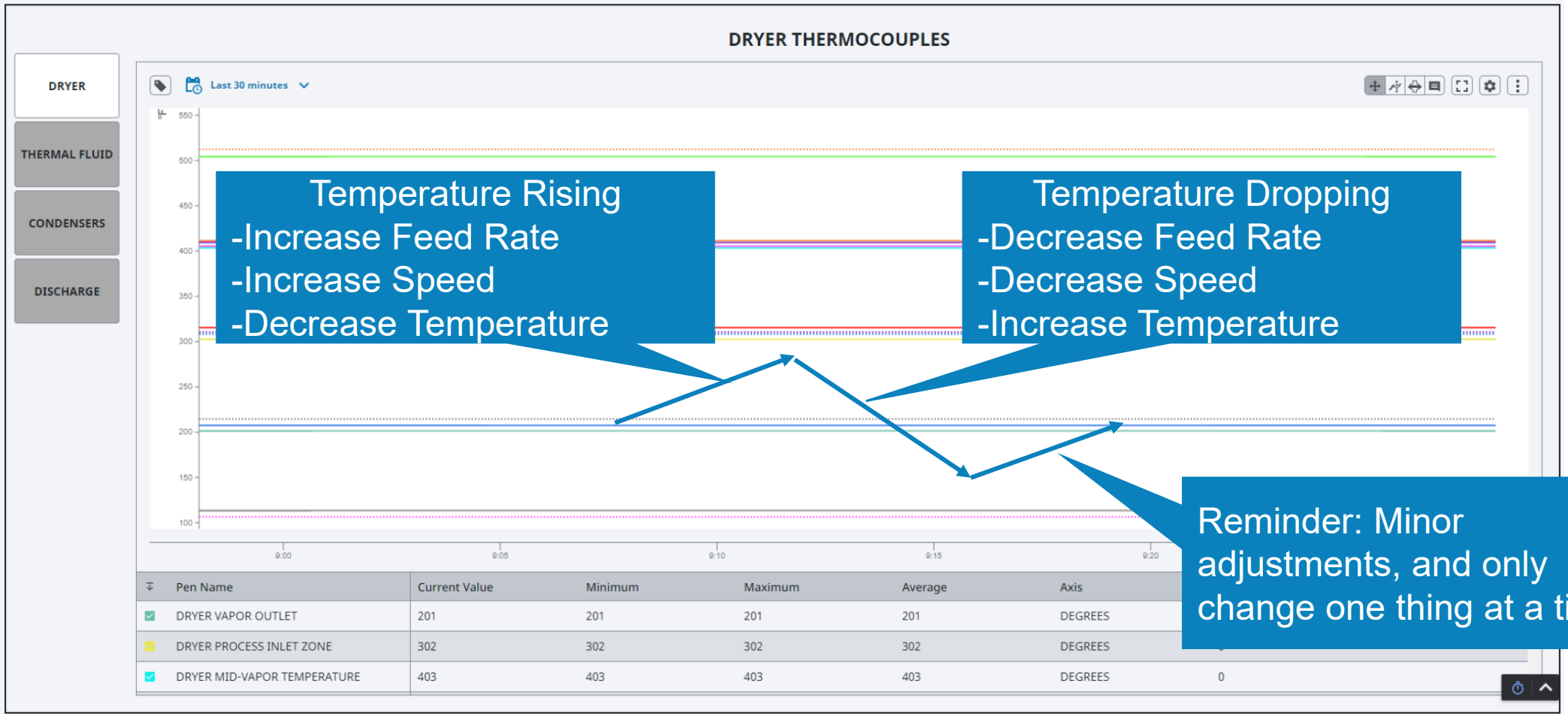
# Thermocouple Trendlines Allow for Operator Adjustments




*Source: BCR*

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# Dried Biosolids Handling and Storage

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# Three Primary Storage Alternatives Are Available for Dried Product

- 180-day requirement
  - Contracts?
  - Off-site storage?
- Dust
- Operations

Floor, dumpster, etc.

Bagging/super sacks

Silo

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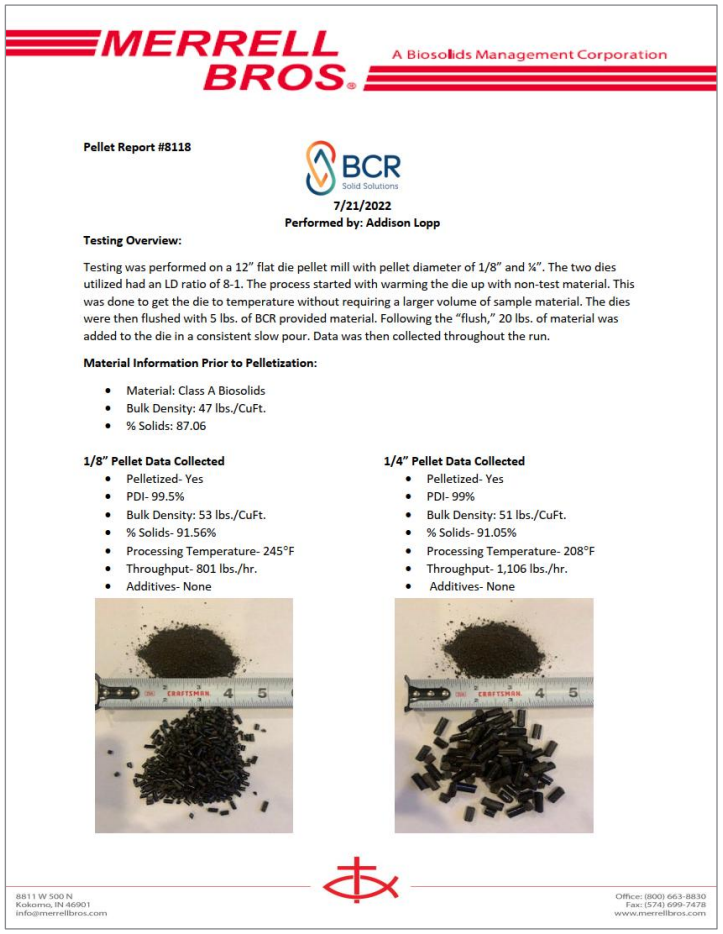
# NFPA 820 Considerations and Dust Exposure

