



## CASE STUDY : PLANT WIDE ENERGY AUDIT IDENTIFIES NUMEROUS ENERGY COST CUTTING MEASURES AT FELDA OIL PRODUCTS

### HIGHLIGHTS

Identified 12% cost savings for fuel, water and electricity in the form of low cost and medium cost measures.

Implemented low cost measures:

- ▶ Process cooling system optimization.
- ▶ Heat recovery for steam conservation using pinch method.
- ▶ Optimization of major pump operation.
- ▶ Optimization of cooling tower operational efficiency.
- ▶ Achieved 54% of the projected cost savings from low cost measures.

Provided hands on training to plant staff on energy monitoring and targeting approaches for continuity.

Established a best practice energy management program for sustainability

Streamlined further activities to achieve long term target of 30% utility cost savings.

### FINANCING

The entire program was financed by Felda Oil Products Sdn Bhd

### SUMMARY

INFOLLIANCE undertook a plant wide energy efficiency assessment at FELDA OIL PRODUCTS SDN BHD (PASIR GUDANG) in July 2004. The assessment objectives were to identify energy cost reduction measures in the utilities area, including *boilers and associated steam systems, electrical motors, pumps, cooling water system, chilled water system and process heating and cooling in the refinery plant.*

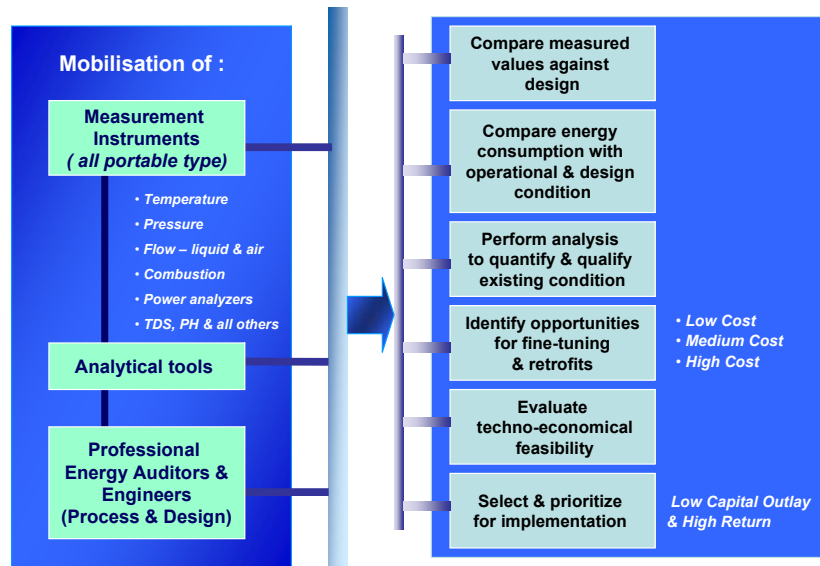
The programme focused at reducing the electricity, fuel and water consumption of the plant. A **potential cost savings of RM 886,600 per annum (233,000 USD p.a.)** was identified with an overall payback time of 8 months. **Seven (7) projects were streamlined** out of which **three (3) were implemented.** The site has **achieved an annual cost savings of RM 480,000 (126,000 USD p.a.)** from the implementation of these measures which are of **low cost type.**

The success of the program was based on the commitment and good team work shown by Felda Oil Product's management and staff. Combined with Lumentech's approach using innovative and collaborative energy auditing methodology, the program managed to achieve operational improvements and more importantly a change towards a conservation culture with a long term strategic vision for energy management.

This case study provides an overview of the energy audit carried out, highlighting major achievements and long-term benefits to the site.

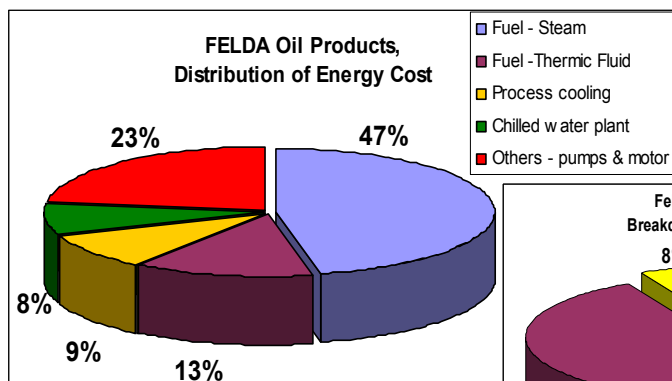
### ENERGY AUDIT APPROACH

The plant wide energy audit focused on the techno-economical evaluation of existing energy systems in the plant utilities and processes, that could benefit from facility retrofits, heat recovery, improved control system, matching utility supply with demand and reduce process heat losses. The entire audit works took two (2) months to complete.

