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Improvement of Energy Efficiency in Industries

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ABSTRACT*:* Energy is crucial to human sustenance and development. Due to increasing of the Demand of energy and deficiency in power generation, day by day the gap between demand and supply of electric energy is wide. Bridging of this gap from the supply side is very difficult and expensive proposition. Also limited energy sources, famine of capital and high costs for the addition of new generation capacity is leading to the increased cost of electrical energy in India. The only viable way to handle this crisis, apart from capacity addition, is the efficient use of available energy, which is possible only by continuously to monitor and control the use of electrical energy. Hence electrical energy efficiency program is a systematic and scientific process for identification the potential of improvements in energy efficiency, recommended the ways with or without financial investment, to achieve estimated saving energy and energy cost.In wide sense, the meaning of energy efficiency is to economize the use of energy without adversely affecting production and development that includes improvement of the efficiency and increasing the productivity of energy used in industries. In This Project, various techniques for improving energy efficiency are discussed; an industry will be identified for case study in which these techniques will be implemented. The result will be documented and report of the same submitted to the industries.

KEYWORDS: Energy Efficiency; Hydraulic Motors; Power; Energy consumption; Energy Conservation.

I. INTRODUCTION

Improving energy efficiency is increase at corporate, local, national and international levels around the world. It is seen as a means of addressing concerns about environmental impact resulting from the use of energy and concerns about energy security. Improving end-user efficiency offers the greatest opportunity to address energy security, price and environmental concerns. Improving in energy efficiency results in better productivity, job creation, reduced fuel poverty and improved public health. To achieve and maintain optimum energy procurement and utilization throughout the organization. To minimize energy cost/waste without affecting production and quality. To minimize environmental effects. In broad sense, Energy Efficiency means economizing the use of energy without adversely affecting production and development which includes improving the efficiency and increasing the productivity of energy used in industry.

This paper deals with the proper selection, application and coordination of components that contribute energy conservation for industrial plants[1]. This study is aiming to describe an evaluate energy efficiency trends and policies at global level and to identify recent trend in energy efficiency performance for devolved countries [2].This paper deals with Energy conservation and energy efficiency are a part of the Government's strategy to decouple economic growth from growth in energy consumption and reduce the energy intensity of the economy [3].

II. ENERGY EFFICIENCY IN INDUSTRY

A. Energy Efficiency

Energy efficiency sometimes simply called as efficient use of energy without affecting the production and quality of product and service which is provided to customers with the satisfaction of customer. It comprises of following stages: -

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i. Energy Audit
ii. Identification of EE opportunities
iii. Implementation of one of the techniques

B. Energy Efficiency Opportunities

An Industry is identified in which following equipment's are identified for energy efficiency improvement: -

I. Hydraulic Motors

Use of timers in the starter of hydraulic motor with help of push button.

II. Furnace

a. Scrap Charging
b. Power Input
c. Superheating of Bath
d. Production Scheduling

