

A STUDY ON EFFECTIVENESS OF ENERGY MANAGEMENT TO LEADING GROWTH OF CHEMICAL INDUSTRY

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Abstract:

Over the last few decades, the Asian countries in particular and globe in general have been experiencing two significant problems such as, 1) Gap between Demand and Supply of Electric Energy 2) Increasing Product Cost

These two issues are prominent due to continuous rise in population, industries and excessive use of conventional sources followed by mining and deforestation.

The paper proposes to address two issues stated above by Analysis of why energy consumption is more and recommendation for improving energy efficiency and decrease product cost.

Key words: energy management, growth, energy consumption, energy efficiency, product cost.

Introduction:

Energy is vital for all living-beings on earth. Modern life-style has further increased its importance, since a faster life means faster transport, faster communication and faster manufacturing processes. All these lead to an increase in energy required for all those modern systems. It simply means that Electrical energy is the most popular form of energy, whether we require it in the usable thermal form (= heating applications), in mechanical form (= electrical motor-applications in Industries), for lighting purposes (= illumination systems), or for transportation systems. The industrial sector worldwide used 44% of the world's energy consumption. Global warming, as a result of increasing greenhouse gases from burning fossil fuel is today a worldwide rising concern. The core of this paper can be narrowed down to include need of energy management in production and supply chain planning. Besides to contribute in terms of models, methods and decision support systems, the paper also aims to provide guidance and bring further awareness of energy and issues that can be useful for decision-making among process industries as well as for other energy intensive industries. The study of Energy

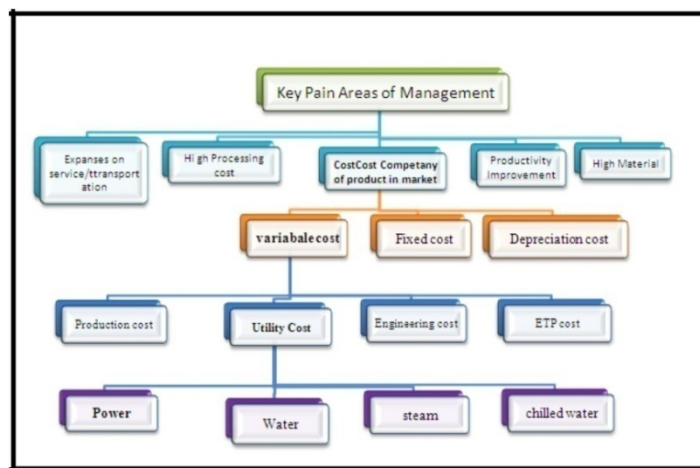
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Management is based on Total Quality Management tools as well as last year Annual Report and equipment survey of Sudarshan Chemicals Industries Ltd, Mahad. In SCILM, Product cost is more because Power/Energy cost is more. This makes energy efficiency an important issue for the SCILM. To be competitive means using the most energy saving production facilities. Energy efficiency measures and improvements are given priority by enterprises today, due to increasing energy prices. Increasing energy prices, on a national basis, have a shocking effect on the competitiveness for manufacturing enterprise. Temperature dependent productions are even more affected by increased energy prices. Company faces increased energy costs; it can increase the motivation to take action on energy efficiency measures. Energy efficiency measures may have a positive effect on the total cost for a company and may guide to increased productivity, giving increased profits. To reduce the competitive threat, SCILM have two options: either try to negotiate a lower energy price from the energy companies or work internally with energy efficiency measures. Energy efficiency measures are complex and involve a variety of technical, organizational as well as behavioral factors .Even though these efficiency actions are complex; they are a part of companies' policy and image today.

Identification of Scope Area for Research:

First step understands the where we can do research that is to find out key pain area of management then analysis which is important key pain area in that.

For study of Literatures and discussion, I have interpreted that cost and cost competency of product in market is important key pain area for every industry. So I have decided to do my research on product cost reduction .Figure1 Shows the detail structure of key pain area of management.



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Figure 1: key pain area of management

Why cost and cost competency of product in market is important key pain area:

Cost and cost competency of product in market is important key pain area because every customer wants high quality of product in fewer prices and every industry aim to earn more profit or increase the profitable ratio. So address these two issues, we interpret that is important to find out way of decrease the product cost up to customer fill satisfaction and industry aim is also completed. First step is analysis why product cost more. Following graphical representation that is fig 2,3and4shows analysis of it.

