Improvement and Integration in High Efficiency Equipment to Reduce Energy Cost

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Abstract

- *The application of improved models of energy management is vital, because it generates continuous improvement, optimizes energy efficient and strengthens the culture of preservation. Incorporating Energy Efficiency aims to optimize the consumption and use of energy required, and the overall energy performance of the project or process operation stage through implementation and application of best practices and technologies for the efficient use of energy. The article illustrates an example of improving efficiency with the integration of new refrigeration equipment in energy management for Energy Cost Reduction made on EATON facilities at Arecibo, Puerto Rico.*

Background

- This article aims to show the way for optimal energy management in the cooling area on Eaton Facilities at Arecibo PR. The process of improving energy efficiency gravitates on a structured continuous improvement process that is supported by management based on data collected and monitoring consumption. Fortunately, energy flows are measurable, therefore, proper management can only be done through data and analysis tools that transform them into information to make operational decisions and change strategies aimed all of them to reduce consumption and energetic cost.

Project Description

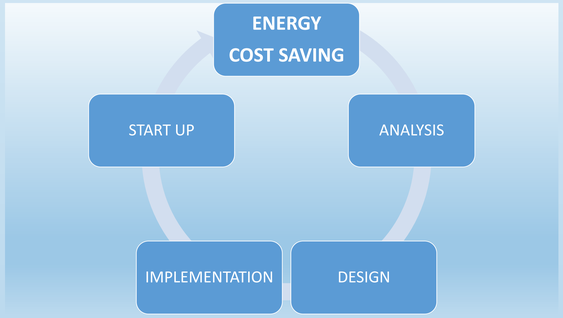
- The focus of this project is to replace damaged and unused air conditioning equipment with new chilled water Air Handling Unit at Eaton Arecibo. The Assembly area is over 52,000 square feet and is currently cooled with air cooled conventional split type air conditioning units. Chilled water can be transferred over long distances more efficiently than Freon. A new water cooled chiller will greatly increase capacity and efficiency and 2 more AHU's will be installed to significantly reduce energy consumption

Objective

- The principal objective of this project is to achieve Energy Costs Reduction by 20% percent compared to last year Consumption.

Methodology

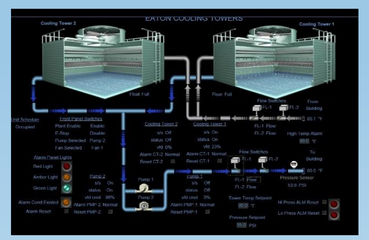
- The methodology used for the development of this project is clearly explained in next Figure. The first phase an analysis of the current system is based to identify areas for improvement. Then the new design based on the expected savings is established and implemented. Finally, start-up the implemented design and results are analyzed.



Analysis Approach

- **Current Design**
- The current design is based on a system using air cooled chiller. There are two 100 Ton manufactured by TRANE. The current design also included eight 30 Ton Air Handle Units manufactured by YORK.

- **New Design**
- A new water cooled chiller will greatly increase capacity and efficiency and 4 more AHU's will be installed to significantly reduce energy consumption. For this new design, Cooling Towers were integrated as part of the necessary cycle for a chilled Water.



Project Cost

- The investment for this project includes the purchase of a water-cooled chiller 300 Ton, a cooling tower 275 Ton capacity and four air handlers cooled water for a total of $ 200,000.

Assets to be acquired	Cost ($K)
300 Ton Chiller – Water Cooled	80
275 ton CT	35
(4) x 30 Ton Chilled Water AHU	30
Installation	55
Total	**200**

Results

- The efficiency of the chillers verses the older HVAC units is > 25% more efficient and will reduce energy consumption at least 765,818 kWh each year. These are very conservative calculations and are based on industry standards for comparison of Energy Efficiency Ratings (EER). 765,818.18kWh x $0.24 (AEE charge/kWh) = $183,796 per year in energy savings. Also, the results as to the temperatures obtained with this new design were as expected. Now with the integration of these new air handlers are meeting the set point temperatures. That mean not only saved energy also obtaining a more stable temperature zone.

Conclusions

- No negative marketing effects are expected of this project. The volumes of the operation are forecasted to increase for the future. One way to achieve this is to increase the Overall Equipment Effectiveness and increase the productivity of each operation using better equipment and method. A centralized chilled water system is the preferred method of cooling large industrial spaces and continues to be revered as a best practice and highest industry standard. The application of continuous improvement tools allowed an optimization of the electrical energy consumption per ton and achieving energy savings proposed.