Impact of ISO 50001- A Study With Reference to DCW Ltd., Sahupuram Plant in India

Dr. R. Sundararaj, A. Karthick, R. Ponraj kumar

***Abstract*- Different standards drive organizations to use energy more efficiently. ISO 50001 provides a basis for energy management improvement. The paper present the impact of implementation of ISO 50001 based energy management in the DHARANGADHARA CHEMICAL WORKS (DCW) Ltd. Sahupuram, Thoothukudi district Tamil Nadu India. The paper also presents organizations that surpass ISO 50001 certification requirements. A knowledgebase that has been founded on the ISO 50001 processes. Further we have proposed the energy conservation in the Air-conditioning system which could saves more power.**

***Index Terms*—ISO 50001. DCW.**

I. INTRODUCTION

Energy management in the form of implementing new energy efficiency technologies, new materials and new manufacturing processes and the use of new technologies in equipment increase their product or service quality. Energy efficiency in industry has many benefits, not just reduction in costs. It helps to reduce maintenance costs, environmental emission, infrastructure, etc. Actions for energy efficiency in the industry can be categorized as low temperature, waste heat, electricity and combined heat and power, efficiency of support systems, improved operation and control, and streamlining of industry-specific core processes.

Amundsen [1] presented that in adding to the energy costs, energy inefficiency generates unnecessary environmental costs. Backlund et al. [2] stated that energy management is focused on the execution of energy-efficient technologies, displacement of inefficient equipment and maintenance of technology. Lee et al. [3] claim that energy management is tied to optimization of energy use, according to their research about energy management system in IT industries of Taiwan. According to CarbonTrust's [4] guide to controlling energy use, energy management includes systematic use of organizational methods and technology. Mizuta [5] reported that all the employees participate in energy saving activities and that all levels of energy use need to be known and monitored. Bunse et al. [6] in their gap analysis between industrial needs and literature, state that energy management includes directing, monitoring and improving of energy efficiency. Abdelaziz et al. [7] in a review on energy saving strategies in industrial sector present that it has three components: review, trainings, and maintenance. ISO 50001 (ISO, 2011), standard for energy management system, which was developed to help improve energy efficiency of organization.

The International Organization for Standardization came out with an idea of producing a common energy management system standard, ISO 50001. In the year 2011, the ISO standard came into existence. Major companies and institutions all around the globe started implementing an Energy management system, and got the ISO certification for their system. The increasing public awareness on environmental issues is another driving force for businesses to reconsider their energy policy. People are paying more attention on the energy performance of organizations. As part of corporate responsibility, besides making profits, organizations should also practice their due diligence to sustainable development of the environment and community, including addressing the public concerns on climate change and resource depletion.

Today there are several standards and guidelines for implementation of a management system in an organization. The implementation of ISO 50001 which conforms the energy management system present in the industry. This certification can be used a tool in measuring the performance of the company's energy management system. Among the companies DHARANGADHARA CHEMICAL WORKS (DCW) Ltd., Sahupuram, Thoothukudi district, Tamil Nadu, India one of the first few companies in India to get ISO certification for energy management system. Our study deals with the methods adopted in the process of getting the ISO 50001 certificate. We run through the details of the certificate, the overlook and the requirements. We have also analysed the various methodologies used for the implementation of the energy management system in the company.

II. ISO 50001 CERTIFICATION PROCESS- DCW INDUSTRY

ISO 50001 Energy Management Systems (EnMS) standard, as the name itself suggests is an Energy Management System standards certification. If we are going to stay with that, we must know what the general need for an energy management system. There are many reasons for which we may need an energy management system, starting from combating environmental changes to the corporate responsibility of a company. The figure 2 shows ISO 50001 certification process generally includes the following steps

Manuscript received October 24, 2016

Dr. R. Sundararaj, Department of Mechanical Engineering, National Engineering college, K.R. Nagar, Kovilpatti, India

