315 -Best Practices for Plant Optimization

Change is Good!

1

315 - "Best Practices" for Plant Organization & Operations

This session will examine Texas Tech University's approach to optimizing central plant utility production. The session will begin with a discussion of the ongoing journey of continuous improvement. It will focus on the strategy used to achieve cost savings even after what was thought to be the low hanging fruit was had. This class will review both a plant and larger scale campus, data driven, approach to optimization practices where seasonal operating matrices are adjusted based on data collected. This concept can be applied in other areas of facilities management where data is collected but not made actionable.

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Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

AIA Continuing Education Provider

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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Course Description

This course provides an overview of best practices for central utility plant optimization. Examples from Texas Tech University's ongoing journey of continuous improvement at its Central Heating & Cooling Plants will be presented.

Learning Objectives

1. Establish Operational Baselines
2. You've got the data, now let's use it!
3. The need for Continuous Improvement

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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Background

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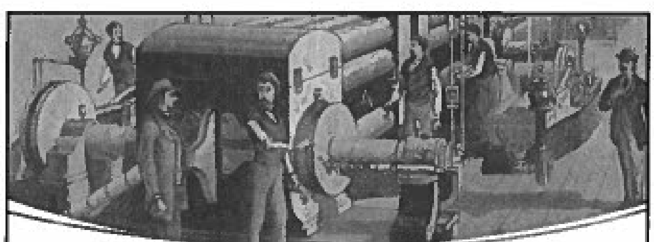

- 1882 - Thomas Edison opens the world's first power plant

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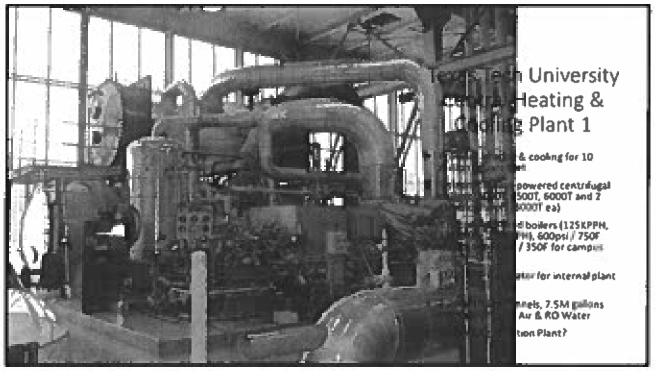
University
Heating &
Plant 1
& cooling for 10
powered centrifugal
500T, 6000T and 2
boilers (125KPPH,
600psi / 750F
/ 350F for campus
for internal plant
7.5M gallons
Air & RO Water
Plant?

7


TTU CHACP1 Safety Video
Video

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Establishing Operational Baselines

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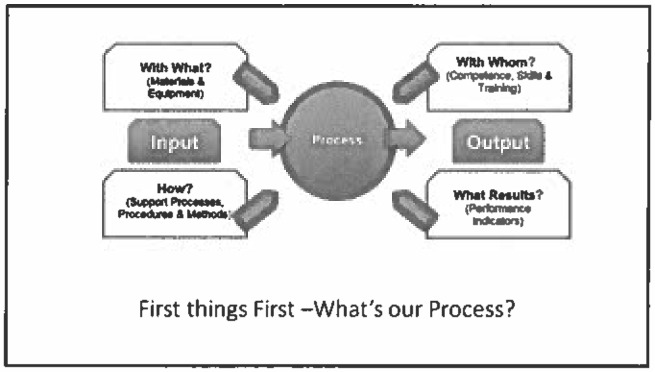
With What?
(Materials & Equipment)
With Whom?
(Competence, Skills & Training)
Input
Process
Output
How?
(Support Processes, Procedures & Methods)
What Results?
(Performance Indicators)
First things First –What's our Process?

