

# The Rauschert Energy Management System: A New Development from the Perspective of an Industry User

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Rauschert/DE is a technology company with over 100 years of tradition in the production of sophisticated components made of ceramics and plastics. The central basis for its competitiveness has for many years been the company's own workshops for the production of tools and automation engineering. Over 300 of the company's total 1200 employees are engineers, technicians, and skilled workers in mechanical engineering, mechatronics and machining.

Since 2009, in addition to ceramic and plastic component manufacture Rauschert has been building up a new division Energy & Engineering that draws on the company's existing expertise in engineering. Rauschert Energy & Engineering not only offers tools, automatic handling systems, sorting systems and special machines, but also constructs photovoltaic systems and develops innovative products in energy engineering, like, for example, the energy management system described below. The system is based on a new principle of current measurement and on the level of the evaluation software, it can be complemented with data of other energy sources.

Reliable and low-cost procurement and efficient use of energy (gas, electricity) have become a key challenge for many producing companies in recent years. Precondition is the introduction of a high-performance energy management system.

- The costs for energy (electricity, gas) are subject to wide variations. For many companies in Germany, the electricity price has risen by more than 100 % in the last five years. The price of gas has fallen by around 15 % in recent months. In the wake of the deregulation and internationalization of the energy markets, alternative procurement options are opening up, the utilization of which requires high transparency of internal energy consumption.
- Not only for cost reasons, but also as a preventative measure against a much reduced supply reliability (above all as a result of short-term voltage fluctuations with risks for electronic control systems), it is becoming increasingly expedient to self-generate part of the power required.

Finally, in recent years in, for instance, cogeneration or the photovoltaic sectors, products have been developed that can generate power more cheaply than having power supplied externally. The utilization of these possibilities demands in turn an efficient energy management system.

- Since 2013, industry companies have to certify the introduction of an energy management system in compliance with DIN EN ISO 50001 to be able to utilize key tax benefits. This too makes comprehensive measurement of the energy consumption and its stepwise reduction necessary.

For this reason, industrial companies will, as an important contribution to assuring their competitiveness, in future no longer cover their energy requirements with the external procurement from energy suppliers, but generate a part more cheaply themselves. The energy will also be used much more efficiently, sometimes more than once. Thanks

<sup>1</sup> Patent registration PCT/EP 2013/066868

to technical innovations, especially in energy storage, company freedom for energy optimization will grow further in the next years (Fig. 1).

As in the view of the Rauschert technicians, the systems so far available on the market were regarded as limited in their capacity or unreasonably expensive for full-cover use for SMEs, Rauschert has worked together with the Fraunhofer Institute IIS over the last five years to develop its own innovative energy management system.

This system was supported by the State of Bavaria as part of the "Microsystem Engineering in Bavaria" initiative. The system was presented at the Hannover Messe 2015 and is successfully used in the Rauschert production plants as well as at the installations of some first pilot customers.

Core of the Energy Management System is a novel electricity metering sensor, which with the use of eight Hall sensors and software developed by Fraunhofer can measure electricity much more precisely than systems available on the market at a comparable price level.

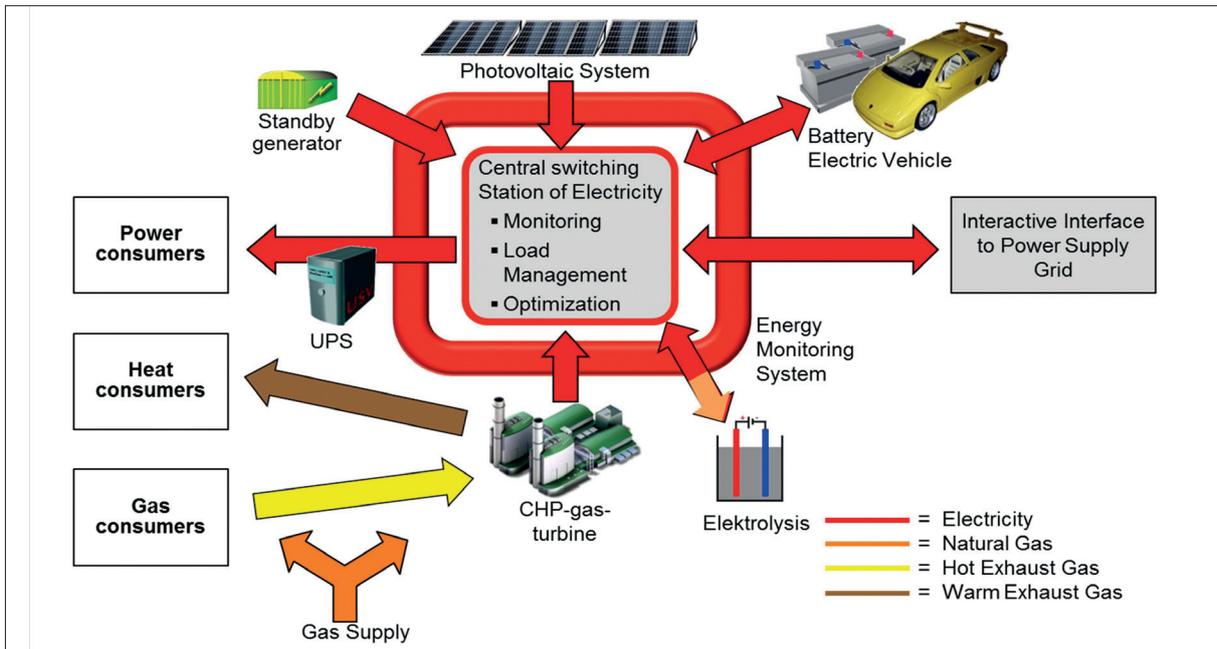
## Rauschert power measurement sensor on the basis of the Hall effect<sup>1</sup>