A. Karthick, Department of Mechanical Engineering, National Engineering college, K.R. Nagar, Kovilpatti, India

R. Ponraj kumar, Department of Mechanical Engineering, National Engineering college, K.R. Nagar, Kovilpatti, India

During EnMS audit, certification can only be granted if all of the criteria indicated below are met: The EnMS must be effectively implemented at least to the extent that:

- The EnMS has been operational for a minimum of three months;
- The internal audit is implemented and can be shown to be effective;
- One management review has been conducted;
- All staff are aware of the energy policy, objectives and the energy management system; and
- Staff involved in managing significant energy uses and associated impacts and has received training according to a training needs analysis.
- In addition to the above mandatory requirements in certification, the certification bodies also focus on the following aspects, most of which are related to the energy review.
- The methodology in determining significant energy uses (SEU);
- Prioritization of areas for improvement in energy review;
- The analysis and evaluation of energy review;
- The methodology to determine the energy baseline for the organization or individual SEU;
- The methodology to determine the energy performance indicator(s) for the organization or individual SEU;
- The method and result verification for energy objectives, targets and action plans; and
- The operational control related to SEU.

Figure 2 ISO 50001 certification process

III. ENERGY MANAGEMENT SYSTEM IN DCW LIMITED

DCW Ltd., Sahupuram is the First Industry in Chloro-Alkali Sector which is certified for ISO 50001: 2011 in the year 2013 figure 1 shows the general layout ISO 50001. ISO 50001 is very similar to other standards that ISO has developed regarding Quality (ISO 9001) and Environmental Management Systems (ISO 14001). DCW has adopted Integrated Management System comprising of ISO 9001, ISO 14001, & OHSAS 18001 and ISO 28000. ISO 50001 provides a recognized frame work to establish the system and processes necessary to improve the energy performance, including energy efficiency, use and consumption. Implementation of this standard not only improve the Organization performance but it leads to reductions in Greenhouse gas emissions to mitigate the worldwide effect of Global warming and other related environmental impacts through a systematic management of energy.

DCW is having a pool of nine certified Energy Managers / Auditors at various plants/departments. A core Energy Management Team & Management Representative has been appointed by the Managing Director for establishing the Energy management System. The core team is a cross functional team comprises of certified Energy Managers/Auditors, Process Engineers and Maintenance Engineers from various plants / departments of DCW.

A. ELECTRICAL ENERGY DISTRIBUTION SYSTEM –DCW

The manufacturing process is power intensive, Furnace Oil based Captive Power plant of 36 MW capacity to meet its demand of electricity was commissioned during 1995-96 and coal based Cogeneration plant of 58.7 MW capacity during 2007-08. During the same period, it switched over their mercury cell operation to membrane Technology for producing Caustic Soda.The other sources are Diesel Based Captive Power Plant of 12 MW which is used as an Emergency power source. Power from TANGEDCO is also used in case of Emergency. The base load Energy source is Co-Gen plant, for peak load application and in Emergency requirement the Diesel Generators were used. The Total Power requirement of the complex is around 36 MW and the balance electrical energy produced is exported to grid for sale. Figure 3 shows the single line diagram of DCW industry

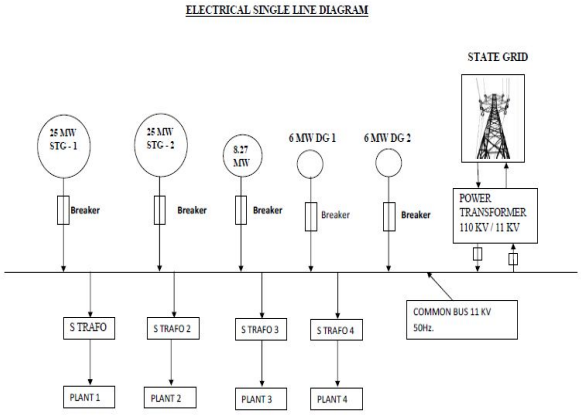

Figure 3single line diagram of DCW industry

B. THERMAL ENERGY DISTRIBUTION SYSTEM-DCW

As a topping cycle co generation system, the Steam produced from the AFBC boiler is fed to the Turbines in which electricity is produced. The turbine used for Electricity production is an extraction turbine where there are three extractions. The first extraction pressure is around 14.5 bar and the second extraction steam pressures is around 4.5 bar