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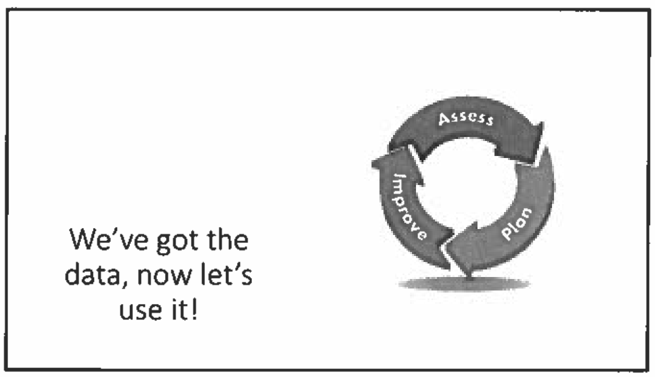
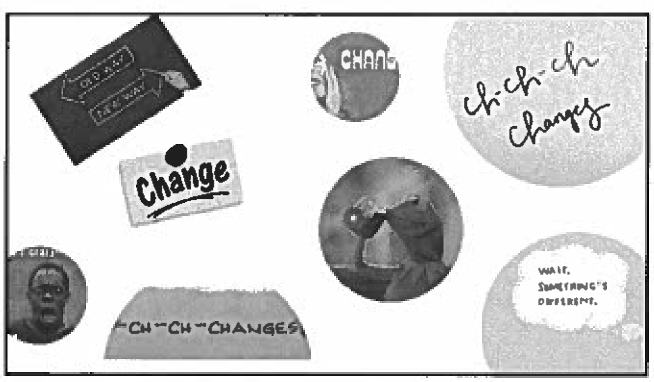

Assess
Plan
Improve
We've got the data, now let's use it!

11


Change
-CH-CH-CHANGES

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Change according to TTU Utilities

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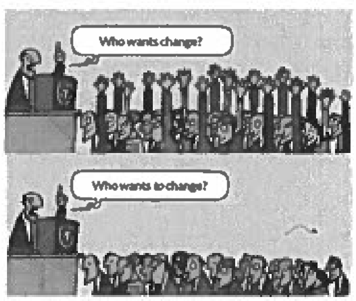
The truth about Change



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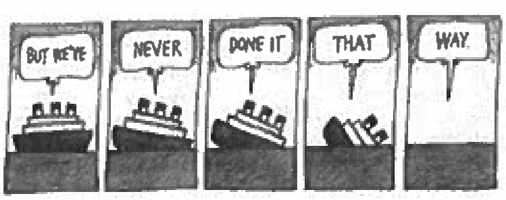

How do I know when change is necessary?

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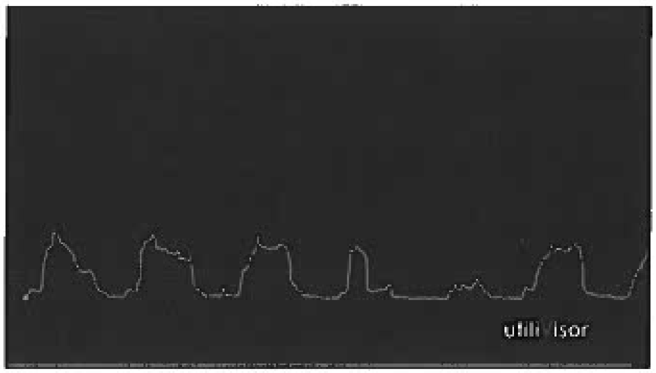

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AGENDA

A. Plant Operating Costs and Savings
B. Chilled Water Optimization
C. Utilizing Performance Metrics in Real Time

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Plant Operating Costs and Savings

- Average Cost to Generate Chilled Water/Year ~$4.5M (CHACP 1 and 2)
- Through continuous monitoring and improvement within the past 3 years (with re-established baseline), TTU has saved $1,040,379 or 8% in generation costs without major capital expenditures.

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Chilled Water Optimization

utiliVisor

- Implemented Chilled and Condenser Water Reset Schedules based on seasonal load profiles and building schedule requirements.
  - Linear Temperature Resets for both Chilled and Condenser Water
    - Increased both Chiller and Auxiliary Efficiencies
  - Differential Pressure Resets for both Chilled and Condenser Water.
    - Individual building loads were monitored to ensure discharge temperatures were being maintained in addition to sustaining increased CHW Delta Ts.
- Utilizing software to forecast tonnage and performance models, operators were able to refine Chiller sequence/staging (while still meeting campus demand) based on cost and efficiency.