Figure 2: Graphical representation of Product cost

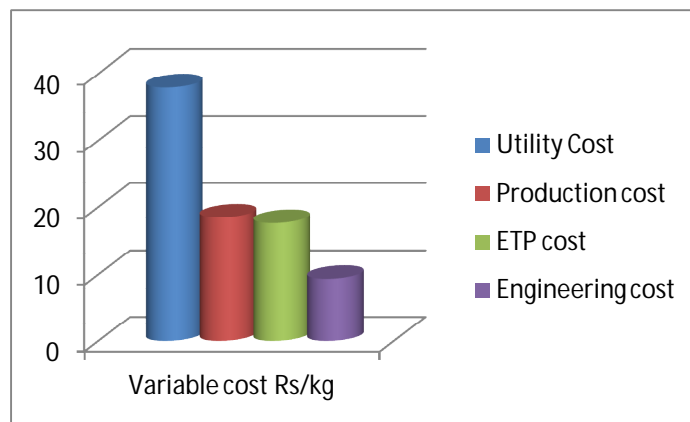


Figure 2: Graphical representation of Variable cost

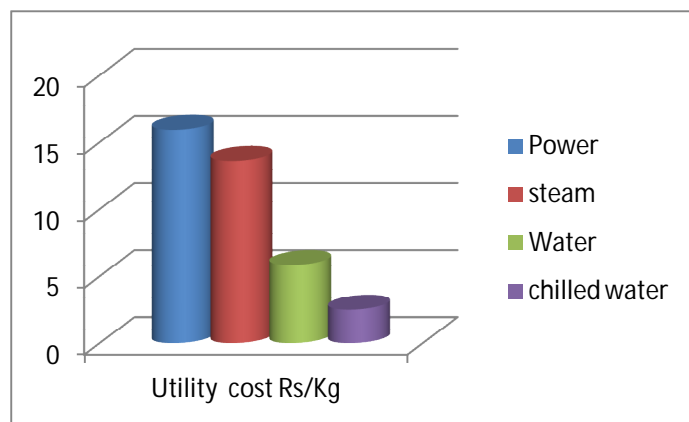
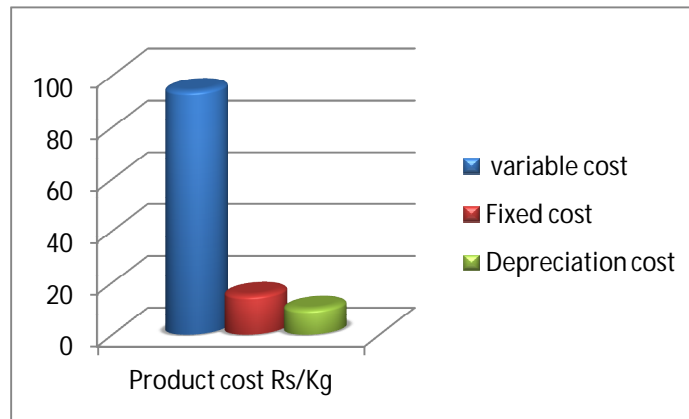


Figure 3: Graphical representation of Utility cost



Final Interpretations: Product cost is more because power cost is more.

Energy Management:

“The judicious and effective use of energy to maximize profits (that is, minimize costs) and enhance competitive positions.” It is the strategy of meeting energy demand when and where it is needed. This can be achieved by adjusting and optimizing energy using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems. Energy management began to be considered one of the main functions of industrial management in the 1970s as the result of the rising price of energy and reports about the approaching exhaustion of world energy resources.

Nowadays, the role of energy management has greatly expanded in industries. Top management of the company participates in planning various energy management projects on a regular basis. The annual reports of the many companies should mention the details of energy conservation activities and various achievements by the company regarding energy conservation projects. To be effective, energy management programs should include four main sections: Analysis of Historical Data, Energy Audit and Accounting, Engineering Analysis and Investments Proposals Based on Feasibility Studies, Personnel Training and Information.

Benefits of Energy Management:

Businesses can realize many benefits through effective ongoing energy management. Implementation of the systems and processes to achieve best practice in energy management can build business value by:

