Energy Conservation in a Small Scale Industry(A case study)

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Abstract— In the last several decades, industrial and agricultural energy audits have increased to decrease the energy costs and move towards a sustainable future. This has made energy audit greatly important. An energy audit is an inspection, survey and analysis of energy flows for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output. Audits are performed to ascertain the validity and reliability of information. When the object of study is an occupied building then reducing energy consumption. Without compromising on human comfort, health and safety are of primary concern.
Keywords-*Energy Conservation, Energy Auditing, Power factor.*

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I. INTRODUCTION

As and when the Economy grows, the energy consumption also increases year by year. Energy is wasted due to lack of knowledge or sometimes due to carelessness.. All the input resources used for production of power will also go waste if energy is wasted. Wasting energy is not good for the environment either. Most forms of energy can cause pollution so it is necessary to use energy wisely to sustain the resources longer and also contribute for a better ecology and environment. Hence energy management has gained a lot of importance. Energy Audit of a given industry deals more about the ways energy is being used in industry. Auditing also helps in identifying the areas where waste can occur. Accordingly, suitable methodologies are recommended for energy conservation

II. LOAD SURVEY

To understand the electrical loads of the industry, a load survey was done. The different work areas were categorized as: Testing lab, R & D lab, Pharmacy Lab, workshop, a Plating plant and administrative block.

Then a single line diagram is drawn to identify the different electrical loads under each work areas.

III. OBSERVATION MADE

An observation was made to find out the continuous loads. It was found that except for the rectifiers in plating shop, Air conditioners in administrative area, lights and fans, all other loads were of smaller size like for example machine tools type. Also they are only short time intermittent loads. A study was made to know if they were contributing for Maximum Demand in any way and found that they were not. The second observation was to find whether they were causing any flickering of the lamps whenever they were started as this would have reduced the life of the lamps. It was observed that since the lamps/fan circuits are separated from these intermittent load power points, they are not disturbing the lamps.

IV. STUDY OF ELECTRICITY BILLS

The electricity bills of the company for a period of 12 months was studied. Any difference in the bills observed were verified to link the same with the production undertaken in each month respectively.

V. POWER FACTOR IMPROVEMENT

One major observation made in the electricity bill was the penalty for low power factor. The total KVA input of the industry is 63 KVA. The PF measured and shown was 0.86. Due to this LPF, the actual power output measure was 0.86x63KVA=53.55KW.

Hence to improve the PF, the recommendation was done to install an automatic PFC panel. The KVAR to be installed was recommended as 53.55X0.39= 20.88 KVAR. Another 5 KVAR for the base load. This is as per standard table to improve the PF from 0.86 to 0.98. This will help the industry even to get the bonus from the utility for improving the power factor beyond 0.95.

VI. AIR CONDITIONERS

Even though they were of good quality and maintained properly, the location of the condenser was not proper. Since they were facing the west side, they were exposed for direct sunlight. Hence the machines were consuming more power to extract the heat from the room to outside. Based on the recommendations, on the north side a new window was made and the condensers were relocated. This helped in avoiding the direct sunlight for energy conservation. However for one of the condensers when this was not possible, a shade sheet was provided to reduce the effect of direct sunlight.

VII. LIGHTS/FANS/COMPUTERS

For the fluorescent lamps, conventional chokes were replaced by electronic chokes. Also some incandescent lamps were replaced by compact fluorescent lamps. Apart from that, to increase the intensity of lamps, the management was advised to improve the maintenance factor by regular cleaning of the

fittings. It was also recommended that for any new installation of the fluorescent tubes, they should of T5-energy efficient type.

Another major issue was to keep them off when not in use. Because any other automatic on/off intelligent methods were not cost effective for this small scale industry. There was a dire need of counselling the work force regarding the energy conservation in work place. Hence the same was under taken in different sessions to different categories of workers. It was ensured that they are convinced and contribute towards energy conservation

VIII. Conclusion

There is a saying on energy conservation that "every one unit of energy conserved is equivalent to two units of electricity generated". Hence even though this case study is about the energy conservation of a small scale industry and the energy bills saved at the end of the month was a few KW Hours, over the years, the trend will contribute substantially for the good cause of society and environment.

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