Article # 7

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Co-generation in India. A misnomer

Cogeneration in India, being a tropical country with power shortfall, means often something else than in Germany. Here cogeneration in particular in the context of sugar mills means the generation of excess power to be sold to an external customer and wheeled through the public grid.

All what you have to do, is to junk the old boiler and low pressure steam turbine and replace it by a high temperature and pressure system. I call this a simple energy efficiency measure and not introducing cogeneration.

Cogeneration as understood elsewhere means “Combined Heat and Power” generation. In other words it generates with one integrated system both, power and process heat. Such plants achieve system efficiencies of 80% - 85%. This means at least 80% of fuel energy supplied to the plant is utilized (i.e. useful energy output). Compare this with conventional power plant efficiencies of at most 40%.

Presently the MoP has issued guidelines for the States concerning cogeneration. Some States give preferential tariffs for such “cogeneration = combined heat and power plants”.

As always investors find loopholes in such rules and regulations, meaning they gladly take the special tariffs, but may not really operate a “combined heat and power” plant.

We have picked the directives of a State Electricity Regulatory Commission (SERC) for our 2,700 odd subscribers and like to discuss on this example, the difficulties to define and monitor “cogeneration”.
All readers are encouraged to read, understand and analyse this directive, and appreciate the complexity or simplicity. It is not an easy task.

We are looking for comments about the best way to define a cogeneration system, not only for sugar mills, and suggest ways to verify in the field its operational efficiency.

Remember the bottom line

$$\text{System efficiency is} = \frac{\text{useful energy output}}{\text{energy input (kWh)}}$$

$$= \frac{\text{electrical energy (kWh)} + 1/2\ \text{process heat (kWh)}}{\text{energy input (kWh)}}$$

For those, who protest the notion of “kWh” for process heat, remember 3.6 MJ = 1 kWh. The energy content of a fuel or steam may therefore be as well expressed in kWh based on the international SI system. If uncomfortable, you may also express all energy input and output in MJ or kcal. But mixing of units should be avoided in this equation.

The objective is to make the system efficiency as large as possible for a given fuel energy input. One may of course as well further utilize some remaining heat in the stack gas of the boiler to improve on the system efficiency even more.

Be aware that useful energy should apply to what the system delivers. It would be unfair to penalize a cogeneration plant for wasteful transport and utilization of the process heat it provides. As an example take a district heating cum power plant in Mongolia, where the steam is transported above ground in uninsulated pipes at -20^0 C in the winter! There may be not too much useful heat arriving at a dwelling for space heating, but anyway it is called a cogeneration plant.