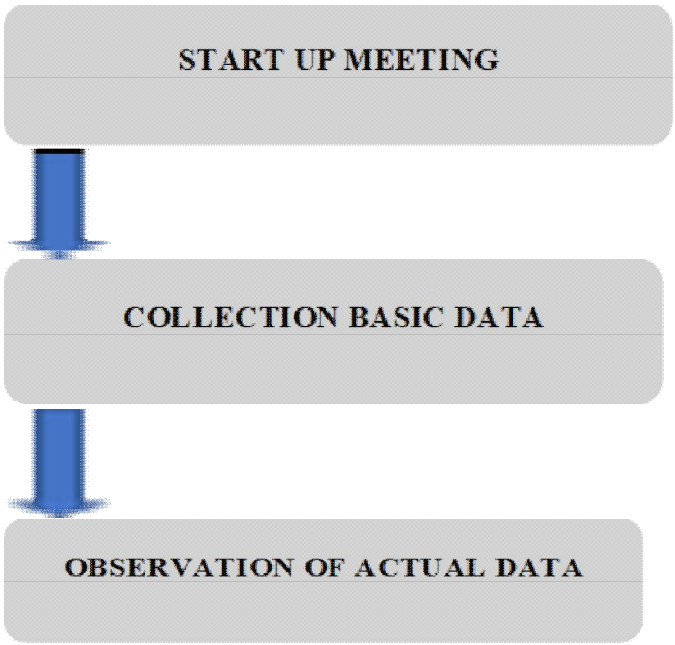
III. Lighting

a) Occupancy Sensors
b) Timed Based Control
c) Daylight Linked Control

IV. Air Conditioners

a. Try 78 Degrees
b. Motion Sensor
c. Servicing of Unit

V. Refrigerators



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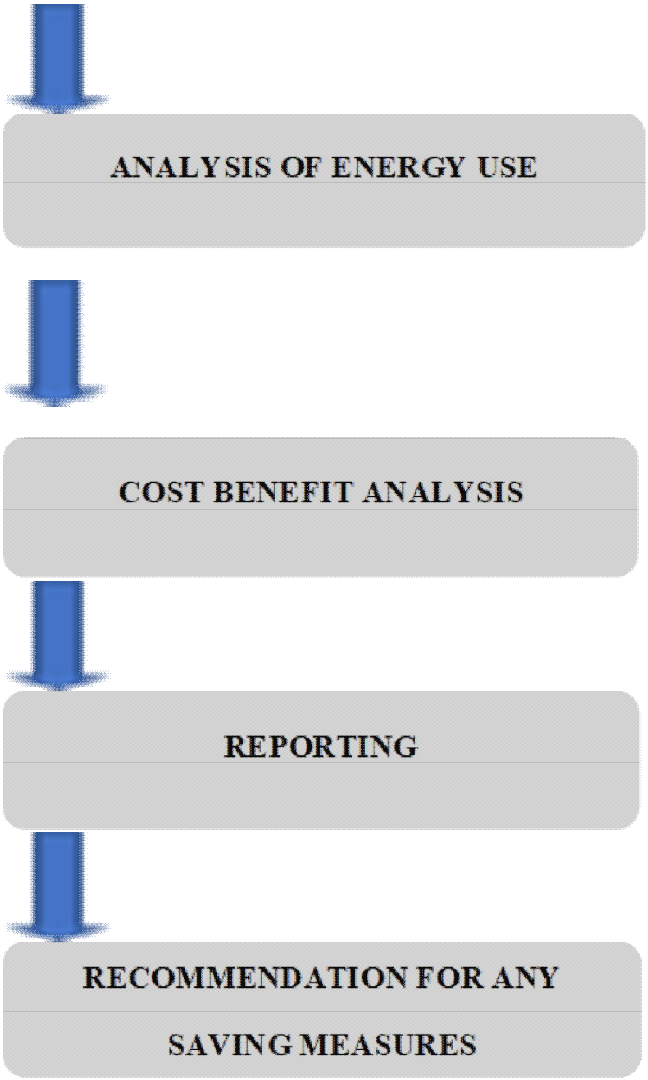

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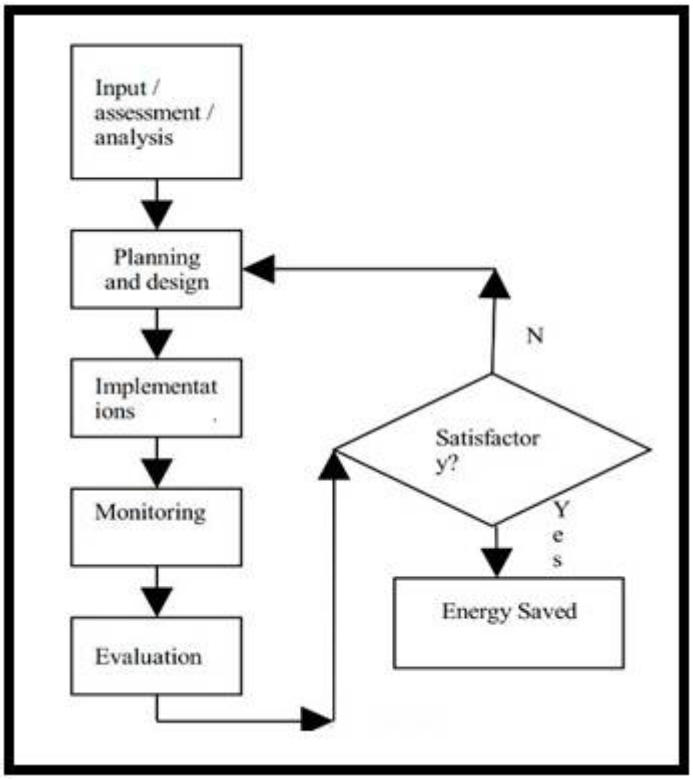

