Written by William C. Livoti
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William C. Livoti I am sure almost everybody has received some notification from their local utility regarding energy conservation. Many of the larger utilities offer incentive programs for premium efficient motors, energy efficient windows, etc. I believe we all understand the purpose and the necessity of the power generator promoting energy efficiency on the demand side. On the other hand, have you ever wondered how efficient a power plant truly is? Let's examine a typical fossil fuel power plant.

The average fossil plant is roughly 33% efficient (at design point). What does this mean? Simply stated only about a third of the fuel (oil, gas, coal) entering the plant actually generates electricity. Even less-around 30%-is actually transmitted to the consumer. So, where does the remaining 70% go?

Thirty-three percent of that remaining 70% goes out the stack; 33% is used to cool the process and ultimately winds up back in the cooling source (lake, river or ocean) and the other 4% is lost in transmission/distribution. This is the same level of efficiency that has existed for the last 60+ years. To get a better understanding of how the power industry determines efficiency, we can break it down by the numbers.

Power plants live and die by the Heat Rate number expressed in Btu (British Thermal Units). Heat Rate is defined as a ratio between fuel energy and generated electricity. The smaller the Heat Rate number, the less fuel is needed to generate one unit of electricity. Although there are several factors that figure into Heat Rate, in the interest of keeping this article brief, let's break it down to the basics:

- **Thermal Efficiency:**
  This is the inverse value of the Heat Rate of the power plant.

- **Load Factor:**
  For a power plant, Load Factor is the ratio between Average Load and Peak Load.

- **Economic Efficiency:**
  This is the ratio between production costs, including fuel, labor, materials and services, and energy output from the power plant for a period of time.

- **Operational Efficiency:**
  This is the ratio of the total electricity produced by the plant during a period of time compared to the total potential electricity that could have been produced if the plant operated at 100% in the period.

- **Capacity Factor:**
  For a power plant, this is the ratio between Average Load and Rated Load for a period of time.

The utility calculates your rate in the following manner:

The power company assumes the Heat Rate as a fixed cost. This is not the case, as the plant efficiency can be improved dramatically by simply improving process control. Why would one believe power generation technology hasn't changed over the last 60 years? Europe has improved the efficiency of its fossil plants to roughly 40 to 45%. What are we waiting for?

The bottom line is the resistance to change and the paralyzing fear associated with change. That being said, how long can we—*as a country*—operate in such an inefficient manner? At the end of the day, we all pay the price. **UM**

References

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Bill Livoti is a fluid power and power industry engineer with Baldor Electric Company. He also is vice chair of the Pump Systems Matter (PSM) initiative. Telephone: (864) 281-2118