

How is energy transformed from cost factor to success factor?



Identify, evaluate and realize cost-saving potential
in an integrated energy management process

Answers for industry.

SIEMENS



System-based higher productivity

Increasing energy costs, increasingly more stringent environmental regulations or achieving certification according to the EN16001 energy management standard – there are several excellent reasons that speak for well-functioning energy management in industrial plants and systems. However, one factor is especially important: The bottom line is that energy management plays a decisive role in increasing the productivity of plants and systems, and in turn, significantly increases the competitiveness of a company – and that, in any sector.



Higher energy efficiency

Energy management is the predictive and systematic coordination of energy procurement, conversion, distribution and use – with the objective to cover the demands taking into account ecological and economic directives. Put another way: Take planned action with the purpose of efficiently handling and using energy.*

... using efficient energy management

Functioning energy management is a process, which – analog to quality management – is used to continually increase the productivity of the energy used. As your partner, we can offer you an extensive portfolio, which supports you in this process.

Energy management is used to continually monitor the energy usage of your plant or system, therefore reducing the energy and operating costs and at the same time reducing the environmental stressing. The key to all of this is the perfect interaction of our portfolio within the scope of Totally Integrated Automation, our open system architecture:

- Hardware and software to acquire, visualize and analyze energy flows
- Programs to precisely determine the cost-saving potential at all levels of production and process automation
- Products and systems that actually reduce the energy demand

*Source: VDI 4602 "Energy Management Terminology"

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Subject to change without prior notice 11/10
Order No. E20001-A20-M117-V1-7600
DISPO 21511
WÜ/29973 GD.GC.EE.XXXX.52.1.01 WS 11105.0
Printed in Germany
© Siemens AG 2010

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The energy management process at a glance

Everybody is talking about energy management. However, Siemens is addressing this topic comprehensively and systematically. We split up the energy management process into three phases – Identify, Evaluate and Realize – and support you in each of these process phases. For this purpose, we can offer you intelligent hardware and software solutions that allow you to transparently display your energy-related resources and effectively control them.

Identify

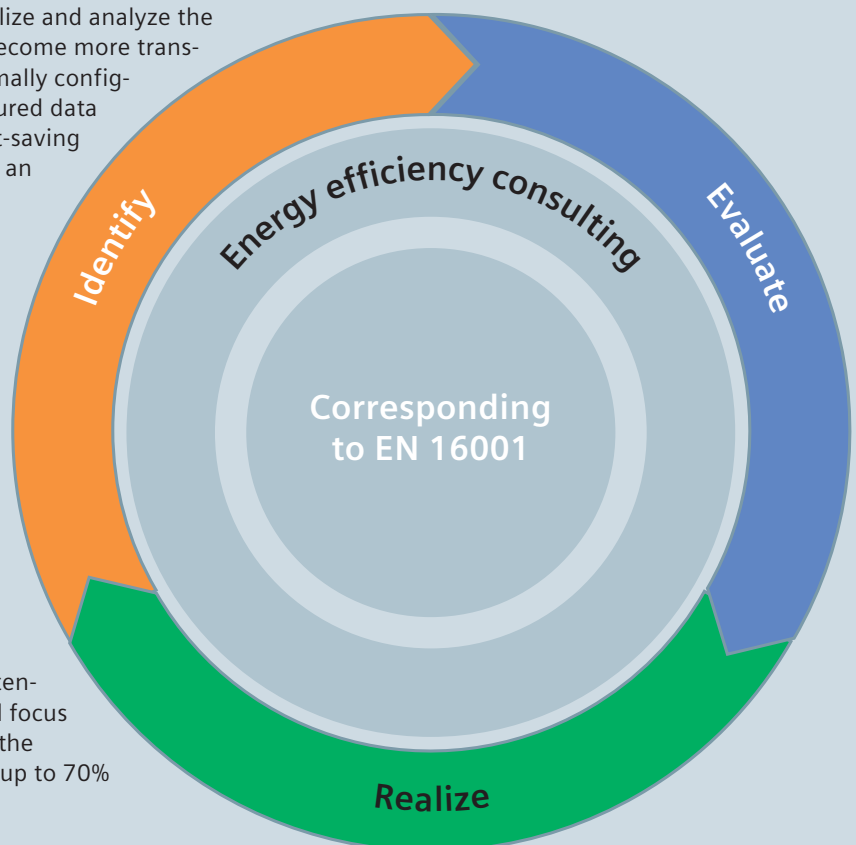
The optimum hardware and software acquire, visualize and analyze the energy flows in the plant or system: Energy flows become more transparent and this means that the process can be optimally configured from an energy-related perspective. The measured data retrieved allow a first evaluation of the existing cost-saving potential – and at the same time, form the basis for an intelligent and efficient energy management.