Fig. 1:EC Flowchart System

III.HYDRAULIC MOTORS

A hydraulic motor is a mechanical actuator that converts hydraulic pressure and flow into torque and angular displacement (rotation). The hydraulic motor is the rotary counterpart of the hydraulic cylinder as a linear actuator. Mostly broadly, the category of devices called hydraulic motors has sometimes included those that run on hydropower—namely, water engines and water motors—but in today's terminology the name usually refers more specifically to motors that use hydraulic fluid as part of closed hydraulic circuits in modern hydraulic machinery.Conceptually, a hydraulic motor should be interchangeable with a hydraulic pump because it performs the opposite function - similar to the way a DC electric motor is theoretically interchangeable with a DC electrical generator. However, most hydraulic pumps cannot be used as hydraulic motors because they cannot be back driven. Also, a hydraulic motor is usually designed for working pressure at both sides of the motor.

Hydraulic pumps, motors, and cylinders can be combined into hydraulic drive systems. One or more hydraulic pumps, coupled to one or more hydraulic motors, constitute a hydraulic transmission. One of the first rotary hydraulic motors to be developed was that constructed by William Armstrong for his Swing Bridge over the River Tyne. Two motors were provided, for reliability. Each one was a three-cylinder single-acting oscillating engine. Armstrong developed a wide range of hydraulic motors, linear and rotary, that were used for a wide range of industrial and civil engineering tasks, particularly for docks and moving bridges.

The first simple fixed-stroke hydraulic motors had the disadvantage that they used the same volume of water whatever the load and so were wasteful at part-power. Unlike steam engines, as water is incompressible, they could not be throttled or their valve cut-off controlled. To overcome this, motors with variable stroke were developed. Adjusting the stroke, rather than controlling admission valves, now controlled the engine power and water consumption. One of the first of these was Arthur Rigg's patent engine of 1886. This used a double eccentric mechanism, as used on variable

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stroke power presses, to control the stroke length of a three cylinder radial engine.[3] Later, the swash plate engine with an adjustable swash plate angle would become a popular way to make variable stroke hydraulic motors.

IV. SAMPLE CASE STUDY

An Industry Jagdamba Auto. Components LTD.in Pune, India is identified for case study.

A. Profile of Industry: -

The industry Jagdamba auto components limited was incorporated by Ms. Ravi Patodia in year 1989 which manufacturing transmission gears and shafts for 2 wheelers 4 wheelers and 6 wheelers. The turnover is around $ 25 million (approx. 162.5 Cr. INR). The employee strength is about 107 which include Managers, Super Visors, Machine Operators an attendant. Technical Details with working hours are shown in table (1) as per monthly energy consumption and energy billing.

B. Technical Details: -

The following equipment's are identified for energy efficiency improvement: -

a. Hydraulic Motors
b. Furnace
c. Lighting
d. Air Conditioners
e. Fan & Blowers
f. Refrigerators

Following table shows Energy Consumption /Day in Jagdamba auto components: -

Table1: Energy Audit

Sr.No.	Equipment	Quantity	Wattage(in KW)	Working Hours	KWh/Day
1.	Hydraulic Motors	24	20	24	11520
2.	Furnaces	380	60	22	1080
3.	Lighting	28	100	24	501.6
4.	Air Conditioners	12	3.5	20	840
5.	Fans & Blowers	03	15	24	67.2

As per Table (1) Shown Above, it is seen that most of the energy consumption in industry Jagdamba Auto Components Limited is in Hydraulic Motors (80-85%) Hence, our area of interest of improving energy efficiency is in Hydraulic Motors to reduce overall consumption without adversely affecting production of industry.

C. Hydraulic Motor: -

Specifications

a. SUPPLY VOLTAGE: -20V to 240V AC.
b. DELAY MODES: -On delay / Interval.
c. TIME RANGES: -3/10/30/60 sec./ Min.
d. OUTPUT CONTACT ACCURACY: -Setting: ± 5% of full scale.

