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Assessment of Energy Conservation at Amman Try Steel Industries through Led Lighting Retrofit

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Abstract **In India, there is a mismatch between power generation and power demand. With the growth of India's economy, demand for energy will also increase. Indian power sector needs to plug the gap between demand and supply through renewable and non-renewable source. The demand for energy has grown closer to 3.5% per annum over last three decades, the power houses that are generating energy fails to fulfill the demand. Industries and households resort to the use of diesel or portable kerosene generators to generate power for operating part of their loads. According to the Indian petroleum and natural gas statistics, India is one of the world's largest importers of crude oil, gas and coal which will create the global warming issues. In The lighting energy consumption in India is 71% of total energy consumption. The paper specifically aims on industrial lighting energy consumption, by replacing the traditional lamps in industries with LED lamps thereby contributing to national energy consumption scheme. LED components were purchased from local market and energy auditing at steel industrial where studied. The recommendations were given to industry for retrofit of traditional lamps with LED.**

Key Words: **Power generation, Power demand, Renewable and Non-renewable source, Global warming, Industrial lighting, Retrofit**

I. INTRODUCTION

As of August 31, 2015, India's total power generation capacity was 280,328 MW. India is home to the world's fifth largest power system. At 195,604 MW, power that was generated using coal, gas, and oil formed the bulk of the total, just under 70%. Electricity generated from renewable sources, including hydro, wind, among others made up 28% of the total. And the remaining 2%, about 5,780 MW, came from nuclear power.

As on March 2015, India's total energy consumption was 938,823GWh. At 23.53% for domestic applications, 8.77% for commercial application, 74.19% for Industrial applications, 3.47% for traction, 6.21% for agricultural purpose and 2.97 for misc. applications. The per capita generation is 73.9KWh.The total installed capacity in India was 271,722MW, at 188,898MW power from thermal power plants, 5,780MW from nuclear power plant and 77,044 from renewable energy sources.

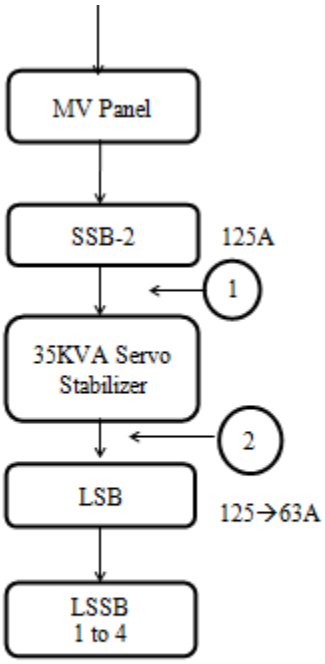
During the period 2015-16, the total energy requirement was 1,162,423MU, but the available energy was 1,138,346. The energy deficit was -2.1% .The peak power requirements was 158,862MW, but the available power was 152,754MW. The peak power deficit was -2.6%.The electrical energy demand for 2016–17 is expected to be at least 1,392 Tera Watt Hours, with a peak electric demand of 218 GW.The electrical energy demand for 2021–22 is expected to be at least 1,915 Tera Watt Hours, with a peak electric demand of 298 GW.

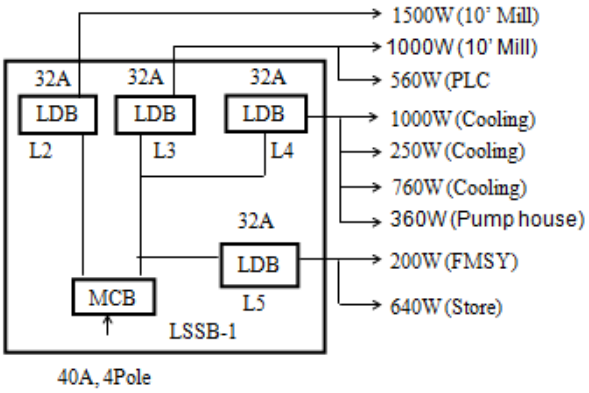
II. ELECTRICAL LOAD DETAILS AT AMMAN-TRY

