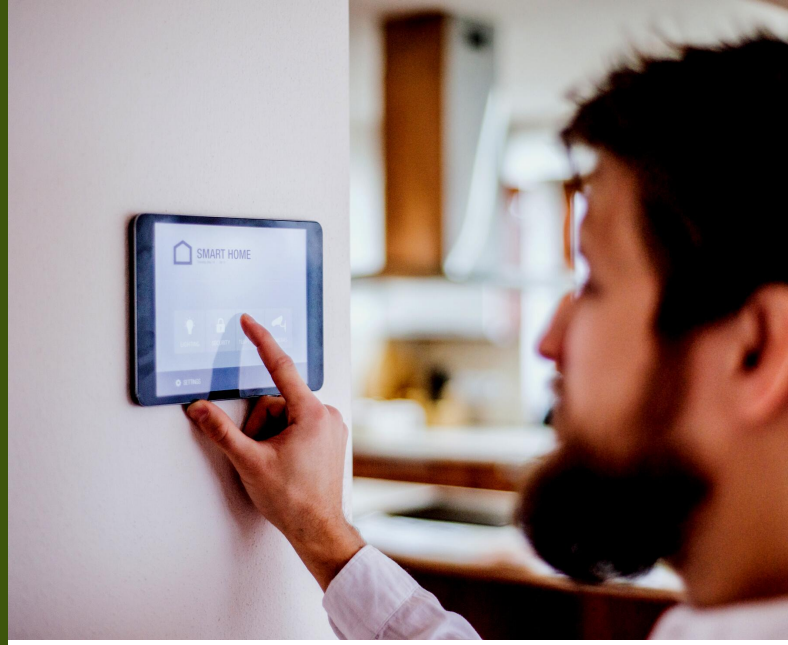
GRAND RAPIDS 2030 DISTRICT

CANNABIS WEBINAR SERIES

TWEAKING THE MARGINS: HOW CONTROLS SET YOU UP FOR A BETTER YIELD AND A LEANER OPERATING BUDGET

Brandy Keen | Surna



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INTRODUCTIONS

Moderator:

Gillian Giem, Program Manager,

Grand Rapids 2030 District

Speaker:

Brandy Keen, Co-Founder/Senior Technical Advisor,

Surna

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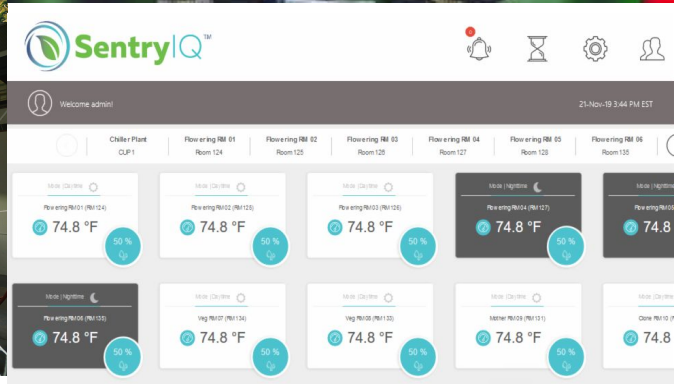
CONTROLS AND AUTOMATION

- Controls: Enabling critical functions in the facility
- Data Collection: Collecting data relevant to critical functions in the facility
- Automation: Performance of critical functions in the facility

MOST COMMONLY CONTROLLED

- Lighting
- HVAC
- CO_2
- Alarms
- Irrigation



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LEVELS OF SOPHISTICATION

What's Out There?

Basic

On/off
Limited data collection

Intermediate

Modulating
Some data collection

Advanced

Modulating
Full data collection
Analytics

In general, controls will remove the “human” element from cultivation operations, minimizing the impact of mistakes and ensuring what’s supposed to happen, happens; when and how it’s supposed to happen.