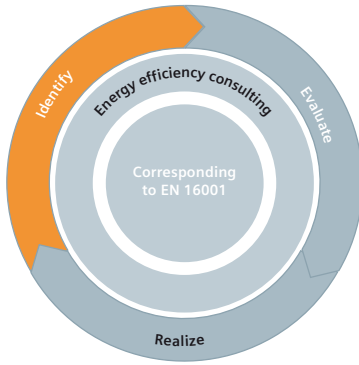
Evaluate

Based on plant and system parameters, powerful software tools calculate the precise cost-saving potential for the specific application and the cost-effectiveness of possible measures – for the drive system at the field level, for the control and supervisory level and for the higher management level. Financing and leasing options allow energy-saving plant and system components to be purchased at a favorable price.

Realize

Specific measures allow the existing cost-saving potential to be fully utilized. In this case, there is a special focus on drive technology. Drives represent two thirds of the industrial energy demand. Potential cost savings of up to 70% per drive are definitely realistic.





Identify: Make energy flows transparent throughout the company

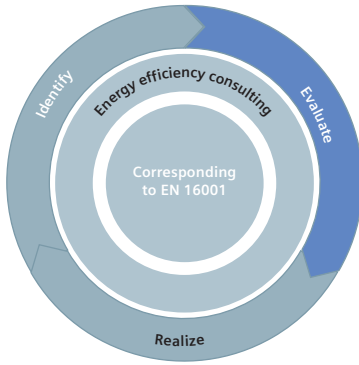
In this phase, data can be retrieved that already allow a first evaluation to be made regarding the energy-saving potential, and create the basis for intelligent and efficient energy management – assuming of course that the energy usage is transparent. Whether for electrical energy or for other energy forms such as water, gas, compressed air etc.: Precise usage values and power data must be available over a longer period of time so that definitive comparisons can be made as well as practical and realistic optimization measures defined.

Efficient energy monitoring is indispensable in production and process automation as well as in the building sector – this is especially true for complex tasks. Only then can the relevant measured variables be precisely monitored and analyzed – for instance, power consumption, load profiles, temperatures and flow rates. We can offer well-conceived and powerful hardware and software solutions for all of these tasks.

Product examples

- **SIMATIC powerrate:** SIMATIC energy management system for WinCC and PCS 7 to efficiently acquire, calculate and log all of your energy data for focused energy usage optimization.
- **SENTRON powermanager software:** The energy management software – as stand-alone solution – is suitable for applications in commercial buildings, smaller or average-sized industrial facilities, where there is no automation, or where the automation and power distribution must be separated.
- **SENTRON PAC:** Compact and powerful multifunction measuring devices. These devices precisely and reliably acquire all of the usage data in the electrical power distribution and display it on a graphic LC display.
- **SENTRON load disconnectors with integrated current transformers:** combined with SENTRON PAC, they acquire the measured data and transfer it to higher-level energy management systems.
- **Communication-capable SENTRON circuit breakers:** Full transparency by providing energy data from the field level without requiring any additional installation.
- **PROFenergy:** Standard based on PROFINET for favorably-priced and granular measured value acquisition directly at the load.
- **SIRIUS switching and protection devices** supply continuous energy values to a higher-level energy management system.





Evaluate: Precisely determining the cost-saving potential

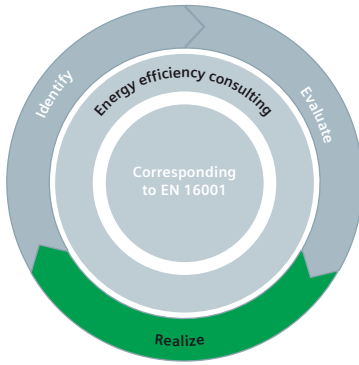
Once the energy flows have been acquired, evaluated as well as visualized and the large energy consumers identified, the specific energy-saving potential must be calculated. The cost-effectiveness of potential measures can be derived for the specific application from this result – and a decision-making basis created for investors.

Across all plant levels – from the field up into the management level – we can supply you with tools that provide you with meaningful results to secure a high degree of decision-making reliability.