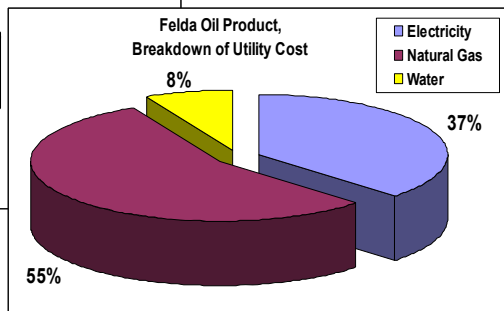


## ANALYSIS OF ENERGY CONSUMPTION STRUCTURE

The plant is designed to refine 1,600 MT of Crude Palm Oil (CPO) daily and is operating at 90% to 95% load. During the energy audit, the team conducted a detail analysis of measured data and prioritised the activities on high priority consumption items. The team recognised that even a small improvement in the efficiency of the main energy consumers (steam, cooling water system and chilled water system) could create significant savings. Following are the Specific Energy Consumption (SEC) Indicators established from the audit:



Specific Electricity Consumption : 30.7 kWh/ MT CPO processed  
 Specific Fuel Consumption : 673.6 MJ/ MT CPO processed  
 Specific Raw Water Consumption : 0.5 m<sup>3</sup>/ MT CPO processed  
 Overall SEC : 0.784 GJ/ MT CPO processed



Note: MT ~ metric tons

The SEC indicators shall serve as baseline and performances of all future energy improvement activities shall be gauged against the established indicators.

## ENERGY COST REDUCTION MEASURES IDENTIFIED

To ensure that the program goals were met, Infolliance's energy audit team identified measures that provide significant energy savings and attractive payback. These measures were analysed and developed during the audit. The energy audit concluded that the highest energy cost savings are particularly in the boiler and steam distribution and condensate return system (fuel savings). The table below details the findings and level of savings as well as payback.

| ENERGY COST REDUCTION MEASURE                                                                                                      | ESTIMATED ANNUAL COST SAVINGS |                      |                |                | CO <sub>2</sub> SAVINGS<br>MT/yr | PAYBACK PERIOD<br>(MONTHS) | RETURN ON INVESTMENT<br>% | STATUS      |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------|----------------|----------------|----------------------------------|----------------------------|---------------------------|-------------|
|                                                                                                                                    | ELECTRICITY<br>RM/yr          | NATURAL GAS<br>RM/yr | WATER<br>RM/yr | TOTAL<br>RM/yr |                                  |                            |                           |             |
| 1. Optimise Cooling Tower & Pump Operation for Cooling Water Supply to Barometric Condenser at Physical Refining & Bleaching Plant | 107,384                       | -                    | 24,295         | 131,679        | 340                              | 0.7                        | 1646%                     | Implemented |
| 2. Centralise Process Cooling Water Supply to Fractionation Plant                                                                  | 136,129                       | -                    | 47,983         | 184,112        | 431                              | 3.4                        | 350%                      | Implemented |
| 3. Increase Boiler Feedwater Temperature using Process Heat Recovery from Plate Heat Exchangers (Pinch Method) at Bleaching Plant  | -                             | 135,343              | -              | 135,343        | 563                              | 4.9                        | 246%                      | implemented |
| 4. 2nd Stage Boiler Feedwater Preheating using Waste Heat From Boiler Flue                                                         | -                             | 104,110              | -              | 104,110        | 433                              | 24                         | 51%                       |             |
| 5. Improve Steam Pipe Insulation & Reduce Steam Trap Losses                                                                        | -                             | 122,000              | -              | 122,000        | 504                              | 11.5                       | 209%                      |             |
| 6. Improve Condensate Collection Method & Utilize Recovered Hot Condensate to Heat Stearin and Olien Tanks at Fractionation Plant  | -                             | 148,225              | -              | 148,225        | 609                              | 8.9                        | 135%                      |             |
| 7. Eliminate Steam Heating & Recover Flash Steam from Contaminated Hot Condensate to Heat Up Hot Water for Fractionation Plant     | -                             | 61,166               | -              | 61,166         | 224                              | 14.7                       | 82%                       |             |
| <b>TOTAL</b>                                                                                                                       | <b>24</b>                     | <b>3,513</b>         | <b>570,844</b> | <b>72,278</b>  | <b>886,635</b>                   | <b>3,104</b>               | <b>8</b>                  | <b>157%</b> |

## IMPLEMENTATION

Implementation of the energy audit findings were carried out in phases. In the first phase, three (3) low cost measures were installed and the savings were verified. Spin off from the savings achieved shall be used to finance medium cost measures in the next stage.

Note: Exchange rate 1 USD = 3.8 RM Cost of electricity is at RM 0.21/k Wh Cost of Natural Gas is at RM 0.49/5m<sup>3</sup>



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