The sensor (Fig. 2) simultaneously returns the measured data for current and voltage with high accuracy ( $\pm 0,5\%$ ) in short measurement cycles (20 ms), which enables precise analyses and monitoring in real time.

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**Fig. 1** Diagram: energy concept for industry

With its compact design, it is especially suitable for installation in existing switch cabinets; even in difficult installation situations. As it is not necessary to unplug the cables, the installation can be done under voltage, that is without interruption to the electricity supply. Excess voltage up to 3,3 kV cannot damage the sensor.

As the sensor is also much cheaper than other measurement systems with comparable quality, a large number of measurement points can be set up without any significant changes to the electrical equipment. In this way, power consumption can be made transparent from the main distribution through the individual departments to the relevant single machines, e.g. kiln and automatic presses.

### Data transmission

The data acquired by the sensors is sent via a data cable to a gateway – a small computer that can collect the data from up to 30 sensors. Here the data is stored and made available to the evaluation system. With the alternative application of the wide-spread MODBUS TCP standard and Ethernet, the sensors and gateway can be combined with a large number of the evaluation systems available on the market. With the Rauschert sensor, existing energy management systems can be extended with additional measurement points.

### Energy efficiency software

In addition, Rauschert has worked together with the plant engineering company

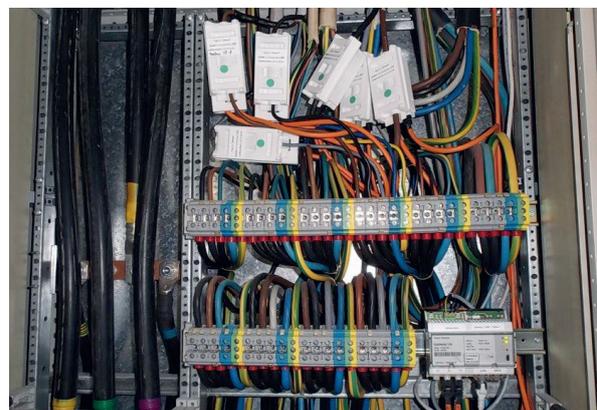
DIENES Apparatebau GmbH to develop high-performance energy efficiency software so as to offer a completely integrated solution for energy management. The energy efficiency software enables evaluation of energy consumption in real time. It can return detailed analyses, provide the data for energy management in compliance with DIN EN ISO 50001 and forms the basis for load management to avoid expensive power peaks.

### Scope of functions of the energy-efficiency software

- Maximum flexibility for organizational or spatial arrangement of any consumers (every sensor has its own ID address, every gateway an IP address)