Product examples

- **B.Data:** In addition to seamless energy and material balancing of the energy generating systems and loads, energy cost allocation depending on the particular consumer and transfer into the ERP system (e.g.: SAP R/3 CO), specific key performance indicators (KPIs) are generated using automatic data analysis. These KPIs form the basis to increase the energy efficiency of production plants and systems.
- **Energy Health Check:** This is an integrated service package to optimize complete plants from an energy-related and holistic perspective, and where an optimization measure has a maximum payback time of just two years. As a consequence, energy costs can be reduced in a focused fashion with low associated costs.
- **SIMATIC powerrate for WinCC and PCS 7 for the control and supervisory level:** complete, seamless and integrated energy management solution to visualize and analyze all of your energy data to identify energy-saving potential.
- **SinaSave:** The software tool for drive technology at the field level, designed for applications with motors directly connected to the line supply (fixed speed) and frequency converter operation (variable speed). This tool calculates, based on your plant characteristic values, the payback time when investing in an IE2 or IE3 energy-saving motor, a direct torque motor or a frequency converter. Frequently, these payback times are just a couple of months.
- **Siemens Financial Services:** Financing and leasing options for investments to increase the energy efficiency.





Realize: Fully utilize optimization potential

After defining the optimum measures based on an economic feasibility analysis, the next step is to tap into all of the potential that has been determined as effectively as possible.









Within the scope of our extensive portfolio, we can offer you the appropriate products, systems and technologies – highly efficient levers that play a role in drastically reducing the energy requirement of your plant or system.








Product examples

- An extensive range of **high-efficiency motors**, which in comparison to standard motors, have efficiencies that are up to 7% higher.
- The most extensive range of frequency converters in the market, which, depending on the application, can slash power costs by up to 70% through variable-speed operation when compared to mechanical flow controls – especially for pumps, fans and compressors to precisely adapt the speed.
- **Frequency converters capable of energy recovery** with innovative infeed technology, which feed the braking energy back into the line supply. For instance, for hoisting applications, conveyor belts and centrifuges, energy costs can be reduced by up to 50%.
- **SIRIUS motor starters and soft starters** to reduce mechanical and electrical peak loads by up to 60% with extremely low intrinsic power loss.
- Intelligent energy management with **SIMATIC powerrate for WinCC and PCS 7** to limit load peaks and therefore reduce energy costs.
- The **B.Data** energy management system ensures that your processes are optimized by automating all of the processes relevant for energy procurement and energy supply. By specifically analyzing energy and production data, you gain extensive information regarding your energy consumption and usage. As a consequence, you reduce the level of resources that you use. Not only this, you optimize your cost structures and at same time increase the efficiency of your plant or system.
- Dynamic energy management with **PROFenergy**, the nonproprietary communication profile from PROFIBUS & PROFINET International (PI) reduces energy costs by completely shutting down (even briefly) loads that are not used in nonproductive periods.
- Our **Customer Support** is there to support you when changing over and upgrading existing drive systems that are no longer economical to efficient motors and variable-speed drives.



The most comprehensive portfolio for an efficient energy management process:

Identify	Evaluate	Realize	More information
PROfEnergy			
 <p>Measuring functionality to acquire energy values</p>		Loads specifically shut down in nonproductive periods	www.siemens.com/profinet
B.Data			
 <p>Seamless acquisition and company-wide visualization of energy flows. Display of trends and reporting</p>	Transparent energy balancing and determining specific KPIs. Energy cost allocation and invoicing according to the particular load	Optimization potential by precisely forecasting energy demand and load profile	www.siemens.com/bdata
SIMATIC powerrate			
 <p>Visualization and transparency of the energy flows of a plant. Archiving, reporting</p>	Energy-intensive loads are evaluated	Load management, efficient process configuration/arrangement	www.siemens.com/simatic-powerrate
SETRON powermanager			
 <p>Stand-alone software for visualization – for transparent energy flows of a plant, archiving, reporting</p>	Support to analyze energy consumption using trends and curves (load curves)	Provide support for efficient process configuration, cost center allocation, monitoring operating states	www.siemens.com/powermanagementsystem
SIMATIC WinCC and SIMATIC PCS 7			
 <p>Measured value acquisition and archiving of the electrical and nonelectrical energies</p>	Trend and curve displays – reports and logs of energy usage		www.siemens.com/simatic-wincc www.siemens.com/simatic-pcs7
SETRON PAC multifunction measuring devices			
 <p>Precise and reliable acquisition and archiving of electrical and other energy values</p>		Measured values to evaluate the plant state and the line supply quality	www.siemens.com/powermanagementsystem
SETRON switching and protection devices			
 <p>Measuring functionality to acquire energy values</p>		Measured values to evaluate the plant condition	www.siemens.com/sentron
SINAMICS frequency converters			
 <p>The power drawn by the drive system is acquired</p>		Up to 70% energy saving for pump, fan and compressor applications. Up to 50% cost saving when using converters capable of energy recovery in e.g. conveyor and hoisting applications	www.siemens.com/sinamics

