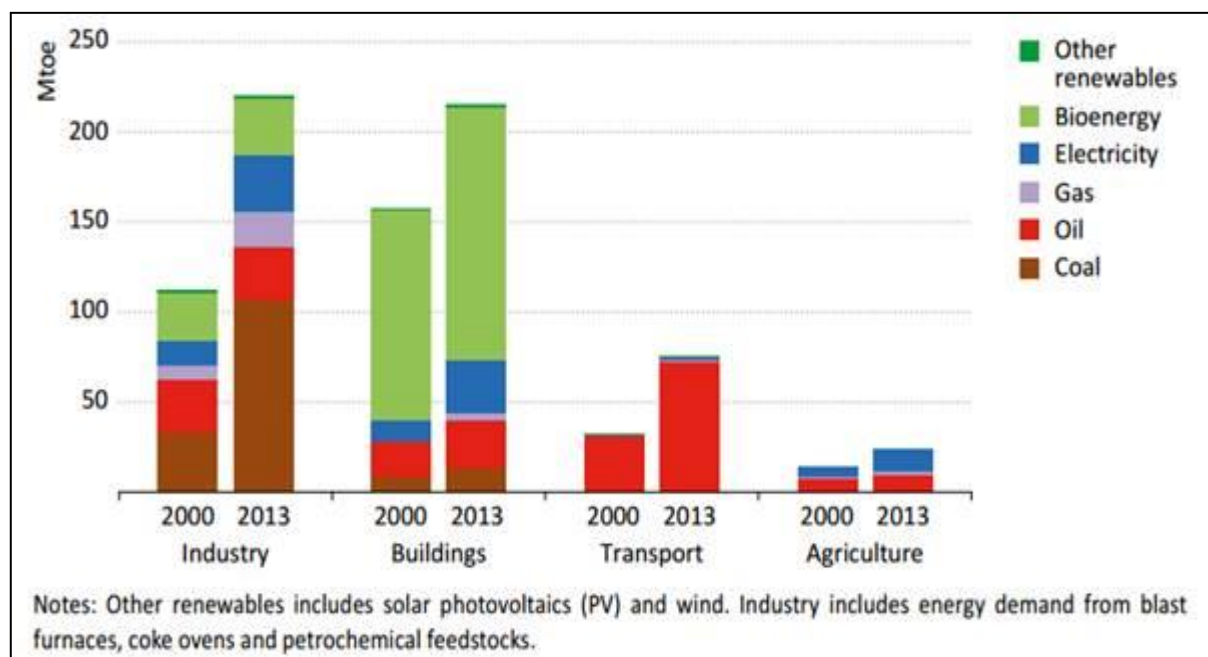


# **Decentralized Application of Biomass Gasifier for thermal energy demand**



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In India, there is increasing concern of depleting fossil reserves and impacts of Climate change due to GHG emissions on utilizing fossil fuels for energy needs. Indian industries are one of the major sectors where total energy demand has grown more rapidly since 2000, almost doubled over the 2000-2013 period. Figure below shows that in industries, coal and oil products are used in significant quantity and therefore, it is important to look out for alternative renewable energy resources for fulfilling the energy demand of the sector.

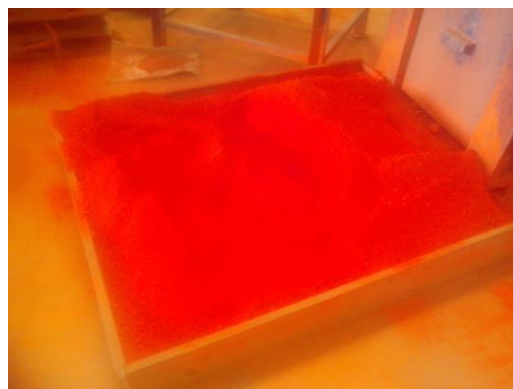


**Figure1: Energy demand in 2000-2013**

In India, in addition to big energy intensive industries such as Steel, Cement, etc., there are several Medium and Small industries which consume large amount of fossil fuels such as furnace oil, diesel, etc. for their routine processes. Replacing the fossil fuel with renewable energy sources for such services would help in saving the fuel and reducing the GHG emissions in the country.

