Case Study: Energy Audit Leading to Energy Cost Reduction & CDM Project Identification backed by Detail Techno-Economic Feasibility & Implementation Assistance in a Metallurgical Plant

About Installation

This project has been carried out in one of the metallurgical industry engaged in the manufacturing of aluminium powder. The finish products are in the form of coarse powder, super finish powder, dust & fine powder. Basically process involves melting of aluminium then atomization, collection of powder, screening, polishing, inspection & packing of powder in bags. The average monthly production of furnaces is nearly 288.89 MT.

The Assignment

1. Techno-economic feasibility of Aluminum melting through solid fuel gasification
2. Elevates plant personnel and management on PG technology through discussion, feasibility report & site visits
3. Road Map for benefiting through Carbon Credit
4. Provides complete consulting assistance for implementation.

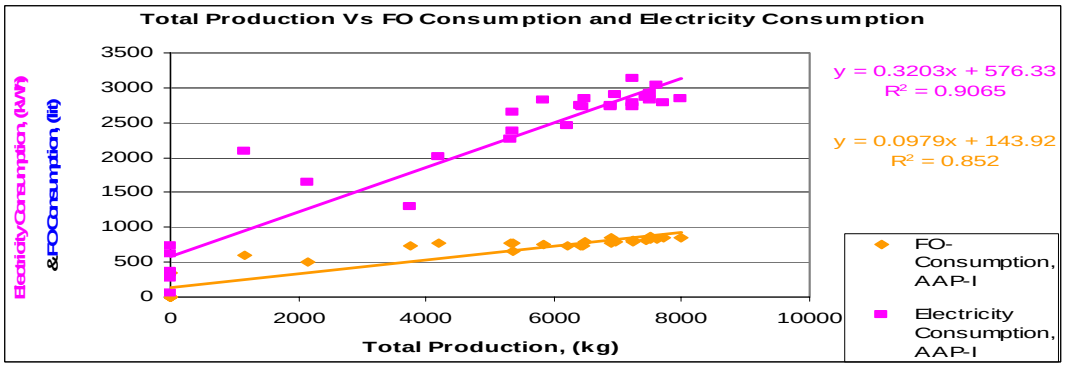
How we executed

In recent past rates of crude oil in international market have increased resulting in corresponding rise in FO rates. In 2 years FO rates have increased from 11 to 13 Rs/liter range to 18 to 22 Rs/liter range. This means drop in Kcal/Rs from 898 to 760 Kcal/Rs range to 549 to 450 Kcal/Rs and thus resulting in corresponding rise in melting cost from Rs. 1514/MT (FO @ Rs 12/ Liter) to Rs. 2524/MT (FO @ Rs 20/Liter) for average consumption of 126.2 Liters/MT.

This has necessitated identification and implementation of low energy cost technologies for melting of non ferrous metals & for heating application upto $800^{O}C$ to $1000^{O}C$ (which consume more than 65% of total energy cost at your Plant). Solid fuels like coal (Rs. 4.00 for 6000 Kcal per Kg in imported low ash coal), briquettes (Rs. 3.00 for 4000 Kcal per Kg with additional benefits of Certified Emission Reduction) and wood chips (Rs. 2.00 for 2800 Kcal per Kg) offers melting cost to stabilize at about 1150 Rs/MT to 1225 Rs/MT by generating producer gas (PG) through solid fuel gasification route (a technology that matured during world war II and Internal Combustion Engines driven automobiles were run on PG).

Observations:

The variations in FO consumption & Electricity Consumption are observed & studied.



Total Production Vs FO & Electricity Consumption for Furnace is shown in Fig. As regression coefficient for the equations is good, both of the equations (developed through regression analysis) above, can be used to calculate FO consumption as well as electricity consumption for given total production.

Gasification

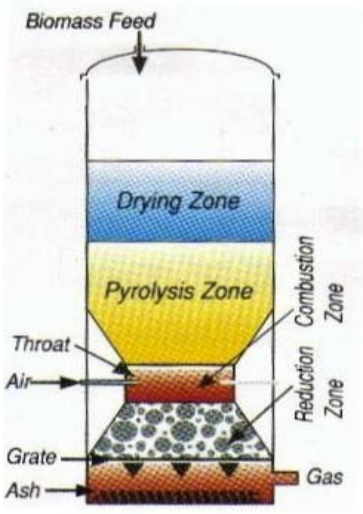
Gasification is basically conversion of solid fuel (wood, briquettes, coal etc) into a combustible gas mixture normally called producer gas. Process involves partial combustion of such biomass partial combustion process occurs when air supply (O_2) is less than adequate for the combustion of biomass to be completed. Producer gas consisting primarily of hydrogen (H_2) and carbon monoxide (CO), with lesser amount of carbon dioxide (CO_2), water (H_2O), methane (CH_4), nitrogen (N_2). Gasification is carried out at elevated temperature 800-1000^oC.

Various types of fossil fuels (coal) & biomass Gasifier have been developed. They are grouped into three major categories:

1. Downdraft Gasifier
2. Updraft Gasifier
3. Fluidized bed Gasifier

The air gasification process is visualized to be taking place in 4 sequential phases happening in four zones:

1. Drying zone
2. Pyrolysis zone
3. Oxidation or combustion zone
4. Reduction zone



Findings & Recommendation

Fuel Specifications Concerned With Non Ferrous Melting

SR	Parameters	Furnace oil	Imported Coal	Briquette	Wood chips
1	**Calorific Value Kcal/kg**	9880	6000	4000	2800
2	**Calorific Value Kcal/Lit**	9387	-	-	-
3	**Rs/kg or liter**	20	4.5	3	2
4	**Overall Efficiency (Kcal per kg of fuel in PG being delivered to furnace / Kcal per kg in terms of GCV in fuel)**	-	75%	75%	70%
5	**Fuel Ratio, Kg of Fuel per Liter of Furnace Oil**	-	2.09	3.13	4.79
	Percentage Saving in Energy Cost, %	-	53%	53%	52%

CDM Benefits

As we are substituting the fossil fuels with the renewable energy sources like briquettes which will reduce CO_2 emission to the environment. Hence the project is viable for CDM benefits and CER Generated through this project per year will be about 1200 to 1250, which means a revenue generation of Rs. 5,40,000 per year (= 1200 x US $ 10 per CER x Rs/US $45) for 10 years. Present Kyoto committed period is from year 2008 to 2012. Therefore minimum benefits can be safely taken from next year (complete year after project commissioning); therefore 6 years thus taking total CDM revenue receipts to Rs. 32, 40,000.

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