

# Tool for Optimising the Energy Consumption in Production

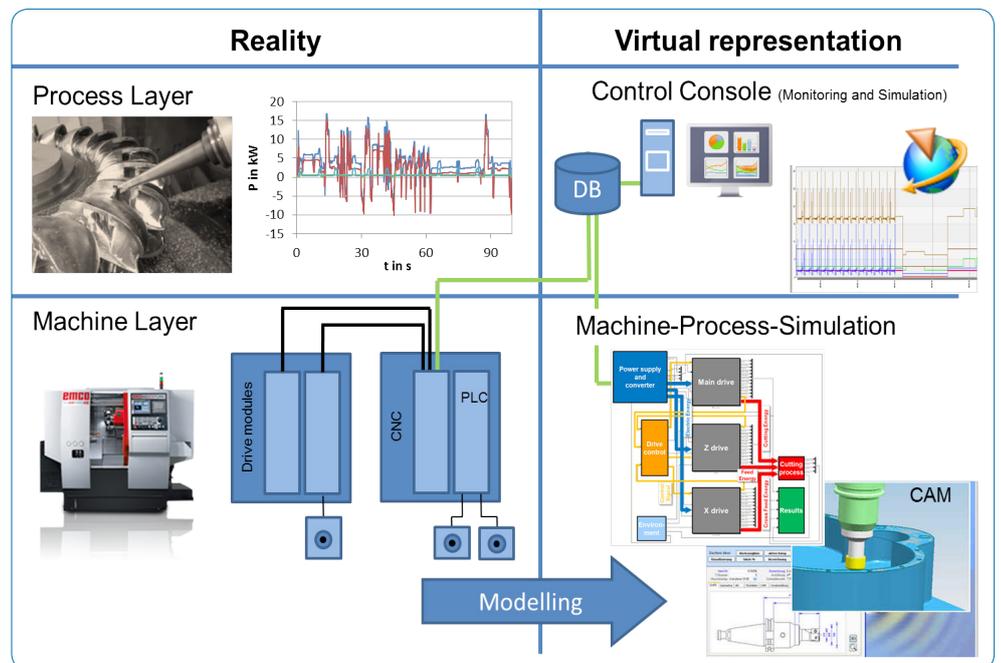
Monitoring and simulation of production facilities and processes for efficient production management

Through uncertain market developments - Keywords: Energy revolution, security of supply, climate change - at a time of increasing international competition, the energy factor is of ever increasing interest in the manufacturing industry. Against this background, the EU Energy Efficiency Directive requires suppliers and manufacturing companies to provide evidence of yearly energy savings through efficiency measures.

The energy consumption and -flows can, depending on the internal consumption structure, be very different. Manufacturing companies have developed and often grown in the past and thus have opaque structures. It is understandable that, in many operations, people do not have a clear idea of the distribution and transmission infrastructure or even of the significant energy consuming devices.

## Objective

In order to provide a basis for energy efficiency measures, transparent energy consumption and flows, and therefore energy measurements, are indispensable. Through energy monitoring, measurement data - such as electrical power, pressures, temperatures or volumetric flows of fluids - are recorded, visualised, processed and stored centrally over a long period of time. The aim of TU Wien's research was the design and implementation of a flexible, individually extendable hardware and software solution for energy monitoring in a wide range of manufacturing companies, and in particular in mechanical and plant engineering and production.



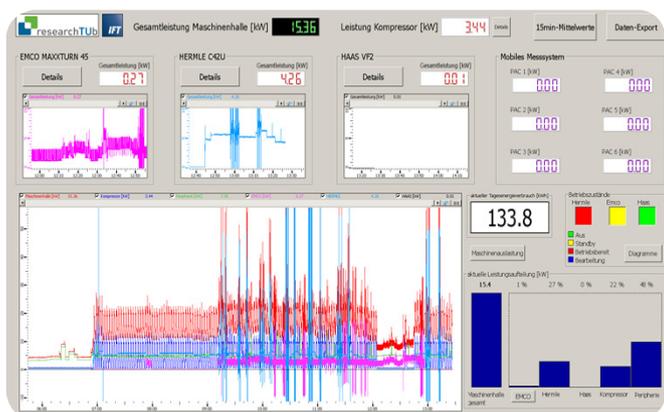
Concept for utilisation of energy and control data for optimisation of manufacturing control

## Approach

The first, and traditional, monitoring approach is to determine at the company level the energy consumption for the entire plant and/or specific areas. If insufficient information about the significant energy consuming devices and their operational performance is available then it is useful to identify these by means of short-term measurements with mobile measuring devices and to determine optimisation potentials.

The knowledge gained serves as a basis for the design of a permanent monitoring system. The specific hardware and software solution is thus dependent on the company's individual objectives.

The second and more comprehensive monitoring approach is that at machine and process level. Targeted



Visualization of the energy monitoring of a machine shop

measures for optimising processes can be derived through the interpretation of high resolution energetic measurement data and from operating data from machine controls. In practice, it has been demonstrated that energy efficiency and productivity often go hand in hand at process level.

## Results

In a production lab at Vienna University of Technology a comprehensive energy monitoring was implemented, in which different sensor data and operational data from machines are visualised and interpreted. This system has already been tested and implemented in several production facilities in an industrial environment. Here, production processes have consistently been able to be optimised, thus increasing productivity and, at the same time, cutting energy peaks and significantly reducing energy consumption.

## Benefits for you

Depending on the specific application, temporary or long-term detailed energy analysis produces the following benefits for your company:

- Evaluation of the efficiency of processes in real time - through the integration of energy-related sensor data and machine control data
- Evaluation of the productivity of a wide range of production systems and machines in real time

- First time integration of comprehensive and detailed energy data in the simulation and visualisation of flexible production lines for the optimisation of energy efficiency and productivity
- Simple and sturdy sensor systems offer operational reliability and cost efficiency
- Optimisation of production planning and adjustment of the energy demand to the supply - made possible by forecasting of the energy consumption for alternative production scenarios
- ‚Quick-Wins‘ by identification and optimisation of the biggest base load and peak energy consuming devices
- Monitoring and optimisation of the operating performance of systems for supplying secondary resources (such as compressors or air conditioning systems)
- Determination and comparison of the efficiency of existing and alternative production processes as a basis for cycle time and technology optimisation
- Analysis and monitoring of the productivity of manufacturing systems, possibly in combination with control functionalities and production scheduling of a production management system
- ‚Condition Monitoring‘ for machines in order to draw conclusions about product quality and to prevent machine defects
- Online availability of all information and data - offsite monitoring via mobile devices possible as well
- Determination of individual CO<sub>2</sub> footprints of the products manufactured

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