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BUILDING MANAGEMENT SYSTEMS (BMS)

- Used in a number of industrial applications and large scale buildings
  - Airports
  - Hospitals
  - Manufacturing

- Not widely used in cultivation operations
  - Controls largely limited to on/off (entry level)

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DASHBOARDS ARE NOT CONTROLS

- Satisfied/not satisfied - send signal to “turn on” or “turn off”
- Displays room parameters
- Generally acceptable for lighting, irrigation, CO_2
- Common dashboards unacceptable for high quality HVAC systems
  - Do not actually control modulating functions
  - Do not display or provide all relevant information
  - Not capable of performing full controls sequence of operations

OPERATING EXPENSE BENEFITS

FOR LIGHTING

BENEFITS FOR OPEX - LIGHTING

- Saving money with basic systems
  - Stage lighting on/off to reduce peak demand
- Saving even more money with more sophisticated systems
  - Stage lighting based on optimal PPFD for plant growth stage (based on timing or lighting sensor)

BENEFITS FOR OPEX- LIGHTING CONT'D

- Saving even more money with more sophisticated systems
  - LED lighting can be adjusted incrementally
    - Provides a consistent PPFD

Note: Not generally advised for HID lighting

OPERATING EXPENSE BENEFITS

FOR HVAC

BENEFITS FOR OPEX - HVAC

- Saving money with basic systems
  - Ensuring that set points are appropriate for the photoperioc (removing human element)
  - Staging equipment
  - Knowing when something is out of whack

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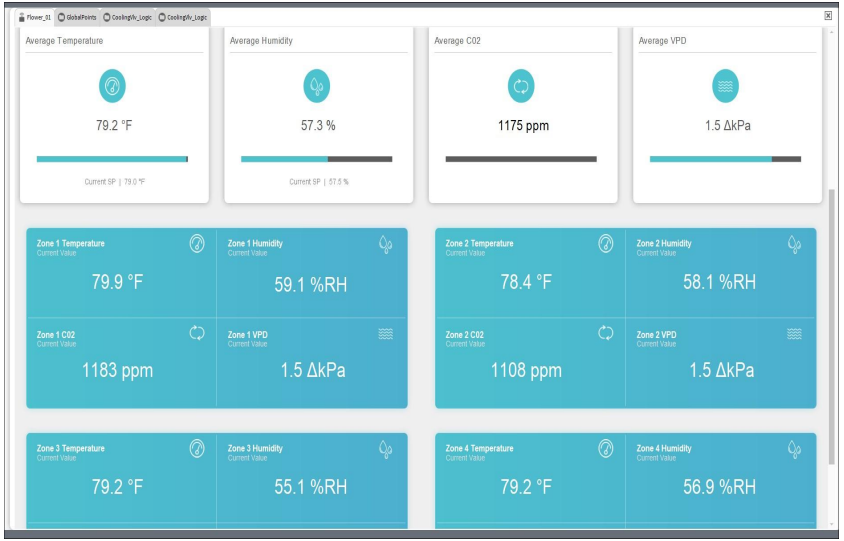
BENEFITS FOR OPEX - HVAC CONT'D

- Saving even more money with more sophisticated systems
  - More sophisticated HVAC systems
  - Modulate all functions (cruise control vs. stop and go traffic)
  - Extreme precision

BENEFITS FOR OPEX - HVAC CONT'D

- Saving even more money with more sophisticated systems
  - Utilize multiple sensors to ensure homogeneity