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e. *LED INDICATION:* -
1) Power 'ON'.
2) Relay 'ON'.

f. *RESET*: -On interruption of power.
Reset time: Less than 100 ms.

g. *SIZE (in mm)*: -22.5(W) x 75(H) X 101(D).

h. *WEIGHT*: -129 grams.

Constructional Details: -

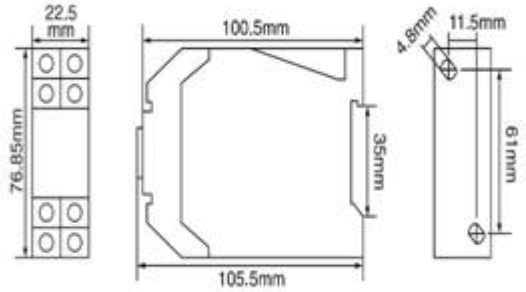
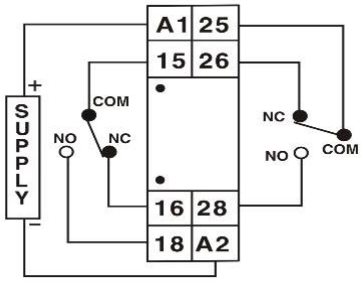


Fig. 2: Timer Dimension

Fig (2) Shows Constructional Details of the Timer 800XU. The timer size is 22.5(W) x 75(H) X 101(D). The timer consists of a Dial. It has 10 ranges from 1 to 10.



TERMINAL	DESCRIPTION
A1	L TIMER SUPPLY
A2	N TIMER SUPPLY
15	COM — RELAY CONTACT
16	NC — RELAY CONTACT
18	NO — RELAY CONTACT

Fig. 3: Connection Diagram of Timer 800XU

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Fig (3) shows Connection Diagram of timer 800XU. There are 8 contacts. The supply is given to the contacts A1 & A2. The Contacts 15 & 16, 25 & 26 are normally closed, then Contacts 18 & 28 where normally open at that time.The Timer consists of various scales shown in fig (4). It also has 2 modes of operation i.e. ON Delay & Interval shown in fig. (5).

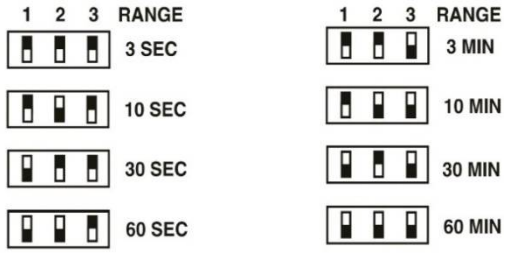

Fig. 4: Switch Setting

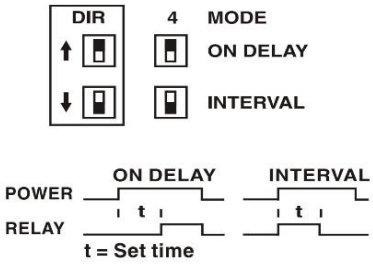

Fig. 5: Timing Diagram

Working: -

In Hydraulic motor the timer is used with the help of push button. When the motor is under normal working condition the timer is not working. But when the load on the motor gets of or there is no job is available in such condition the push button is pressed by the operator manually and after some time delay which is provided to the motor the motor gets off.

V. EXPERIMENTAL RESULTS

Table 2: Overall Energy Consumption Before & after implementation

Hydraulic Motors					
Before Implementation		After Implementation		Saving/Day	Saving/Day
KWh/Day	Cost/Day (Rs.)	KWh	Cost/Day (Rs.)	Units	Rs.
11520	80460		79572	120	837.5

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VI. CONCLUSION

In this paper, an attempt is made to show that the strategies applied have achieved average consumption of 11520 and later the consumption becomes 11400 KWh. The total energy saving is about 120 kwh/day. Energy efficiency is an effective in identifying and perusing a comprehensive energy management program. A careful audit of any type will give the organization a plan with which it can effectively manage the organization energy system at minimum energy cost. In this project work, a detailed study has been made to Improving Energy Efficiency in industries in Jagdamba Auto Components LTD. It highlights the amount of energy savings that can be obtained in an industry by some methodologies thereby energy crisis can be reduced considerably.

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