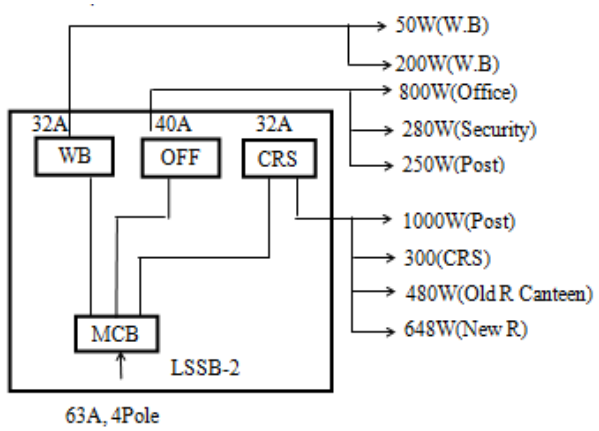
HT supply is obtained from Electricity board. A step down transformer with capacity of 2500KVA and 11KV/433V is installed inside the premises. The maximum permissible demand for the industry is 1525KVA but the actual demand reached by the industry is 90% of maximum demand, i.e. 1400KVA. 2 generators with capacity 125KVA, 440V are installed in the industry premises. A separate lighting transformer of 35KVA with a servo stabilizer is erected to serve lighting loads. The main function of the Stabilizer is to stabilize the voltage & safeguard the electrical equipment's. Energy saving is an added advantage. Highly fluctuation in AC supply is a common phenomenon in whole country. The voltage requirement of different electrical appliances is vary to a great extent. The electronics equipment like spectrophotometers, PH-Meter, X-Ray plant, recorders are all affected by high main voltage, whereas the refrigerators, deep freezers, incubators and other compressors are affected by low main voltage. However in industries, which are running 24 hours, also affected by this fluctuation voltage. So to achieve constant voltage Servo Stabilizers are used.

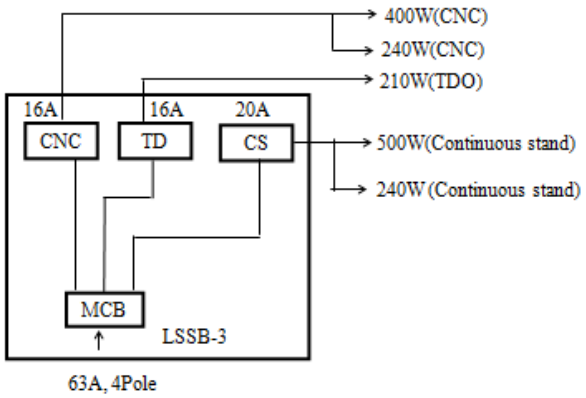
Servo Voltage Stabilizer uses an advance electronic

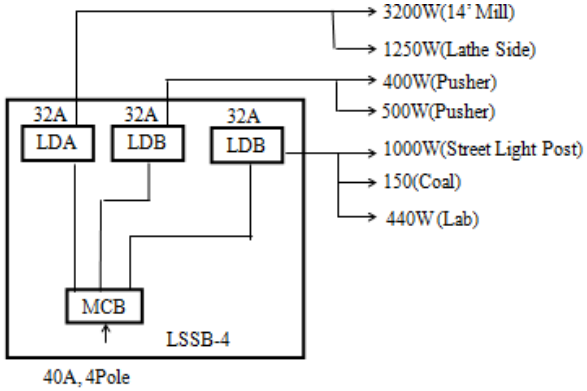
controlled servo motor concept to govern a motorized variable transformer. Because of the motors involved, there is a small delay in voltage correction. However, output voltage accuracy is usually ±1% with input voltage changes of up to ±50%.











There are 23 locations where lighting load is used in AMMAN-TRY. In these 23 locations traditional lamps such as Sodium vapour lamps (250W, 400W), Mercury vapour lamps (250W, 400W), Metal Halide lamps (150W, 250W), Halogen lamps (500W), Fluorescent (40W), CFL lamps (25W), solar lamps (15W) are being used. The total connected load is 20,510W.

S No	Type Of Lamp	Wattage	Lumens	Power Factor
1	Sodium Vapour Lamp	250	26000	0.29
		400	42300	
2	Mercury Vapour Lamp	250	12750	0.84
		400	22750	
3	Metal Halide(double ended)	150	11000	0.32
		400	33000	
4	Halogen Lamp	500	9500	1.0
5	Incandescent Lamp	40	360	0.55
6	CFL Lamp	15	860	0.86

TABLE 1: Traditional Lamp Ratings (Presently Used At Amman Try)

1. *Energy bill data:*

The average energy consumption per month calculated from the last one year data is 3 to 4 lakhs. The average demand reached at AMMAN-TRY is 1400KVA.

The average energy bill per month at AMMAN-TRY calculated from the last one year data is 23 to 27 lakhs. The maximum demand cost is 5.30 lakhs.

2. *Lighting auditing:*

The details of lamps used, wattage of lamps, type, quantity and locations were studied. The details of total connected load for lighting were calculated. The lumens values for different locations at AMMAN-TRY are tabulated below.