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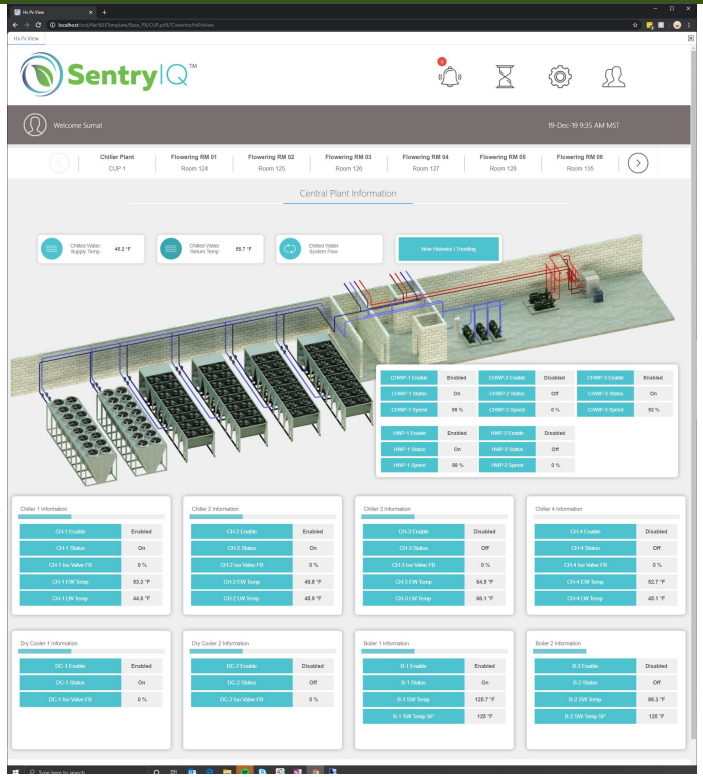
BENEFITS FOR OPEX - HVAC CONT'D

- Saving even more money with more sophisticated systems
  - Operating status and energy use of each piece of equipment



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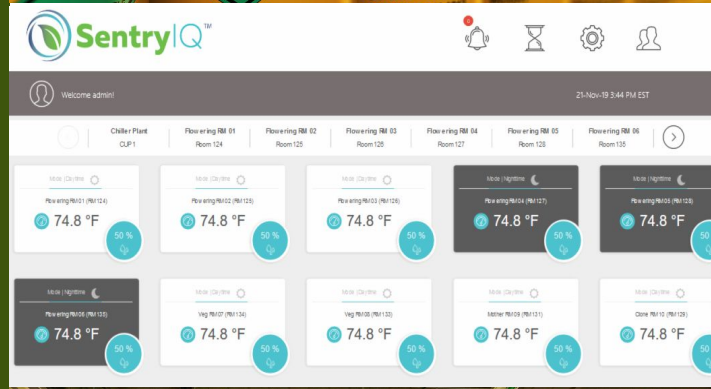
BENEFITS FOR OPEX - HVAC CONT'D

- Maintenance (use less energy and/or avoid early failure)
- Operating adjustments to reduce energy use
- Perfect sequence of operations

OPERATING EXPENSE BENEFITS

FOR CO_2
ALARMS
IRRIGATION/FERTIGATION



BENEFITS FOR OPEX - CO2

- Maximize yield, minimize expenses
- Homogenize CO_2 levels throughout grow
- Level out swings in PPM

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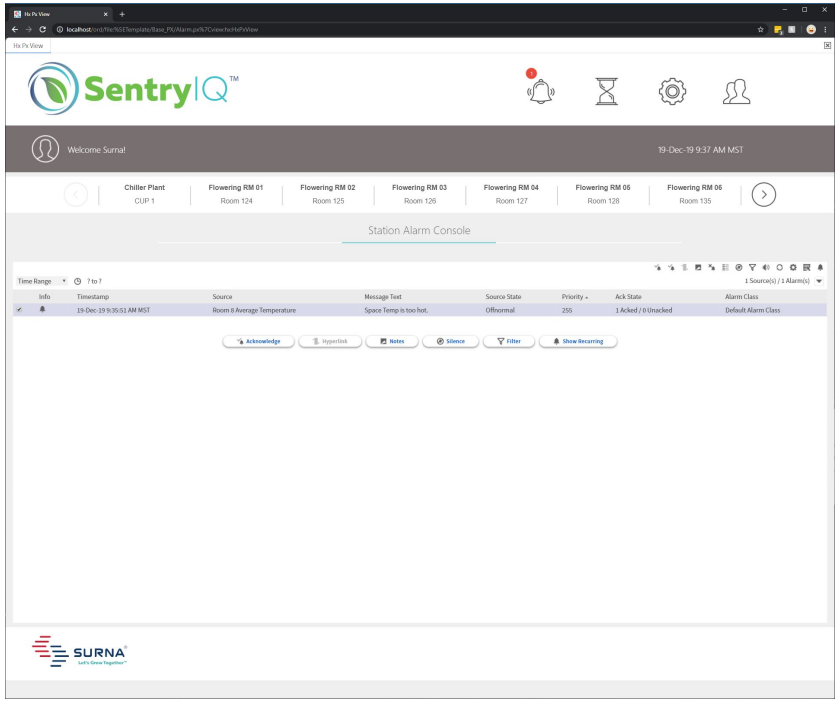
BENEFITS FOR OPEX - ALARMS