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Utilizing Performance Metrics in Real Time

utiliVisor

- CHWP/Chiller Sequencing from CHWP kW/ton and GPM/Ton
  - Utilizing these metrics, building outliers were identified and corrected.
  - Ex. High CHWP GPM/Ton identified CHW Control Valve tuning issue.
- CWP/Chiller Sequencing vs. load vs. Header Pressure
  - Identified higher head pressures had no additional flow output.
  - Operators are now cognizant of when pressure increases, therefore reduce pump speeds/# of Cooling Tower Cells
- Chiller Performance vs. Design (and year over year) to modify sequence based on improvements

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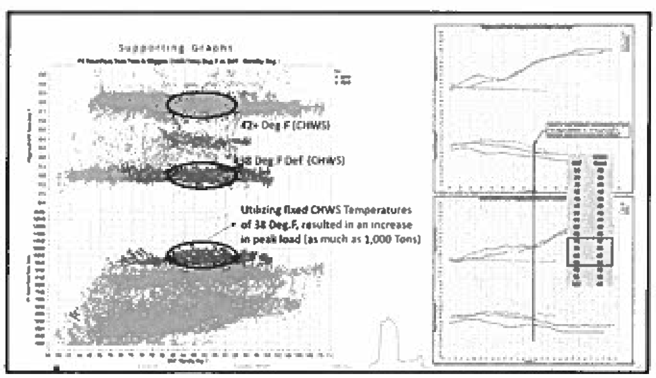

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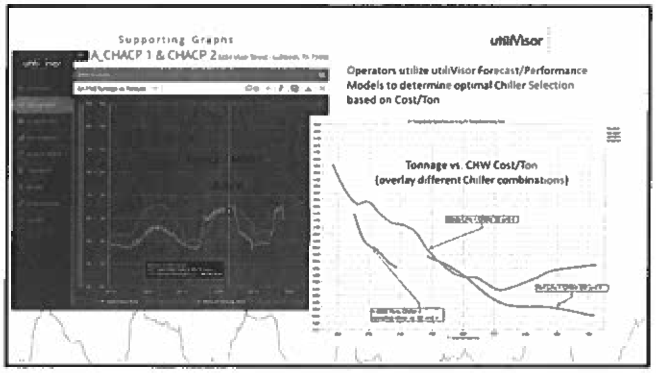
Supporting Graphs
utiliVisor
A_CHACP 1 & CHACP 2
Operators utilize utiliVisor Forecast/Performance Models to determine optimal Chiller Selection based on Cost/Ton
Tonnage vs. CHW Cost/Ton
(overlay different Chiller combinations)

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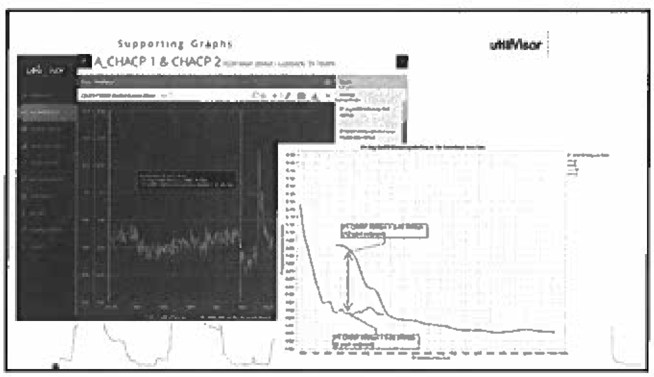
Supporting Graphs
utiliVisor
A_CHACP 1 & CHACP 2

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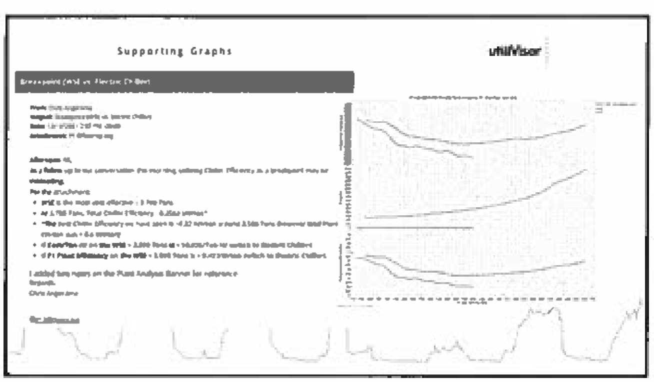
Supporting Graphs
utiliVisor

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