and third extraction is 1 bar. The first extraction steam from the both turbine is used to run the 8.27 MW turbines.
The various are of Steam requirement are:

- ✓ Drying Purpose in Plants.
- ✓ Moisture Removal from products.
- ✓ For Vapor absorption machines.
- ✓ For process aid.
- ✓ Cogeneration internal use like Boiler De aeration, and Gland sealing purpose.

C. Variable frequency drives

As part of the energy conservation in motor the industry have installed 166 Variable frequency drives in various location to conserve energy which includes, Blowers, Centrifugal pumps, Cooling towers, Compressors.As a result by installing VFD in cooling towers have saved the annual savings of 7,871$ and its payback time 7.62 months.

D. Proposed Methodology AIR CONDITIONING SYSTEM:

In a total of 2200 acres of space used by the DCW Ltd., most of the area is used for the production of salt, which in turn is used for caustic soda production. The next major thing covering the area is production units. There are 9 production plants inside the company. Next to these comes the office space. The management of the company is keen on making their employees comfortable in their working area. Hence all of the office rooms are air conditioned. With this the waiting halls and recreational halls are also fully air conditioned. By considering all these factors it might be clear that around 27% of the total electricity consumed is being used for air conditioners. Hence we have chosen our first area of suggestion would be to monitor the air conditioning systems. In this suggestion we have decided to split it into two parts.

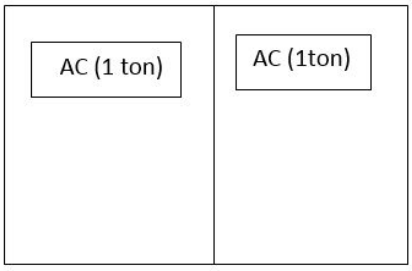

Figure3 The present condition where two adjacent rooms use two air conditioning systems.

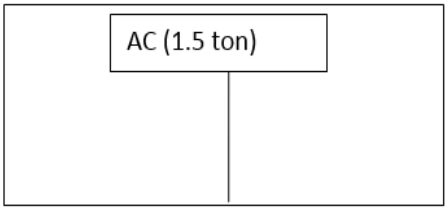

Figure 4 proposedAir conditioning system between two rooms

The first part would be to use a single air conditioning system for two consecutive rooms. Our proposed method is clearly explained in a diagrammatic way below.

Four rooms in the human resources department of the DCW Ltd., are separated from each other only using wooden planks. In all these rooms, Carrier one ton, single star rated air conditioners are used. Instead of this setup if we use a single one and a half ton, 3 star air conditioning systems for two rooms, we can save up to 67% of the current electrical charge they are facing. Simple cost benefit analysis Introduction of a single three star air conditioning system in the place of a 2 single star air conditioning system

Installation cost for a 3 star, 1.5 ton A.C: Rs. 35,000
Installation cost for two A.C : Rs. 70,000
Running cost for the current A.C/month : Rs. 45,995
Running cost for our idea/month : Rs. 17,880
Saving per month : Rs. 28,115

Replacement of less energy efficient air conditioning system with three star air conditioning system
Replacement cost for replacing all the air conditioners with new energy efficient A.C : Rs. 20,65,000
Running cost for all the A.C/month : Rs. 6, 78,426
Running cost after changing all the A.C/ month Rs. 5, 27,460
Total saving/ month : Rs. 1, 50,966
Time period before retrieving the invested amount : 14 months

IV. CONCLUSION

.