Identify	Evaluate	Realize	More information
SINAMICS and ROBICON medium-voltage converters			
 <p>The power drawn by the drive system is acquired</p>		<p>Up to 70% energy saving for pump, fan and compressor applications. Up to 50% cost saving when using converters capable of energy recovery in e.g. conveyor and hoisting applications</p>	<p>www.siemens.com/robicon-perfect-harmony</p>
DYNAVERT T frequency converter			
 <p>The power drawn by the drive system is acquired</p>		<p>Up to 70% energy saving through variable-speed operation</p>	<p>www.siemens.com/loher-dynavert-t</p>
SinaSave			
	<p>The cost-saving potential of energy-efficient drive technology and its payback time</p>		<p>www.siemens.com/sinasave</p>
SIZER engineering tool			
	<p>The energy efficiency of two drive solutions is compared and the solution with the highest energy efficiency is automatically generated.</p>		<p>www.siemens.com/sizer</p>
SIMATIC ET 200S FC, ET 200pro FC			
 <p>The power drawn by the drive system is acquired</p>		<p>Energy saving using variable-speed operation. Energy saving using energy recovery</p>	<p>www.siemens.com/et200</p>
SITOP power supply			
		<p>Save energy as a result of the high-efficiency and low power loss under no-load conditions. SITOP compact power supplies save up to 35% in operation.</p>	<p>www.siemens.com/sitop</p>
SIRIUS switching and protection devices			
 <p>Measuring functionality to acquire energy values</p>		<p>Reduced and extremely low intrinsic power losses result in energy savings - for example for the new circuit breakers, contactors with UC coil, electric overload relays and compact load feeders. Active switching, e.g. using load management permits savings of up to 25 %</p>	<p>www.siemens.com/sirius</p>



Identify	Evaluate	Realize	More information
SIRIUS motors, starters and soft starters			
Measuring functionality to acquire energy values		Active switching. Intrinsic power loss is slashed by up to 92% using soft starters with integrated current bypass	www.siemens.com/sirius
SIMOCODE pro motor management system			
Measuring functionality to acquire energy values		Active switching. Higher plant availability through increased transparency of the complete control. Up to 25% energy saving	www.siemens.com/simocode
Low-voltage induction motors and explosion-proof motors			
		Extensive range of high-efficiency low-voltage motors from 0.09 kW, which when compared to standard motors have efficiencies up to 7% higher – with an efficiency classification IE2 and IE3 in the range from 0.75 to 375 kW. Also explosion-proof motors are available across the board from 0.75 to 375 kW in the high IE2 efficiency class	www.siemens.com/motors www.loher.com
HT-direct motors			
		Very high efficiency through a direct drive – up to 3% higher than conventional motors. Further, higher system efficiency with SINAMICS	www.siemens.com/ht-direct
MOTOX geared motors			
		High efficiency across the board, IE2 (or IE3) up to 375 kW	www.siemens.com/motox
Siemens Financial Services			
		Financing solutions with plannable costs for investments in energy-efficient Siemens technology	www.siemens.com/financing
Energy Health Check			
		Energy optimization for industrial plants and systems – integrated and holistic approach to sustainably improve the energy efficiency of industrial plants	www.siemens.com/industry-solutions



Energy efficiency – the specifics: Examples from the field

Using the following specific application examples, we will show you the cost-saving potential that our energy-efficient products, systems and solutions offer. These examples will also demonstrate how quickly an investment in leading-edge technology is paid back.



Chemical industry: Infracor GmbH Marl, Germany

An energy management system for 30,000 energy data trends

For Infracor GmbH managing energy efficiently is a central function when it comes to supplying energy to the Marl Chemiepark. In this huge facility, the average demand of all of the plants is approximately 300 Megawatt of electric power and between 700 and 1100 tons of steam per hour. Three dedicated power stations with a total of five generating units and three 110 Kilovolt feeder stations from the public grid are used to supply this facility. Infracor has been using the B.Data energy management system for eight years now in this remarkable energy environment. B.Data is used to acquire and optimize the energy flows. Since it was introduced, B.Data has been continually developed and expanded. Today, approximately 30,000 energy data trends are acquired, and when required, called up. In some cases, the archives go back over 15 years. This integrated and holistic perspective creates the basis for extensive optimization. Today, B.Data is the central control tool for all energy planning processes relating to supply and disposal and allows the usage of all of the energy consumed to be optimized.



