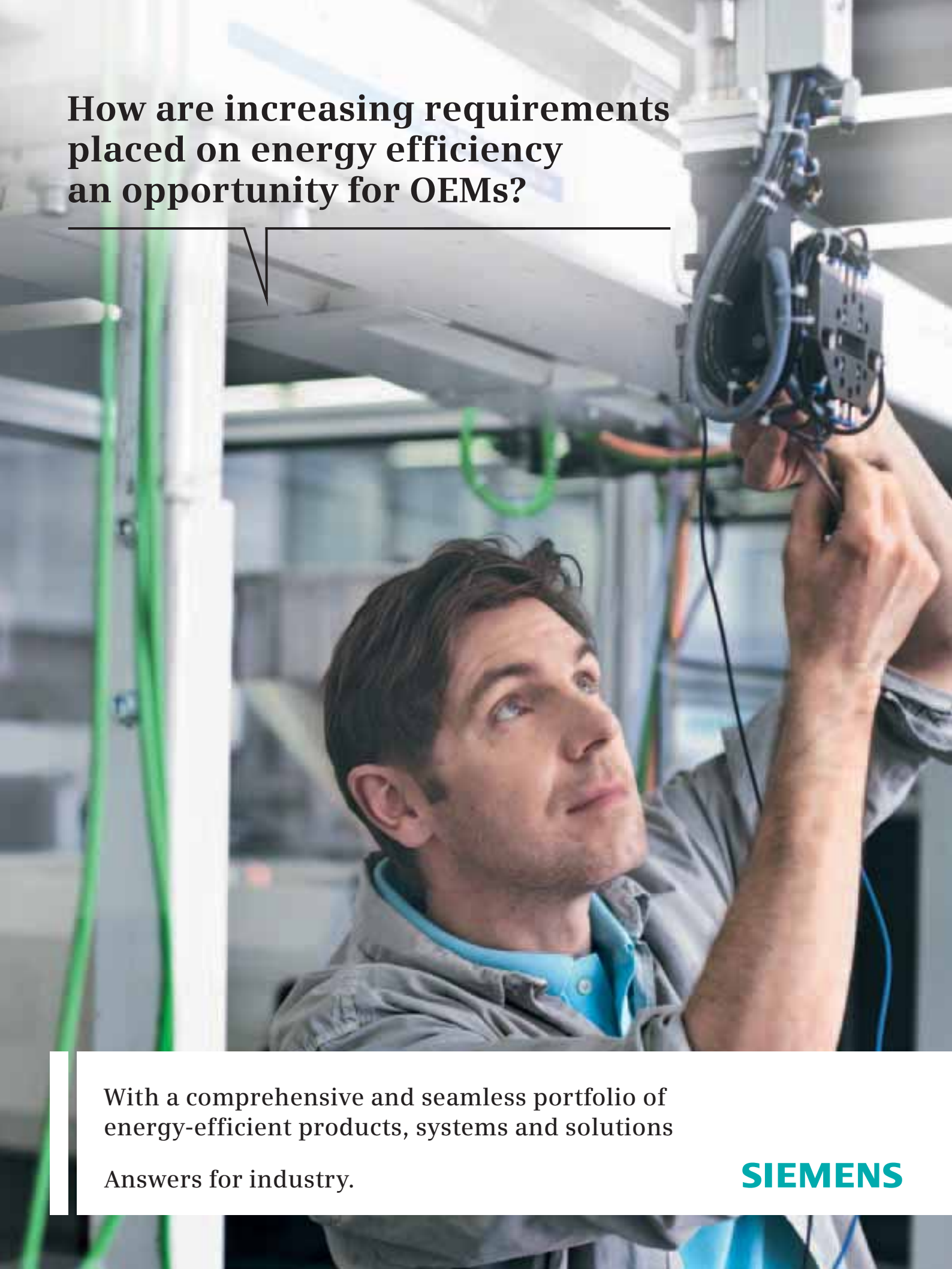

How are increasing requirements placed on energy efficiency an opportunity for OEMs?

With a comprehensive and seamless portfolio of energy-efficient products, systems and solutions

Answers for industry.

SIEMENS

Energy efficiency: Project for the future

For plant and machinery construction, energy efficiency is becoming an increasingly more important subject: On one hand, because energy is a significant and ever-increasing cost factor for the manufacturing industry. On the other hand, because of the increasingly more stringent standards and legislation, both at the domestic and international levels, which must be complied with.