- **Unlocking significant savings** – Organizations that have taken a strategic approach to energy efficiency often find project opportunities with attractive payback periods and ongoing reductions in energy expenditure.
- **Reducing exposure to future energy price increases** – Many businesses are feeling the impact of rising energy costs. Energy efficiency improvements offset these costs, making energy-efficient organizations less at risk to future price increases. Energy efficiency improvements deliver ongoing financial benefits. The return on investment for these projects improves as energy prices increase.
- **Improved risk management** – The business risks associated with rising energy prices and inefficient energy use include reputation damage, price instability and operating cost risks, supply chain risks, energy security and climate change risk. Effective energy management is a core component of an effective risk management strategy.
- **Improving productivity** – Businesses increasingly know the link between energy performance and business productivity. Understanding this link can lead to reduced resource consumption. Improvements in energy productivity are often accompanied by improvements in the use of materials, water and other resources.
- **Reducing maintenance costs and improving reliability** – Energy efficiency actions can identify problems before they occur and reduce the load and operating hours of machinery and equipment. This can improve production uptime, reduce labor and equipment costs, and extend the useful life of the asset.
- **Reputational benefits** – Public perception is an important consideration for many companies. A responsible approach to energy management can demonstrate good corporate citizenship and attract investors.
- **Empowering and educating senior management** – An energy management system provides board and executives with clear insight into how and where energy is used in the organisations and where improvements may be needed.
- **Reducing employee turnover and many other benefits** – Businesses that actively monitor and manage their energy use often enjoy other indirect benefits such as demonstrable improvements in environmental performance and new means of staff engagement.

Why energy consumption is more:

At the time of detailed analysis of energy consumption in SCILM first, I have analysis which plant consume more energy and why. Final interpretation of it is BG Plant consume more energy at the time analysis of BG Plant its highlighting problems why Energy consumption is more in this plant. Figure 5 shows that why energy consumption is more in BG Plant.

Problem : High power consumption in BG & QA

No.	Problem	Impact Kwh/Day	Root Cause Level 1	Root Cause Level 2	Root Cause Level 3
1	High power consumption in attritors	5621	High speed milling	Desired quality (Alpha content) should be achieved	
			High time cycle	Desired quality (Alpha content) should be achieved	
2	High power consumption in BM	3036	High running hours due to low alpha content	Insufficient cooling to BM	Same header of cooling for all three BM
					Water seal leakages
					Non availability of cooling water due to failure of LCV
3	High power consumption in blenders	2250	Continuous running of blenders	No stoppage of blenders even after sampling of material	
			Frequent oil leakages of gear box	Belt drives motors	
4	Power consumption in SD	2829	Low rate of drying	Low feed slurry concentration	
			Two motors of 100 & 60 HP		
5	Use of separate pumps for cooling of beta, green & QA	698	Two pump of 40 HP used for cooling water circulation	Old make pump having low efficiency	
6	Air consumption in plant		Air leakages on plant		
			Manual airtion system for filter presses		
7	High consumption in TK21401	214	Excess running of agitator during filtration	Negligence of operator	
8	FP21203/204 Washing pump	299			
9	High running hours in distillation time	695	Use of jacket steam for K21601 instead of direct purging	Back flow of material in jacket due to low steam pressure	
10	High power consumption of reslurry mixer of CG	411	Idle running of reslurry mixer	Negligence of operator	
11	Efficiency of motors				
12	Low efficiency of equipments like attritor, BM, Blenders, Tanks, CT Pumps, SD FD & ID Fans		High moisture content of press cake	Less squeezing / airtion time	

Figure 5: Reason of why energy consumption is more

The Dimensions of Energy Management:

The experience of organisations that successfully manage their energy use indicates that technological solutions alone do not achieve maximum energy savings, and are less likely to be sustained in the long term. Rather, energy management has the greatest impact when organisations address these three dimensions:

- **Technical**-- the energy consuming devices and systems that use energy efficiently, or inefficiently
- **Organizational**-- the structure and management systems that can support or hinder the achievement of energy efficiency goals

- **Human behavioral**--the personal values, attitudes and practices of individuals in the organization that impact on energy use. There are cases to demonstrate that a focus on people alone their awareness of energy efficiency as corporate priority, their values and attitudes towards energy use, and their skills and knowledge related to the management and use of energy systems can achieve significant and sustainable savings. The combination of these two approaches technological and human resources typically yields the best result.

Recommendation for improving energy efficiency:

As for above Analysis, study Dimensions of Energy Management, literature we can improve energy efficiency by three way technical change, organizational policy change and employment behavior change. Following figure 6 shows some action to be stake in Sudarshan Chemicals Industries Ltd Industry. Mahad for increase the energy efficiency or reduce the product cost.

➤ **Employee Tasks for Reduce Power Cost:**

Personnel at all levels should be aware of energy use and organizational goals for energy efficiency. Staff should be trained in both skills and general approaches to energy efficiency in day-to-day practices. In addition, performance results should be regularly evaluated and communicated to all personnel, recognizing high achievement. Some examples of simple tasks employees can do are outlined below

- Eliminate unnecessary energy consumption by equipment. Switch off motors, fans, and machines when they are not being used, especially at the end of the working day or shift, and during breaks, when it does not affect production, quality, or safety. Similarly, turn on equipment no earlier than needed to reach the correct settings (temperature, pressure) at the start time.
- Switch off unnecessary lights; rely on day lighting whenever possible.
- Report leaks of water (both process water and dripping taps), steam, and compressed air. Ensure they are repaired quickly. The best time to check for leaks is a quiet time like the weekend.
- Look for unoccupied areas being heated or cooled, and switch off heating or cooling.

