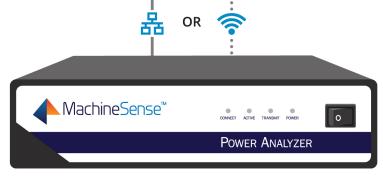# Energy Analytics in a Smart Factory using MachineSense Power Analyzer

by Biplab Pal, PhD
Co-Founder & CTO
MachineSense

Improve Energy and Productivity Efficiency using MachineSense Power Analyzer

The lack of understanding of energy consumption behavior, "who", "where", "when", and "how", is the essential reason for the difficulty in evaluating and improving factory energy efficiency. For example, imagine an extrusion manufacturer is experiencing a rising electricity bill without any increase in productivity. How will management know which extrusion line is at fault? Even with the help of an energy meter where a particular energy leaking line is sorted out, the next question is: Which element is causing the energy waste? Is it the 240 kW heater bank or the 600 hp motor? It is not practical to replace a complete operational extrusion line. Factory management needs to know why this is happening and which element is adding to the greatly increased energy bill.

Two vital pieces of information

To achieve energy efficiency in a factory, a manufacturer needs to have two vital pieces of information:

1. **A clear picture of energy consumption of each machine, and its subassemblies, in real and historical time.**
2. **The ability to map them into the process and capture the energy consumption variation from the process variation.**

First, it is important to identify the machines that waste energy. Second, it is vital to diagnose the root cause of that wasted energy, which will lead to a solution. For example, maybe a 600-horsepower motor is ON for four hours even when there is no material feed. Energy analytics should be good enough to understand energy usage under material feed load vs. no load. Only then is it possible to identify that the energy wastage is coming from the process. Or, maybe a particular motor has a high bearing current due to a faulty bearing which can cause the motor to draw much higher energy under the material load.

MachineSense Power Analyzer is ideal for such energy optimization. They can be configured to track energy, faults and process of four machines at a time using 4-port version**s,** provided all machines are powered from the same electrical panel.

Fig. 1.0: Identification of an energy optimization objective in a factory is the first goal.

Define sustainable strategies and practices in production management to improve energy efficiency.

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Integrate energy data into factory's tools for improving energy efficiency.

↑

Monitor and analyze energy consumption in real time using IoT technology. (i.e., smart metering and sensors)

↑

Understand production processes and evaluate current energy management practices.

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Why Choose Power Analyzer and Not a Common Smart Energy Meter for Energy Analytic?

Power Analyzer has multiple features and benefits --beyond standard energy monitoring-- which are required to map the energy usage with process, faults and productivity for root cause analysis. For example, it can detect and compare energy usage between a good and poorly maintained machine, or a machine under load and no load. **MachineSense Power Analyzer** does this automatically using its intelligent, built-in cloud based machine learning. *(Figs. 2.1 and 2.2)*

The ability to extract such comparative analytics is the first step towards understanding whether an old machine is consuming more energy than a new machine for the same level of production. Even if two machines are relatively the same model and their energy cost is vastly different, such difference must be understood by understanding the difference in the process to which the machines are connected.

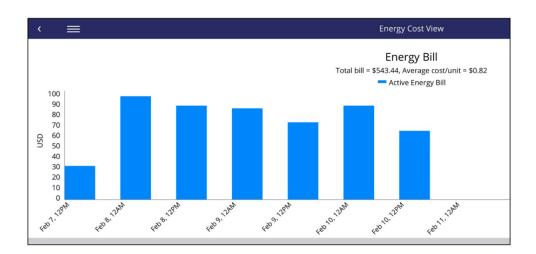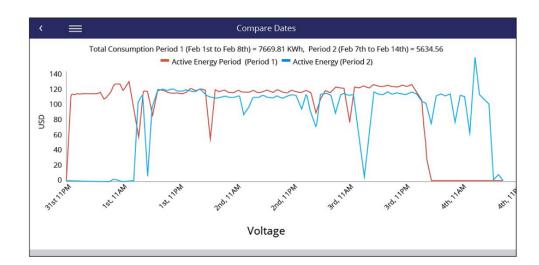*Fig. 2.1: Energy consumption for a machine for a period of one week.*

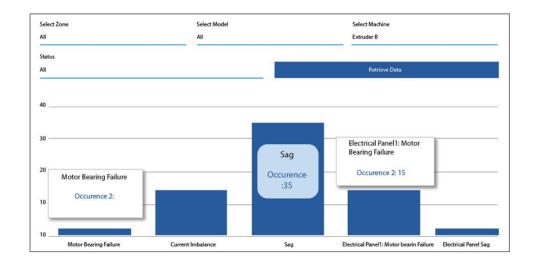*Fig: 2.2 Comparison of energy consumption for a machine over two different time periods.*

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This is highly desirable when a large number of machines need to be monitored for their energy efficiency.

The MachineSense Power Analyzer provides all the diagnosis, predictive and preventative maintenance advice automatically in MRO and in email/SMS alerts. *(Fig. 3.1; Fig. 3.2)* This is critical when it is desirable to track many machines in a factory and one needs to look at the issues as a dashboard. The MachineSense data viewer also provides an energy dashboard with a maintenance dashboard. In a cluster of many machines, additional email alarms can be created to warn a user about excessive energy consumption, energy leaks, etc. This is highly desirable when a large number of machines need to be monitored for their energy efficiency.

Fig. 3.1: A graphical display of maintenance advice and their respective number of occurrences over a period of time – up to 2 years.

Fig. 3.2 The list shows preventative maintenance advice over a period of one month.

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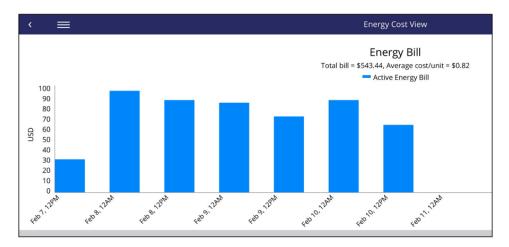## Provides energy cost analytics.

Fig. 4.1: A complex rate chart from utility company can be ingested as a csv file type for an accurate estimation of machine operating cost.

The **MachineSense Power Analyzer** also provides a full cost analytic. The rate chart *(Fig. 4.1)* from any utility company can be highly complex as it depends on energy consumption level, seasons, weekdays vs. weekend, day vs. night, holidays, etc.

With **MachineSense Power Analyzer** a user can easily see the rate card in a template and the system will provide an accurate running energy bill. *(Fig. 4.2)*

Fig. 4.2: Represents a graphical display of a cost analytic for a given machine during the period of one week.

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Provides utilization and productivity data

Further, **MachineSense Power Analyzer** provide utilization and productivity data for the machine. Thus, a user gets a full view of energy cost per unit of production as well as utilization per unit of production. Both metrics are important operational parameters for operational cost optimization. *(Fig. 5)*

Fig. 5 : Usage analytics from MachineSense Power Analyzer energy analytic. Usage analytics help you understand if your energy is being properly used.

Usage Analytics

Usage analytics help you understand the percentage of time a machine is being used

Shows the Trend line for utilization

Shows 100% utilization–Means it is operating at optimum level

Shows the graphical form of utilization per day

Both the Trend line and Graph show the machine utilization.

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