Workshop on

Energy Efficiency Enhancement in Refineries under PAT Scheme

Energy Conservation Opportunities in Refineries : A case of BPCL, Kochi

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ISO 9001 : 2008 Certified Institute

Back Ground

Aim of the Project

To meet the compliance of Energy Conservation Act 2001 (52 of 2001), as *Designated Consumer – Kochi Refinery* (90,000 MTOE or above)

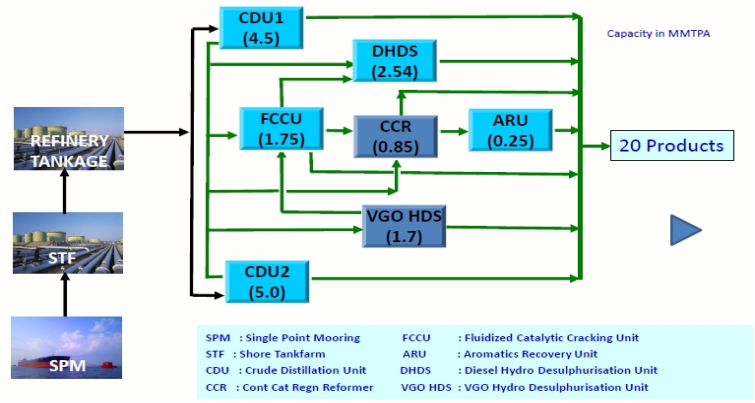
Main objectives of Project

- Identify energy efficiency opportunities in refinery operations and its utilities, to reduce costs and negative environmental impacts, while up grading the capacity;
- Assessment of technical feasibility & cost benefit analysis;
- Meeting statutory requirements of BEE & SDA and to develop a comprehensive strategy for implementation of identified potential energy savings;.

Time Line : 3 months (January – March 2016)

Refinery Profile : BPCL Kochi

Installed Capacity : 9.5 MMTPA



Integrated Refinery Expansion Project (IREP) under progress to 15.5 MMTPA; To meet the growing demand of petroleum products in Indian market (as well as improve the auto-fuel quality to Euro-IV/VI levels)

Energy Audit Methodology

- Preliminary Survey
- Data Collection

  Plant records, energy input, equipment specifications, Process flows, etc.,

- Field Measurements using instruments
- Data Analysis (Historic & actual measured data)
- Discussions with individual plant production teams
- Techno-economic evaluation of energy conservation measures
- Presentation to Management

- Submission of draft report for Review to Individual units
- Discussions with Individual units for acceptance of proposals
- Final report submission

TERI Experience : Energy Audit Services (Last 3 years)

Creating Innovative Solutions for a Sustainable Future

Petroleum & Natural Gas Sector

Company	Type of Study
British Gas India	Offshore Exploration
Kochi Refinery	Lighting Adequacy
GAIL	Gas Processing Stations
HPCL	Product Pipeline

TERI Experience : Energy Audit Services (Last 3 years)

Creating Innovative Solutions for a Sustainable Future

Offshore Exploration Study :

- Air filter design change for Solar mars turbines;
- Optimization of wash Cycles;
- Inter connection of Power systems;
- Minimizing the flare gas emissions by additional storage (floating).

Estimated GHG emission reduction - 9820 MT of CO_2 eq (4% of present level)

Lighting Adequacy Study : Implementation investment Rs 225 lakhs

Plant Lighting load : 1.75 MW

- 700 HPSV/HPMV lamps replaced with Metal Halide in Plant premises
- 17 Induction lamps / LED for street lighting
- 3 High Mast towers for Improving lighting adequacy levels
- Optimize the tap setting in lighting transformers

Estimated energy conservation Potential - 250 MTOE

Refinery Energy Audit

How different from other sectors (under PAT)

- Entry Authorization (permits) for the team
- Mandatory safety training
- Daily Work permits for different types of works from different departments
- Continuous presence of team in field
- Co-ordination between plant internal team with audit team

Refinery Energy Audit

How different from other sectors (under PAT)

- Plant Operating Conditions (EOR, SOR)
- Plant shutdown due to unforeseen circumstances
- Understanding process technologies – w.r.t mix of products and technology
- Documentation (OEM's design documents)
- Modifications in process flow from original design
- Confidentiality

Energy Performance : Indian Refineries

No of Refineries under PAT : 18

Parameters	Unit	Range
Throughput	Million Metric Ton per annum, MMTPA	2.81 - 41.44
NRGF		4.2178 - 10.259
MBN	MMBTU / Barrel / NRGF	50.9986 (High η) 99.895 (Low η)
SEC	kCal/liter	524 - 1042

Captive energy consumption of refineries is 8.3 liters for barrel of crude (159 liters);

Kochi Refinery : PAT Target

Based on Refinery submitted data FY 2014-15

MBN	Crude Throughput Th.Bbls	NRGF	Target MBN	MBN Reduction	% Reduction
78.3944	78496	4.2178	73.1011	5.29	6.75

Based on sectorial target reduction of 5.97%

BEE Calculation

MBN - Million British Thermal Unit per Thousand barrels per Energy Factor (*MMBTU / Barrel / NRGF*) = (Fuel + Loss)

NRGF - Complexity of the refinery

Reference :
https://beeindia.gov.in/sites/default/files/PAT%20target%20for%20Petroleum%20Refinery.pdf

Energy Conservation Opportunities - Process

- Optimization of heat sources and using for product pre-heating;
- Optimization of valves position as well process parameters and improving yields;
- Additional power generation sources (instead of pressure drops);
- Optimization of reaction parameters and improve yields;

Energy Conservation Opportunities - Utility

- Power generation in place of PRDS;
- Vapour Absorption System (VAM) in place of vapour compressor system;
- Optimum sizing of impellers / pumps and operating practices;
- Use of variable speed drives (both HT/LT) for capacity control;
- Optimizing boiler capacity utilization and steam consumption;
- Reactive power management and use of energy efficient motors

Barriers for EC Implementation

- Reliability of operations – Running equipment in part load;
- OEMs approval for modifications;
- Space constraints for implementation;
- Continuous operations (Restricted Shut down);
- Budget Limitations;

Meeting PAT Target

- Minimizing losses (flaring etc.,);
- Capacity enhancement of Refinery;
- Use of external fuels (Natural gas, etc.,);
- Crude composition;
- Technology improvement options;

Conclusion

- ✓ Potential exists for improving energy efficiency and energy conservation in refineries with no cost and low cost measures;
- ✓ Review of steam economy on continuous basis;
- ✓ High priority to implement process improvement measures and high investment proposals (with attractive payback period);
- ✓ Use of latest technology in energy monitoring systems.

THANK YOU

Save Energy. Save our Planet