Water industry: Wastewater treatment plant Minden-Leteln, Germany

Soft starters reduce the operating costs by 20–25%

In order to reduce their energy costs, the company operating the Minden-Leteln wastewater treatment plant invested in a control for the new aerator turbines in order to avoid usage peaks as far as possible. Within the scope of the modernization, the electric turbine drives were equipped with 3RW44 soft starters and the supervisory control system upgraded to state-of-the-art technology using SIMATIC PCS 7. As a result of the modernization, the power used in the biological area of the wastewater treatment plant was reduced by 20–25%. In addition, the soft starter solution minimized the danger of failures as well as the gear unit service times. This investment paid for itself in a very short time and over the next 10 to 20 years, will play a role in significantly reducing the operating costs.



Pharmaceutical industry: DSM Nutritional Products AG, The Netherlands

Efficient drive control saves 70,000 Swiss Franks – year in, year out

The Dutch company DSM Nutritional Products AG replaced the fixed-speed pumps equipped with valve control by variable-speed pumps at their factory located in the Swiss Canton of Wallis. MICROMASTER 440 frequency converters, which are connected to the main control room in the factory via PROFIBUS, adapt the flow rate. The new solution not only allows the closed-loop control of the plant to be significantly increased, but also reduces the usage of primary energy. The expected cost savings are 70,000 Swiss Franks per annum.



Oil and gas industry: Shell Deutschland Oil GmbH, Germany

Energy costs slashed by 3000 Euros per month using frequency converters

In its large tank farm in Kaiserwörthhafen, Germany, Shell Deutschland no longer wanted to simply waste energy in mechanical valves. In order to ensure that the main diesel fuel pumps always operate at their optimum operating point, Siemens frequency converters each with a rating of 132 kW and 1LG4 motors for the redundant pump system were used. The SinaSave software clearly proved that the frequency converters had already paid for themselves after about 14 months. The plant has slashed its energy costs by 3000 Euros per month. An additional advantage is the fact that the various processes have been optimized and the stress on the piping network as a result of mechanical surges has been reduced. In turn, this has minimized maintenance costs and increased the plant availability.



Supply and disposal utility: Stadtwerke Chemnitz, Germany

35% energy cost saving through modernization

As a result of the fluctuating demand from the district heating station, the Stadtwerke Chemnitz (public utility in Chemnitz, Germany) planned to optimize the energy balance in its district heating station that supplies heating to the local community. The oversized hot water circulating pump drives with fluid coupling were replaced by variable-speed drive systems based on rugged, high-efficiency N-compact low-voltage motors and the matching SINAMICS G150 frequency converters. The power costs for the hot water circulating pumps were reduced by about 35% by using variable-speed drive systems and the fact that it was no longer necessary to over-dimension the motors. An additional advantage is the more precise closed-loop flow rate control and operation with lower stress on the mechanical system as pressure surges have been eliminated.



Automobile industry: ALRO Group, Belgium

Almost 20,000 Euros of cost savings per month by using frequency converters

In its Genk plant, the Belgian Company ALRO investigated the energy-saving potential of pumps and fans for a painting system for automobile parts. Initially, a stochastic potential analysis was performed for all of the installed pumps and fans with a power rating of 5 kW or more – which were previously controlled with throttles and valves. These were then replaced by Siemens frequency converters. The analysis indicated that 19,870 Euros could be saved annually by using frequency converters for the 12 drives. The payback time is less than 1.5 years.



Public sector, Murimoos association, Switzerland

New wood chip heating system: Heating demand is covered 100% using waste materials

While renovating the heat and energy supply, the "Murimoos, werken und wohnen" association were looking for a leading edge control technology that could also control a new wood chip heating system with a thermal rating of 600 kW. The solution: A SCADA system based on SIMATIC WinCC, which controls all of the energy-producing systems and energy users. The optimum energy supplier is used depending on the actual situation, e.g. the availability of energy and the actual prices. The advantage of the new wood chip heating system: the wood waste from its own woodworking operations and the regional compost dump completely covers the heat demand without having to purchase any wood chips. Being able to substitute the heating oil not only had a positive financial impact, but emission values were also reduced.

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Subject to change without prior notice 11/10
Order No.: E20001-A20-M117-V1-7600
Dispostelle 21511
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