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SME CASE STUDY

Introduction

This case study is based on the lessons learned from implementing energy efficiency in Small and Medium Enterprises (SMEs) under the USAID ECO–III project. This exercise involved collaborative activities involving a local partner organization–National Institute of Secondary Steel Technology (NISST), the All India Steel Re-rolling Mills Association and Small Scale Local Associations at Mandi Govindgarh, Punjab and a few SME unit owners willing to implement energy conservation measures using their own funds. Punjab Energy Development Agency (PEDA), the state designated agency and the Bureau of Energy Efficiency (BEE) have also been active collaborators under this initiative. The efforts included creating awareness on Energy Efficiency Technologies (EET) relevant to the specific SME cluster, selecting three SME units from participating cluster, conducting pre-investigative studies (for identifying energy saving potential), preparing pre-feasibility reports for evaluating return on investments through energy savings. The project has benefitted from past activities undertaken through other donor programs (UNDP–GEF, World Bank) and activities carried out by PCRA. It is hoped that lessons learned will also help other organizations working to promote energy efficiency in the SME sector.

Methodology

The project along with Industry Associations and PEDA organized a workshop at the inception of the ECO- III project activities on January 21, 2008. Energy Efficient Technologies and their benefits were presented to an audience consisting of 50 SME units from the Mandi Govindgarh cluster. Three units were short-listed based on their commitments and under the premise that the units will pursue the viable energy conservation measures as follow up of the pre-feasibility studies by NISST, located in the hub of the

Planning

- Meetings with associations soliciting their active participation
- Conducting Awareness Workshops
- Circulating Questionnaire to SMEs in the cluster

Scoping

- Analyzing information collected from the units
- Shortlisting the units
- Seeking commitment from the selected units

Pre-Investigative Studies

- Preparing process flow diagram
- Conducting energy audit
- Generating options and screening them

Pre-Feasibility Studies

- Technical and financial evaluation
- Shortlisting options from the audit reports

Post Studies Support

- Follow up meetings
- Facilitation of suggested measures during the implementation

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Steel Cluster of Mandi Govindgarh with over 300 re-rolling mills.

Case Study

This case study illustrates the example of results achieved by Thakur Steels at Mandi Govindgarh, as a result of the ECO-III intervention. The unit is one of the small re-rolling units well equipped with energy efficiency monitoring devices. The unit has a single zone reheating furnace and an open train rolling mill with six stands driven by a single AC motor of 500 hp. The drive mechanism has a 13 MT flywheel. The power supply of 11 kV is from Punjab State Electricity Board (PSEB). The unit has a bore well for make up water supply and closed loop water recirculation system with a cooling tower. The annual capacity of the unit is approximately 5500 to 6000 MT of rolled steel per annum. It is utilizing re-roll-able scrap and cut piece of Ingots/billets as raw material and producing product mix of different sizes of flats and strips. The material flow in the existing mill is as shown in the adjoining

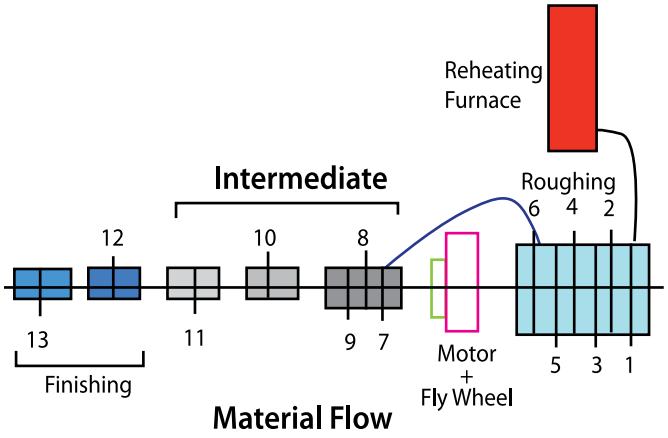

figure. The input material is heated in the reheating furnace and processed through the stands.

Energy Efficiency Options

An energy and process audit of the unit highlighted system deficiencies contributing to energy savings opportunities. Interestingly, material loss reduction is an important consideration besides energy savings. Pre-feasibility study was taken up to determine the scope of cost-effective investment options. Roadmap

	Energy Efficiency Technologies (EET) Options	GH	PM	EM	TC
Re-Heating Furnace	Modification of different zones to improve combustion and production				√
	Installation of proper burner			√	
	Installation of improved recuperators			√	
	Installation of VFD at combustion/coal carrier blower			√	
	Installation of VFD at suction ID fan of Air Pollution Control Device (APCD)			√	
Rolling Mill	Improvement of shaft alignments				
	Installation of roller bearing				√
	Installation of universal spindles				√
	Replacement of V-belt by flat belt		√		
	Replacement/synchronization and automation of lubrication system	√			
Electrical System	Augmentation of capacitor bank	√			
	Rectification of MD controller		√		
	Improvement in mill stoppage/ideal running of motor				
	Improvement of house-keeping and lighting	√			
	Replacement of rewound motors with energy efficient motors				
Coal Pulverizer	Rectification of worn-out grooves in pulverizer	√			
	Increasing number of hammers			√	
	Increase in RPM of pulverizer motor		√		
	Change of hammer chemical composition for improvement in grinding			√	
	Checking of coal mesh size (daily)	√			