As a result of implementation of ISO 50001:2011energy management system in the DCW Ltd, they save 30 to 40% of the electricity. Hence the company is becoming more energy efficient, which ultimately helps them in reducing the cost incurred during the production, this leads to the maximization of the profit. Further by adopting the proposed air conditioning system which has given can increase their energy efficiency. There is a general myth among people that adapting an energy management system would be an extra burden, but unlike all whose myths, it is really easy to maintain an energy management system.would not know whether the top axis label in Fig. 1 meant 16000 A/m or 0.016 A/m. Figure labels should be legible, approximately 8 to 12 point type.

REFERENCES

[1] Amundsen, A., 2000. Joint management of energy and environment. J. Clean. Prod. 8 (6), 483-494.
[2] Backlund, S., Thollander, P., Palm, J., Ottosson, M., 2012. Extending the energy efficiency gap. Energy Policy 51, 392-396.
[3] Lee, S.-K., Teng, M.-C., Fan, K.-S., Yang, K.-H., Horng, R.S., 2011. Application of an energymanagement systemin combination with FMCS to high energy consuming IT industries of Taiwan. Energy Convers. Manag. 52 (8-9),3060-3070
[4] CarbonTrust, 2011. Energy Management e a Comprehensive Guide to Controlling Energy Use.
[5] Mizuta, Y., 2003. A case study on energy saving and new energy services in Japan. Manag. Environ. Qual. Int. J. 14 (2), 214-220.
[6] Bunse, K., Vodicka, M., Schonsleben, P., Brülhart, M., Ernst, F.O., 2011. Integrating energy efficiency performance in production management gap analysis

between industrial needs and scientific literature. J. Clean. Prod. 19 (6), 667-679

[7] [7]Abdelaziz, E.A., Saidur, R., Mekhilef, S., 2011. A review on energy saving strategies in industrial sector. Renew. Sustain. Energy Rev. 15, 150-168.

Dr.R.SUNDARARAJ is working as Associate Professor / Humanities, Department of Mechanical Engineering at National Engineering College, Kovilpatti, Thoothukudi District of Tamilnadu state, India. My educational qualification is M.Com , M.Phil., PGDPM, Ph.D. I have completed post - Graduation and Master of Philosophy in commerce at Madurai – Kamaraj University, Madurai during the year 1985 and 1986 respectively. I have completed Post Graduate Diploma in personel management at Annamalai University, Annamalai Nagar during the year 1988. I have completed Doctor of Philosophy in Commerce during the year 2010 at Madurai – Kamaraj University, Madurai as a part time – candidate. My area of specialization is Rural Banking. The Author has 27 years of teaching experience for handling classes in under – Graduate and post – Graduate Engineering students and published four Research papers in the National Journal and presented five papers at National and International Conferences. The Author has guided five M.Phil dissertations under the Commerce and Management. At present the Author is a Life member in Indian Society for Technical Education(ISTE) and member in Board of studies at National Engineering College and SRNM College,Sattur.

Mr.A.KARTHICK is working as Assistant Professor, Department of Mechanical Engineering at National Engineering College, Kovilpatti, Thoothukudi District of Tamilnadu state, India. My educational qualification is B.E, M.E, Pursuing Ph.D. I have completed UG Electrical and Electronic Engineering and PG Energy Engineering at Anna University, chennai during the year 2009 and 2012 respectively. My area of specialization is Energy conservation, Building integrated Photovoltaic system. The Author has 4 years of teaching experience, 3 year research experience and published three international conference and two international journal .At present the Author is a Life member in Institution for Engineers.

R. Ponraj kumar completed Bachelor of Mechanical Engineering at National Engineering College, Kovilpatti, Thoothukudi District of Tamilnadu state, India. During 2016. This work has completed as major project under guidance of Dr, R. Sundararaj & Me. A. Karthick.