S No	Location	Total Watts	Average Lumens
1	Power Room	440	48.4
2	10 Inch mill	2500	133.11
3	14 Inch mill	4450	56.4
4	CNC	1520	265
5	Lathe	40	45
6	Bushers	1050	116.5
7	Cooling Bed	2720	113
8	Outside Unit	2750	29
9	CRS Shed	380	37.6
10	Street Light	100	19
11	Store Room	520	44.3
12	Car Parking	80	42
13	Welding	80	41
14	Pressure Machine Rest Room	240	47
15	Protection	80	43
16	Pump House	320	32
17	New Building	450	36
18	Quarters	480	40.6

Table 2: MEASURED VALUES AT AMMAN TRY (After 6.00pm)

The lighting loads were divided based on the operating hours and the lighting energy consumptions are tabulated below

Operating Time	Connected Load (W)	Energy Per Day (Kwh)	Energy Per Month (KWh)	Energy Per Annum (KWh)
PHASE 1 21 HOURS	6120	128.5	3856	46272
PHASE 2 12 HOURS	4540	54.5	1362	16344
PHASE 3 10 HOURS	2148	21.5	772	9264
TOTAL	12808	204.5	6000	71880

Table 3: Lighting Energy Consumption At Amman Try Per Year

3. COST ANALYSIS:

The main focus is the replacement of traditional lamps at AMMAN-TRY with LED lamps\

S No	Traditional Lamp	Wattage	Led Equivalent
1	Sodium	70	30W
		150	50W
		250	100W
		900	120W
2	Metal Halide	78	50W
		150	70W
		250	100W
		400	160W
3	Halogen	50	4W
		100	10W
		200	20W
		300	30W
		500	70W
4	2ft Fluorescent	18	10W
	3ft Fluorescent	30	15W
	4ft Fluorescent	36	20W
	5ft Fluorescent	58	25W

Table 4:Equivalent Led Lamp Retrofit For Existing Lamp

The components required for LED retrofit were purchased from local market and LED lamps were assembled. The costs of assembled lamps were compared with the market price of Philips lamps. The comparison is tabulated below

S No	Rating (Watts)	Price Of Assembled Components (Rs)	Price Of Philips (Rs)
1	7	180	490
2	14	490	950
3	2ft LED Tube light	620	1500
4	4ft LED Tube light	875	2800
5	24W Street Lights	1350	2430
6	100	3200	6500

Table 5: Price List Comparison of Led Lamp For Philips And Assembled Components

If all the traditional lamps are replaced by LED, the initial investment would be around 2.54 lakhs for AMMAN-TRY steel industry.

4. RESULTS AND DISCUSSION:

1.1. ENERGY SAVING

Existing energy consumption of lighting at AMMAN-TRY per year is 71,880 units. If all the traditional lamps are replaced by LED lamps through LED retrofit the energy consumption per year would be reduced to 42,901 units. The lighting energy savings per year would be 28,979 units.

S No	Operating Time	Connected Load (W)	Energy Per Annum (Kwh)
1	Phase 1 (21 hours)	3470	26600
2	Phase 2 (12 hours)	2060	7519
3	Phase 3 (10 hours)	2005	8782
Total			42901

Table 6: LED lighting energy consumption at AMMAM-TRY per year

The Break even period $= \frac{\text{investment}}{\text{savings}}$

The energy savings cost per year would be 28,789*5.5=1.6lakhs

Therefore the break even period would be 1.58years i.e. 19 months

III. CONCLUSION

Today almost 90% of all households in Andhra Pradesh and puducherry have replaced the traditional lamps with LEDs and the electricity bills of households have reduced up to Rs200 every month. The LED push, under the domestic efficient lighting program was launched full swing in various states of India in January and the outcome was quite encouraging, 68 lakhs KW of energy is being saved every day. If we cut in 645MW of power during peak hours, then daily carbon emission from power station would drop by 5520 tones with Rs2.71 crores of domestic saving every day. Hence LED lamps and their application are quite mandatory for conserving energy and to make our country evergreen.

India is mainly depended on thermal power stations (79%) for power generation; the thermal power plant involves burning of coal for generating power. The amount of coal burn for generating one unit of electric power is equal to approximately 1Kg of CO_2. The effect of Global Warming is increasing day by day, which is a major threat to future generation. This paper is initiative for reduction in energy consumption for Industries in India, which could result in reduced effect of Global Warming.

IV. FUTURE SCOPE:

Laser lighting could be the next generation of lighting. Using just a handful of tiny but powerful lasers and then redirecting the laser into fiber optical cable and other types of light-transmitting plastic that could take that light and evenly distribute it into warm diffuse glow.

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