Experience the Improvement in Power Usage Ratio and Specific Energy Consumption Reduction in HCCBPL Siliguri Plant

Sukhvir Singh Dhillon[1], Nitish Kumar[2]

[1]*Assistant Professor, Department of Industrial and Production Engineering Dr. B R Ambedkar National Institute of Technology Jalandhar*

[2]*Student, Department of Industrial and Production Engineering National Institute of Technology Jalandhar*

Abstract - Energy is used in fields and sectors of life, from the provision of resources such as water, oil and gas, to electric consumption in homes and the power required by industry and commerce. Much of that energy is consumed usefully, but large amount is wasted every day due to carelessness. It is the waste or inefficient use of energy that needs to be reduced. The importance of energy conservation is not only a technique for preventing inefficient use of energy but also a mandatory responsibility of citizens of country to protect the environment from Pollution and to avoid the fast depletion of natural resources. This study presents an approach to reduce the energy consumption using DMAIC to reduce power losses & increase the efficiency of equipments. As to minimize the energy consumption trends, the Specific energy consumption was considered. The main objective of this study is to reduce the specific energy consumption by 15% by using DMAIC approach.

Keywords - Power Usage, Energy Consumption, HCCBPL.

I. INTRODUCTION

Energy efficiency is a fundamental element in the progression towards a more sustainable energy for future and has been on the business agenda for years with significant strides already achieved. As global energy demand is increasing day by day, actions to increase energy production will be essential. There are many environmental benefits to energy efficiency including reduced emissions and reduced use of resources. The intention of energy conservation for a company begins with change in economic environment, direction of top management, regulatory compulsions from Government and stakeholders. The process of energy audit kicks off with good intention but many a times the findings are sealed in the bounded copy of audit reports. The factors that affects are organizational, technical, environmental, cultural and the people. There are initiatives taken over a period of time to conserve or to save the energy used for various purposes during the journey of human Life. Ravindra M Datar [1] mentioned that the energy audit is the first step towards systematic effort for conservation of energy. An energy audit identifies where energy is consumed and how much energy is consumed in an existing facility, building or system. Information gathered from the energy audit can be used to introduce energy conservation measures. Energy auditing evaluates the efficiency of all building components and systems that impact energy use. The audit process begins from utility meters where the sources of energy coming into a building or facility or a system. The efficiency of each of the functions is analysed, and energy and cost-savings opportunities are identified. At the end, an energy audit study is prepared. George Reyes & Martin Rosen[2] narrated that the activity of a systematic energy audit comprises of identifying the energy system, evaluate the condition, the scope for improvement and reporting. There are three types of audits namely Walk through Audit, Standard Audit and Computer simulation. M/S. Schneider Electric [3] explored the two approaches to energy efficiencies namely, Active energy efficiency and Passive energy efficiency. The Active Energy Efficiency is defined as effecting permanent change through measurement, monitoring and control of energy usage. Passive energy efficiency is defined as the installation of countermeasures against thermal losses and the use of low consumption equipments. An article by International Chamber of commerce [7], summoned the barriers exist between the deployment and adoption of enhanced energy efficiency measures.

P M Sayeed [4] explained that the Industry is the major energy consumer utilising about 50% of the total commercial energy use in India. The six key industries – namely aluminium, cement, fertilizers, pulp& paper, petrochemicals and steel - consumes about 65% of the total energy use in India. The energy intensity in some of these industries is reported to be higher than the industries in developed countries. One of the main reasons for higher energy use is the presence of obsolete and energy inefficient processes in some of these sectors. Karl & Roger [5] described about the requirement of an effective energy management system.

They have mentioned that the reduction in energy consumption can be achieved through a lot of strategies in EMS depending up on the industry and system. Each strategy consists of set points, parameters and sequences that will ultimately determine how successful the strategy is for saving energy or improving the system. N.M.Majhi [6]highlighted the barriers like environmental, organizational, cultural, financial and People related towards the energy management services and how its affect the industries to sustain the profitability. The author suggested the adoption of DMAIC method of energy management and SWOT analysis to overcome the barriers but provided an efficient energy manager or Leader to co ordinate the activities. In this Study, a systematic approach was taken to reduce the energy consumption in a Carbide Cutting tool Industry. The Specific energy consumption per product has measured and through DMAIC approach various studies were identified aim to reduce the same by 15%.