This case study would highlight one such example of using biomass resource for diesel replacement in Lead and Alloy melting and Red Oxide production.

M/s Starlit Power System, Mewat, Haryana is a manufacturer of Refined Lead with minimum 99.97 % purity, Lead Alloys with Calcium, Antimony, Selenium, Tin and Grey Oxide and Red lead. The annual capacity of the plant is 12,000 MT with an equivalent 12,000-15,000 MT of smelting



capacity. The process energy requirement in the plant as thermal energy is for processes such as melting, refining and oxidation and reduction operations.

The Company decided to move towards the green energy and therefore looked out for options displacing diesel in the boilers.

Biomass gasifiers are advantageous for such applications because of ease of operation, providing required temperature levels, cost-effective, etc. The biomass gasifier at the project site was implemented by M/s Chanderpur Works based on TERI's technology.

## Adaptation of gasifier technology

The plant has reactors for melting (2 numbers), refining furnace and the reduction rotary kiln which have a cumulative thermal energy requirement of about 4,00,000 kCal/hr. The required temperature in the furnace is about 850-900 °C. A total of 1,650 litre of diesel was used for one batch of the production process in melting and lead furnace.



The technology deployed in the industry is downdraft gasifier with a capacity of 180 kg/hr of wood consumption which would be able to give a thermal output of 4,50,000 kCal/hr. The gasifier is capable of replacing at least 60% of diesel consumption in the DG set of 125 kVA rating, when used in the dual fuel mode and when the Rotary reduction furnace consuming about 35 litre of diesel per hour is not running (which is normally the case).

## Payback analysis for the project

A typical payback analysis for biomass gasifier based thermal projects is calculated and presented in the table below.

<b>Cost calculation</b>		
<b>Particulars</b>	<b>Value</b>	<b>Unit</b>
Diesel consumption per hour	40.0	litre
Daily running hours	22.0	hours
Diesel consumption /day	880.0	litre
Price of diesel (at the time of project implementation)	49.0	Rs./ litre
Diesel Calorific Value	10000.0	kCal/litre
<b>Cost of diesel per day (X)</b>	<b>43,120.0</b>	<b>Rs</b>
<b>Cost of wood</b>		
Wood Calorific Value	3500.0	kCal/kg
Wood required to replace 1 litre of Diesel	4.0	kg
Wood requirement/day	3520.0	kgs
Price of wood / kg (landed Cost)	5.0	Rs
<b>Total cost (A)</b>	<b>17,600.0</b>	<b>Rs</b>
<b>Cost of electricity for running the gasifier</b>		
Auxiliary electricity consumption of gasifier per hour	20.0	kWh
Daily operating hours	22.0	hrs
Power cost	6.0	Rs/kWh
<b>Total cost (B)</b>	<b>2,640.0</b>	<b>Rs</b>
<b>Cost of Manpower</b>		
Skilled (8 hrs/shift)	3.0	persons
Cost of skilled manpower	300	Rs/day
Unskilled (8 hrs/shift)	6.0	persons
Cost of skilled manpower	200	Rs/day
<b>Total cost (C)</b>	<b>2,100.0</b>	<b>Rs</b>
<b>Cost of annual maintenance</b>		
Maintenance cost/day (Considering 300 working days)	50,000.0	Rs
<b>Total cost (D)</b>	<b>167.0</b>	<b>Rs</b>
<b>Cost of running gasifier per day (A+B+C+D) (Y)</b>	<b>22,507.0</b>	<b>Rs</b>
<b>Profit per day (X-Y)</b>	<b>20,613.0</b>	<b>Rs</b>
<b>Annual Saving</b>	<b>61,83,900.0</b>	<b>Rs</b>

From the above figures, it is clear that application of biomass gasifiers can be very useful in the industries, by way of reducing the cost of operation in addition to reducing the carbon footprint of the industries.