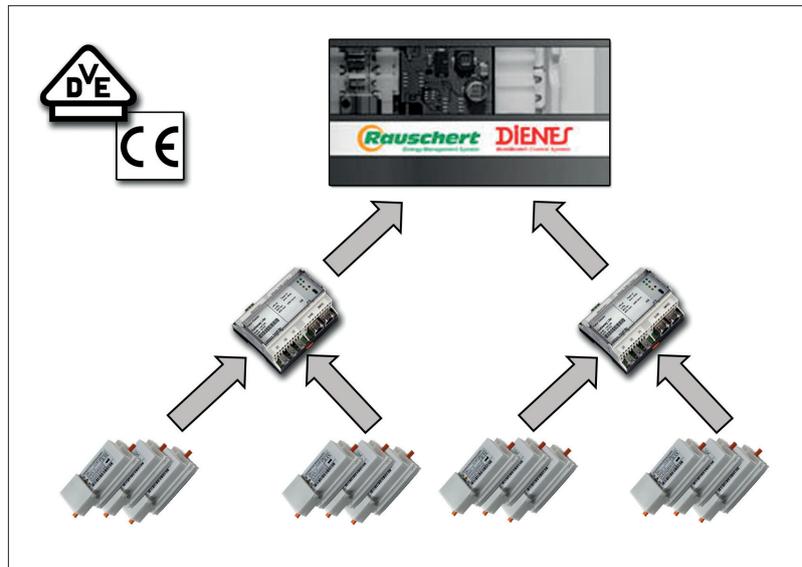


**Fig. 2** Sensor



**Fig. 3** Sensor installed in a switch cabinet

- Efficient energy data analyses based on the combination of any consumer groups
- Requirements-optimized tools enable the accurate-to-the-second process data tracking of all consumers (condition monitoring)
- Comparative analyses of several process data based on scalable graphics
- Additional tools adjustable on time basis for automated logging of selected measurement data
- Accurate-to-the-second live process data of the last five weeks enable precise event analyses
- Direct permanent accessibility of data and graphically supported display of the quarter-hour data
- Automated long-time process data storage of the processed quarter-hour values on data storage media.

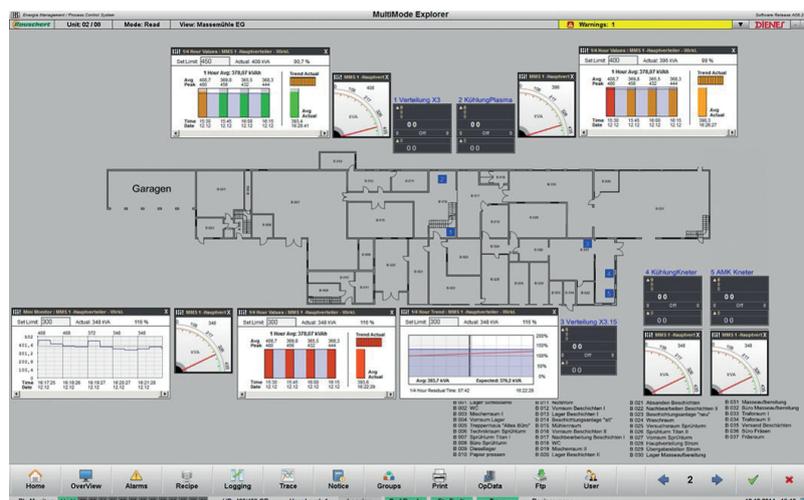


**Fig. 4** Data collection and evaluation with software

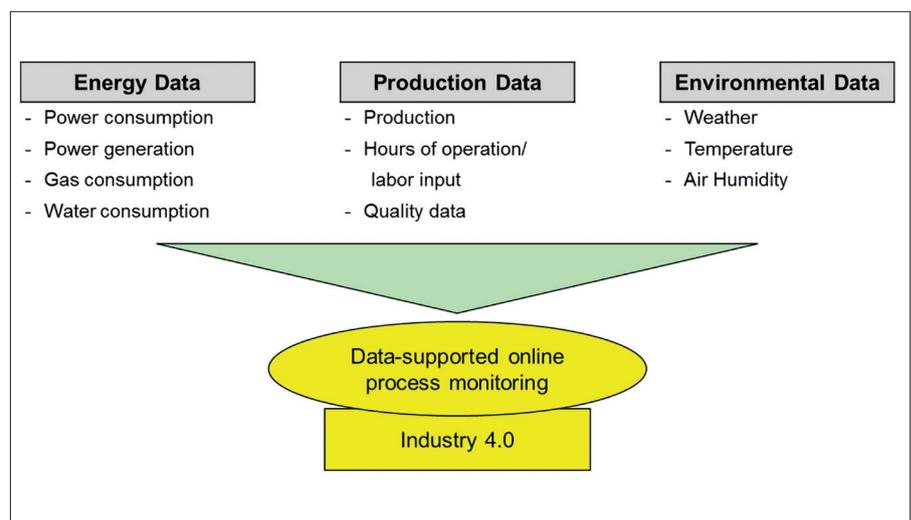
In customer-specific projects, it is also possible to develop the software beyond energy management in the direction of integrated process monitoring. If data of the energy consumption are combined with production and environmental data, insights not only into the reduction of the energy consumption, but into product quality and production costs can be obtained. An evaluation of this data provides additional possibilities to optimize the process parameters of the production better and more accurately. The use of this data enables a more detailed understanding of the function of the different machines (condition monitoring) and the overall production process.

- The quality of the products can be more precisely monitored in the course of production. Accordingly, defects can be detected earlier and the causes eliminated more quickly.
- The production equipment can be adjusted more precisely to the process so that production costs can be lowered and especially the time required for setting up the machines on a product change reduced.
- The logging of the process parameters in real time enables better planning of preventative maintenance, which reduces repair and downtime.

In this way, starting from the energy efficiency software, a complete enterprise-specific Industry 4.0 data management can be realized step-by-step.



**Fig. 5** Screenshot of the Energy Management Software



**Fig. 6** Online process monitoring