- Check that heating controls are not set too high or cooling controls set too low. In this situation, windows and doors are often left open to lower temperatures instead of lowering the heating.
- Check to make sure the pressure and temperature of equipment is set right.
- Prevent drafts from badly fitting seals, windows and doors, and hence, leakage of cool or warm air.

Corrective Action Long term)	FPR	Deadline	Results of action	Status of action as on	Remarks
Take trial by reducing milling time and check for required alpha content and shade difference	PAP	Start from 25.06.2016	Savings of 700 Kwh/day	Trial taken of 1.5T material taken successfully and material supplied to customer	Milling time reduced from 100 to 85 mins
Separate header of cooling water and run the single pump for two BM	SBY				
Leakproofing to be done	SBY	5th July	Savings of Rs18.72 lacks per annum	Management decided to purchase new Ball mill of bigger size	Ball milling cost reduced from 20 to 17.55 rs/kg
Lower the level of level indicator	SRJ	1st July			
Timer installation of ON OFF operation	SBC	5th July	Savings of 972 Kwh/day	Completed	Time cycle reduced from 6 to 2 hrs
Change the gear box to Knod gear box	SBY				Future plan
Study the slurry concentration of feed & optimize to 20-25%	PAP	8th July			
Take trial of moisture content by stopping of 60 HP motor	PAP		Savings of 643.8 Kwh/day	Slurry concentration improved to 22%	Drying rate improved from 100 to 130 kg/hr
Replace two pump by single high efficiency pump with low hp, to be	SJK	29th July			Future plan
Air leakages to be rectify on regular basis	PAP, SDW,CYP, PBD, SBY	5th July		1.Air leakages in plant are rectified 2.Aretion time optimized and automated for all filter presses	20 % reduction in air consumption of filter presses leads to reduction in power consumption of compressor
Study and optimize the aretion time for each filter press based on moisture content & put autocontroller	PAP	15th July	Saving of 294 Kwh/day		
Use of autocyclic timer to the agitator	BVD	30th June	Saving of 214 Kwh/day	Cyclic timers are provided to all tanks	Agitation time reduced
Use of high pressure verticle pump with low HP motor	SJK, SBY				
1.Fixing of orifice to direct steam purging line to reduce distillation	PBD, SBY	1st July	Savings of 173 Kwh/day	Orifice & NRV provided to inlet steam line	Distillation time reduced from 24 to 18 hrs
Ensure use of timer in reslurry mixer	PAP	28th June	Savings of 205.5 Kwh/day	Provision of cyclic timer to all reslurry mixers	Mixing time reduced from 12 to 6 hrs
Check efficiency of attritor motor and replace with high efficient motor	BVD	26th Aug			Future plan
Check the moisture content of all filter presses & optimize the squeezing / aretion time to minimize the moisture	PAP	15th July			

Figure 6: Energy saving opportunity in BG plant

- Carry out regular maintenance of energy-consuming equipment.
- Ensure that the insulation on process heating equipment is effective.

➤ **Technological Recommendation for Reduce Power Cost:**

Summary and Conclusion:

By increasing energy efficiency, companies can reduce costs and increase predictable earnings in the face of ongoing energy price volatility. Considering energy price volatility and recent sharp

increases in natural gas prices across the nation, energy efficiency improvements are needed today more than ever. This paper has summarized many energy-efficient technologies and practices that are proven, cost-effective, and available for implementation today. These opportunities are applicable at the component, process, facility, and organizational levels. Sudarshan Chemicals Industries Ltd company, Mahad energy-using systems and identify areas for improvement. Figure 6 summarize the energy efficiency measures presented in this paper. Many of the measures discussed have relatively short payback periods and are therefore attractive economic investments on their own merit. The degree of implementation of these measures will vary by plant and end use; continuous evaluation of these measures will help to identify further cost savings in ongoing energy management programs. While the expected savings associated with some of the individual measures may be relatively small, the cumulative effect of these measures across an entire plant may potentially be quite large.

For all energy efficiency measures presented in this study, individual plants should pursue further research on the economics of the measures, as well as on the applicability of different measures to their own unique production practices, in order to assess the feasibility of measure implementation.

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