Mahdi Ghassemi and Abbas Saghaei [8]implemented six sigma for cost reduction in the water and water waste company. Cost reduction, being one of the key goals of Six-Sigma, has been repeatedly considered in articles, but application results of this approach in costs reduction of water and waste water companies have not been reported yet. Costs of maintenance and repairs of installations and equipment are allocated a significant part of water and waste water companies costs. Hence, in order to decrease maintenance and repairs costs of facilities and equipment of a water and waste water company, authors deals with a step by step description of Six-Sigma methodology. The results indicate that implementation of Six-Sigma in the company has been followed by a considerable cost reduction.

Himanshu Kumar and Anurag Singh [9] carried out DM(De-mineralize) Make up Water Reduction in Power Plants UsingDMAIC Methodology a Six Sigma approach. The Main aim of this authors was to find statistical as well as subjective solutions for minimizing DM water wastages or leakages. DMAIC approach is used to find out at what sigma level our plants are performing. To initiate our work a DM water audit sheet (online survey) has been designed to find out various aspects of DM consumption in NTPC Dadri plant.

II. PROBLEM DEFENITION

There are many losses in plant but the contribution of Power /Fuel in Cost Per Case is maximumso in order to be economic and increase the savings. we have concentrated on Power/Fuel Project. We Applied DMAIC to reduce power losses & increase the efficiency of equipments.

III. METHODOLOGY

This study addressed how the six sigma technique with DMAIC approach can apply to reduce the energy consumption. DMAIC is a Six Sigma acronym for the five interconnected phases of a process improvement study: Define Measure, Analyse, Improve, and Control. At the study level, the DMAIC structure enables study teams to identify the root causes of process variation, design and implement solutions to resolve these problems and to then measure and control the improvements. However, the following methodology had adopted to successfully complete the study.

• Literature review done by referring previous research on this topic to understand the energy conservation measures in various industries and different methods adopted to reduce the same.

• Studied and analyzed the present energy consumption at different function/area by real time monitoring of energy meters.

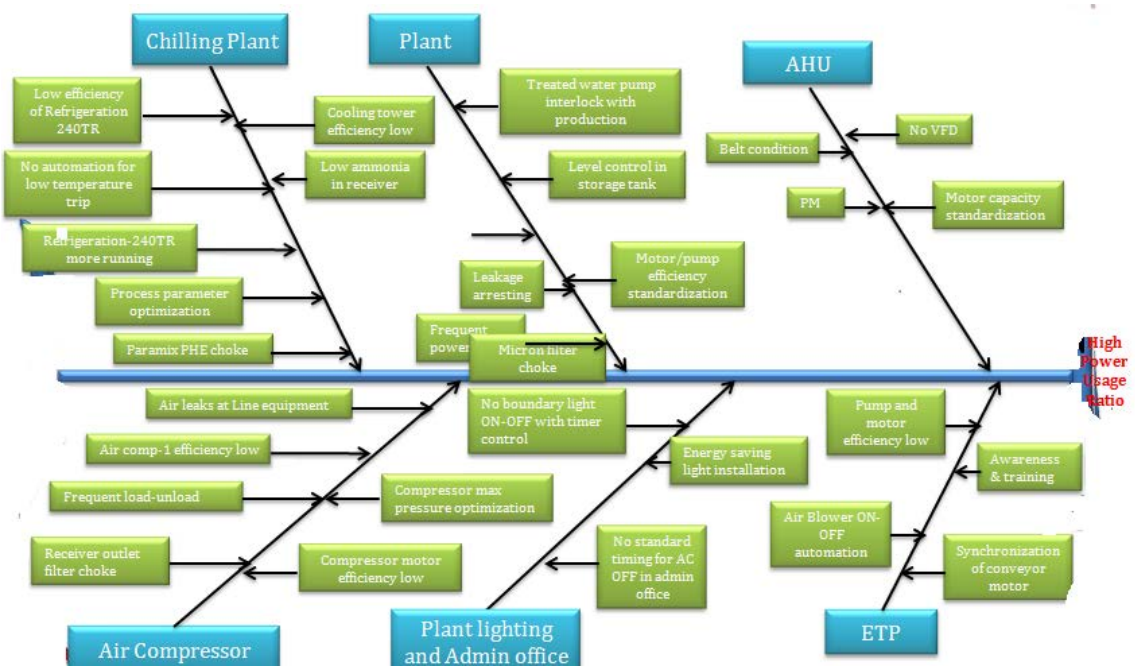
• Identified the area/function which is major contributors of energy consumption through statistical analysis.