- Class I – gas
  - Ventilation
- Class II – dust
  - Within dryer/storage – Division 1
  - Within 10 feet – Division 2
- Dust hazard analysis


*Source: NFPA*


MERRELL BROS. A Biosolids Management Corporation

**Pellet Report #8118**

BCR Solid Solutions

**7/21/2022**

**Performed by: Addison Lopp**

**Testing Overview:**

Testing was performed on a 12" flat die pellet mill with pellet diameter of 1/8" and ¼". The two dies utilized had an LD ratio of 8-1. The process started with warming the die up with non-test material. This was done to get the die to temperature without requiring a larger volume of sample material. The dies were then flushed with 5 lbs. of BCR provided material. Following the "flush," 20 lbs. of material was added to the die in a consistent slow pour. Data was then collected throughout the run.

**Material Information Prior to Pelletization:**

- Material: Class A Biosolids
- Bulk Density: 47 lbs./CuFt.
- % Solids: 87.06

**1/8" Pellet Data Collected**

- Pelletized- Yes
- PDI- 99.5%
- Bulk Density: 53 lbs./CuFt.
- % Solids- 91.56%
- Processing Temperature- 245°F
- Throughput- 801 lbs./hr.
- Additives- None

**1/4" Pellet Data Collected**

- Pelletized- Yes
- PDI- 99%
- Bulk Density: 51 lbs./CuFt.
- % Solids- 91.05%
- Processing Temperature- 208°F
- Throughput- 1,106 lbs./hr.
- Additives- None

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**Dust Hazard Analysis Report Excerpt** *Source: BCR*

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# Land Application Considerations

- Sludge needs to be EQ if it is to be used on lawns or home gardens
- Different application equipment for liquid or cake sludge
- Additional uses pending WDNR approval (partial list)
  - Highway right of ways
  - Final cover at landfills
  - Restoration of construction sites
- Generator maintains responsibility

**Professional landscapers**

**Community pick-up**

**Land application**

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# Sludge Management Plan Summarizes Biosolids Operations and is Typically Required as a WDNR Reporting Submittal

- Sewage sludge information
- Outfalls
- Sludge characterization
- Sludge transport
- Land spreading site submittal procedures for requesting new sites
- Land spreading

# Summary

- Biosolids dryers continue to be a common trend in Wisconsin and Midwest region
- Monitoring requirements are critical to demonstrating Class A or EQ sludge
- Engage WDNR early and often in the process of implementing Class A via drying
- Think about Sludge Management Plan development throughout design, construction, startup phases

# Questions?

Source: © marish – vectorstock.com

**Thank you for listening!**

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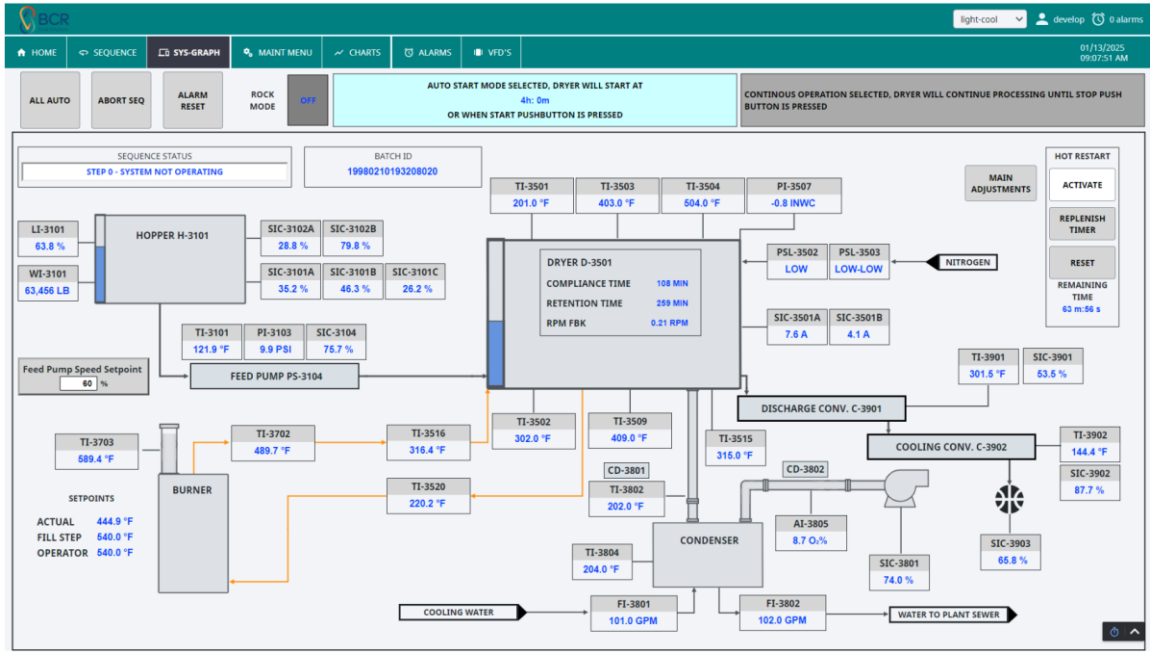
*Excellence in Engineering*SM

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