GH: Good House Keeping; **PM:** Process Modification; **EM:** Equipment Modification; **TC:** Technology Change

and Project Plan (PP) for the unit was prepared and used to convince the management of the company. Energy Efficient Technologies (EET) options that were discussed are listed in the table.

Benefits & Achievements

After the study was completed by NISST, EETs were reviewed by the top executives to prepare the road map for implementation as detailed below:

1. **First phase:** Use of VFD for better air/fuel ratio control at combustion air blower and at Air Pollution Control Device (APCD) blower for draft control.
2. **Second Phase:** Revamping of reheating furnace for energy efficiency by increasing the productivity and,
3. **Third Phase:** Replacement of existing bearing with roller bearing.

Description of Implementation Programme

1. **Rectification of worn out grooves of Pulverizer and use of modified chemical composition of Hammer:** The Pulverizer was rectified with its worn-out grooves replaced and the chemical composition of the hammer was changed. Earlier unit was using spring steel composition in hammer. Now the unit has deployed around 100 pieces of head fed steel composition (increased Maganese composition). This resulted in improved grinding of coal, which has improved combustion of coal and ultimately improved the temperature profile in furnace.

2. **Introduction of hot air in furnace through modified burner:** The unit has put around 20% hot air in furnace. The burner was modified and hot air was introduced at a cross angle. This has also increased combustion of coal and ultimately improved the temperature profile in furnace. The coal consumption decreased to the tune of 4-5 kg/t. This has brought a saving of Rs. 1, 80,000 per annum.
3. **Improvement in Shaft Alignment:** During the study, it was found that the power consumption during no load running condition was very high. It was found that when the main motor was attached with fly- wheel, roughing stand and gear box only, power consumption was 51.2 kWh. It is worth noting that when main motor was attached to all other stands and idle mill running load, power consumption increased to 132.9 kWh. It was later established that the cause for excessive power consumption was the shaft misalignment. Rectification of the deficiency saved power consumption to the tune of 15 to 25 kWh. This measure resulted in electricity savings of Rs. 1, 50,000 per annum.
4. **Installation of Variable Speed Drive on Combustion and Coal Carrier Air Blower (FD Fan) and APCD blower (ID Fan):** As discussed above, the first phase of implementation was carried out to regulate the air/fuel ratio at a desired pressure. VFD was recommended on combustion air-blower. To regulate draft accordingly, a VFD system was also recommended on APCD Blower. This VFD system reduces the energy required and also reduces the scale loss to the tune of 0.25%.

Conclusions

Energy savings achieved by the unit is reflected in the table below:

The unit is now going to implement the second phase of recommendations, viz. revamping/furnace modification which requires modest capital costs. To some extent, the pace of these efforts is dampened by the recessionary trend. The sector is very much affected by the economic melt down. Earlier, the unit had planned to increase the furnace output by increasing the width of the furnace by 25-30%. Now, they are simply changing the furnace zone dimensions to increase the production by 10-15% only. The learning under the project is useful for the unit to raise operational efficiency in the changed situation–the unit is able to beat the inflation by taking up cost-effective energy conservation measures. Such efforts will need replication by several other SMEs, many of which are on the lower ladder of energy conservation movement.

Summary of Overall Cost Benefit Analysis

S. No	RHF	Parameter	Implementing Partner (s)	
1	**Rate of Production**	3 tph	Unit /NISST	
Recommendation Implementation		**Before Implementation**	**After Implementation**	
2	**Unit fuel consumption**	65kg/t	60 kg/t	Fuel Saving: 5 kg/t
3	**Unit power consumption**	140-150 kWh/t	115-125 kWh/t	Power Saving: 15 kWh/t
4	**Total Scale loss**			
	Fce scale loss	4.00%	3.75%	Saving in Scale loss 0.25%
	Mill scale loss	0.70%	0.70%	
	Miss rolls & cobbles	1.30 %	1.30 %	Saving in power by 5.0 kWh/t
	End cut loss	2.00 %	2.00 %	
Benefits achieved	• Savings in coal = Rs. 1,80,000 per annum • Savings in materials = Rs. 6,00,000 per annum • Savings in power = Rs. 20,000 per annum			
Investment	**Rs. 1,00,000**		**Pay Back: Less than two months**	

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