• Studied the losses/scope for Improvement by measuring/comparing the efficiency and effectiveness of energy consumption in equipments.

• Identified and implemented different studies/methods to reduce the energy consumption.

• Appied an effective Energy Management System to monitor and control the energy consumption through establishing standards & procedures/instruction and audits.

IV. DATA COLLECTION AND ANALYSIS

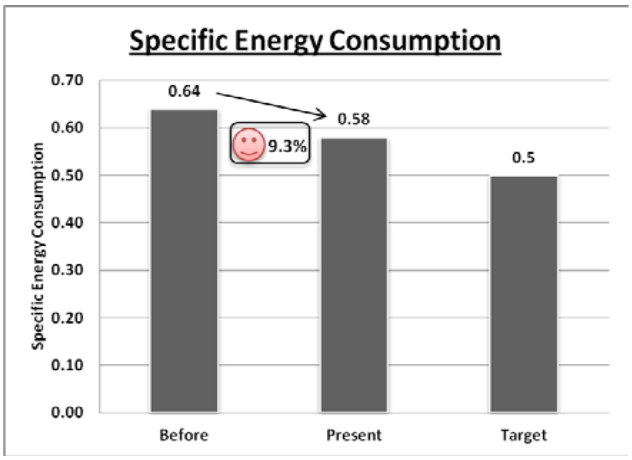


FISH BONE DIAGRAM

This phase of the study was intended for identifying major root causes by data and process analysis. It facilitated to identify gaps between existing performance and goal performance. The table 1 below shows the summary of the analysis. There were 5 improvement points identified through analysis.

Table1: Problems, Description and Improvements

Actual Problem	Problem Description	Improvement
Cooling tower efficiency low	The spray nozzle was found choked in 240TR Cooling Tower, even the fins were also choked and algal growth was noticed in the water which gave rise to this condition.	Fins & nozzle cleaning in annual maintenance. Additive to be added in Water Daily (500 ml).
Cooling Tower CT fan efficient working	Cooling Tower CT Fan was running continuously as there was no interlock to operate it as per the cooling water temperature.	Install wet bulb based automation for 240TR cooling towers to operate CT fan efficiently.
: Old AHU Motor capacity standard	The Old AHU motor was not as according to specifications. Wear & Tear of the AHU fan belt	Old AHU Motor capacity is now 18.5 HP & belt replacement done during annual
ization/ Belt Replacement		overhaul.
Emergency lighting system in PET-300 BPM & New PCC Line Continuously on .	The emergency lights of PET-300BPM & New PCC line were continuous on even in EB Power as well as in DG Power. Causing 24x365 hrs total of 88 lights were said to be consuming power.	Automation has done by placing a contactor, I.e. when the EB power is available then the emergency lights were automatically switched off.
Admin office Air conditioners ON mode at night time also.	Admin office Air conditioners ON mode at night time also. Daily manually switched off - so in case of communication gap or electrician check error it is left ON mode & gets unnoticed.	Provided Multipurpose Digital Timer - Start time 8:30AM and Stop time 6:00PM which automatically Start and Stop AC at set time



.Fig. 2 Graph showing summary of results

V. RESULTS AND DISCUSSION

After implementation of improvements, measurements were performed to analyse gap between expected and achieved results. The specific energy consumption was measured along with the specific cost to verify the benefit. The graph 2 below shows the summary of the result.The specific energy consumption has reduced from 0.64 kWh/piece to 0.58 kWh/piece.

The target was toachieve 0.5 kWh. Even though the target was to achieve 15% reduction in specific energy consumption; the actual achieved was 11%. some improvements have also been written in Table 1.

VI. CONCLUSIONS AND FUTURE SCOPE

The result shows that there is a lot of scope for further improvement. Even though the total energy savings were above 15%, the specific energy consumption was reduced by 11%. From the study we conclude that the energy cost was more than 20 % of the manufacturing cost. The specific energy consumption was taken as a way to reduce the energy conservation activities. The study follows DMAIC approach. The specific energy consumption was reduced from 0.64 to 0.57 Units /Piece. The specific energy consumption shows a decreasing trend after implementing the study.

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AUTHOR'S PROFILE

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