

Executive Summary

This report summarizes the results of the comprehensive energy audit study carried out at the KEMAPCO in March, 2007 by the National Energy Research Center (NERC).

The study focused on the following major energy consuming areas at the company to identify energy conservation opportunities:

- Electrical System.
- Steam System
- Energy Management.
- Compressed Air System
- Lighting System.
- Water Pumping System.

The Detailed Energy Audit (DEA) study team would like to express their gratitude and appreciation for all of KEMAPCO management and employees who facilitated and assisted in conducting the study.

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In fact, energy inputs both electrical and fuel – are an essential part of manufacturing process and expenditure on these inputs often accounts for a significant share of manufacturing cost. This is compounded by the fact that the cost of energy is constantly escalating and will continue to rise.

Any saving in energy costs directly added to the operating profits of the company. It probably requires less effort to improve profits through energy savings than by reducing labor cost, increasing sales, increasing prices, and etc. For this purpose, KEMAPCO has considered the energy audit as one of the measures that could reduce the rising energy cost.

According to the available data and auditors' analysis, it is found that the annual cost of energy is JD 4,294,268 and distributed between electricity JD 1,214,551 and fuel (heavy fuel oil and diesel) JD 3,079,717. An increase in energy cost is noticed in 2006 by around 60% compared to energy cost in 2005.

The amount of electricity consumed in 2006 was 28,570 MWh, while it was 29,288 MWh in 2005. And the amount of thermal energy (heavy fuel oil and diesel) consumed in 2006 was 140,302 MWh and 18,893 MWh respectively.

It is also found that electricity forms 28% of the total amount of energy consumed in 2006, while thermal energies; heavy fuel oil and diesel comprise 59% and 13% respectively.

Various opportunities are discussed and analyzed in this report. These include steam system notably the heat recovery from blowdown of auxiliary boiler including flash steam, condensate recovery from some steam traps, insulation of steam piping system and other uninsulated surfaces, operating the synchronous generator as a motor to produce mechanical power, using variable speed drives for water pumps, using electronic ballasts in fluorescent lighting. A pre-feasibility for using natural gas instead of heavy fuel oil and diesel is also considered to show the feasibility of the substitution of heavy fuel oil and diesel by natural gas.

Table 1 summarizes a list of projects or recommendations resulted from the detailed energy audit which was carried out at KEMAPCO. This table includes the needed investments, cost savings, and pay back period for each project.

The Detailed Energy Audit showed an energy saving potential of about **15%** of the annual energy cost. .

Table1: Summary of potential savings.

Area	Annual Energy Savings		Cost Savings (JD/yr.)	Investment Required (JD)	Pay Back Period (Years)	CO ₂ (TON/year)
	KWh/yr					
	Electrical	Thermal				
Steam System						
1. Operating the Synchronous Generator as a Motor		12,684,272	379,000	N/A	N/A	2900
2. Blowdown heat recovery: Combination of the Flash Steam Recovery and Blow down Recovery		2421354	60800	19,930	0.33	566
3. Insulation of the Uninsulated Valves and surfaces.		193333	7590	530	0.07	46
4. Condensate Recovery		1224154	30736	1,000	0.04	286
5. Converting the Flash Dryer from working by Diesel to working by LPG			122938	256,500	2.09	
Compressed Air System						
Reducing the working pressure of the compressed air from 7.5 to 7 bars.	92,667		3,940			62
Lighting System						
Replacing the Conventional ballasts by Electronic Ballasts for Fluorescent Lamps	52486		2231	6,773	3	35
Water cooling system						
Sea Water pumping system.	377,952		16,000	24,000	1.5	250
Cooling water pumping system	186,893		7,940	9,000	1.2	125
Total	709,998	16,523,113	631,175	317,733	0.55	4270
% Saving (based on consumption cost)					15%	
% Saving (based on consumption in MWh)					10%	

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