- Saving money with basic systems
  - Understanding when something is wrong in the cultivation space
- Saving even more money with more sophisticated systems
  - Understanding when something is wrong with a piece of equipment, before it impacts the cultivation space
  - Maintain ahead of failure, improve longevity

BENEFITS FOR OPEX - ALARMS

- Saving even more money with more sophisticated systems
  - Understanding when something is wrong with a piece of equipment, before it impacts the cultivation space



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BENEFITS FOR OPEX - IRRIGATION/FERTIGATION

- Saving money with basic systems
  - Reducing manpower associated with irrigation
- Saving even more money with more sophisticated systems
  - Reducing runoff
  - Reducing nutrient use

ANALYTICS

MANUALLY OR THROUGH ANALYTICS COMPANIES

ANALYTICS

- How to use analytics
  - Revenue and yields
  - Performance and yields of varying PPFD to maximize production
  - Understanding correlations between seemingly unrelated events

ANALYTICS CONT'D

- More ways to use analytics
  - Reviewing anomalies when harvests are particularly good/bad to identify a pattern
  - Reviewing energy performance related to cultivation operations
  - Perfecting processes to boost yields

ANALYTICS CONT'D

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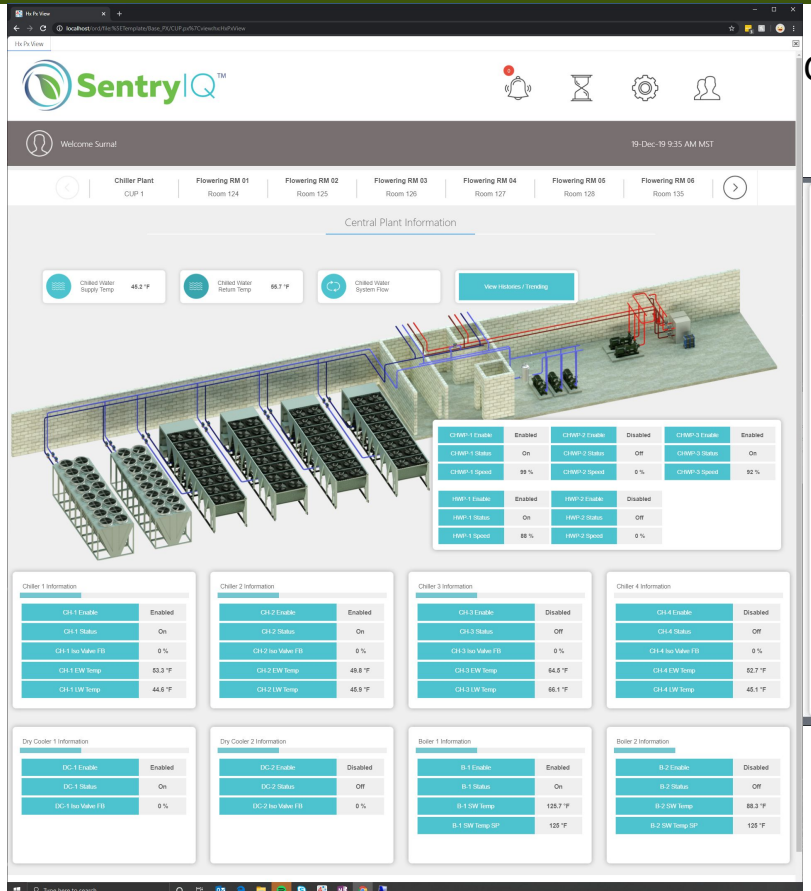

Central Plant

Single Room

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QUESTIONS?

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