Achieve more with less

It has always been the case that machines and plants must set themselves apart through optimum functionality, performance and therefore productivity. Nothing will change in this regard. However, in the future, productivity growth will be considered more and more under the aspect of sustainability. As a consequence, the objective must be to implement solutions that achieve a maximum result but with a minimum use of resources.

Challenge and opportunity for plant and machinery construction

Siemens can offer you everything you need to fulfill the ever-increasing requirements of companies operating plants: The world's most comprehensive portfolio to achieve the highest energy efficiency. Our innovative products, systems and solutions create the preconditions for intelligent and efficient energy management. This involves a continuous process in plant or system operation, where also the initial concept, the engineering and the implementation of a machine or plant are of significant importance. Here, we can provide an extensive range of support and consulting services.

We can offer you the technology required to achieve this 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 factory automation
- Products and systems that actually reduce the energy demand

Discover for yourself just how you can address new opportunities in international markets with our portfolio – to sustainably improve your competitiveness.

Contents

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The energy management process at a glance

We can offer you everything that is required for focused energy management. Products and systems, which decisively play a role in significantly reducing operating costs – and at the same time, reducing the stress on our environment. As continuous process, our well-conceived concept ensures a continuous reduction in the energy demand. Our energy management is based on the following phases – Identify, Evaluate and Realize. We can offer you the perfect solutions for each and every one of these phases.

Identify energy flows

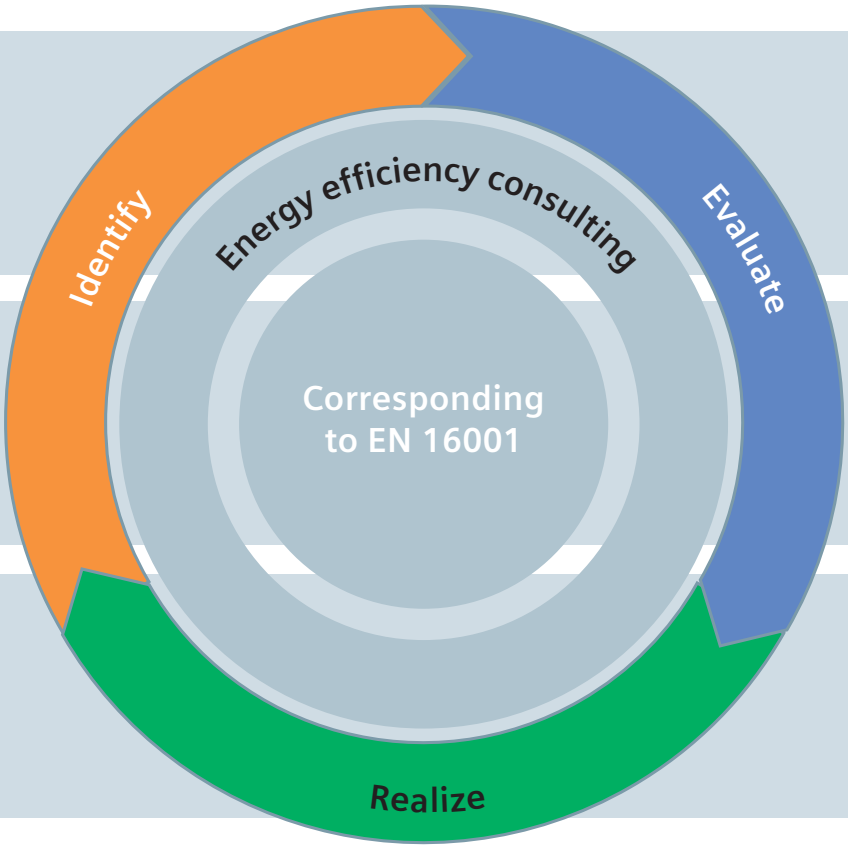
Identify hidden energy-saving potential

Determine cost-saving potential

Evaluate the complete life cycle costs

Concrete measures

Implement and realize the energy-saving potential



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 levels 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% are definitely realistic.

Energy costs under control with PROFIenergy

Another key to reducing the energy costs: Shutting down loads that are not required in nonproductive periods as well as acquiring measured energy values at a favorable price and in a granular fashion.

With this as objective, PROFIBUS & PROFINET International (PI) have developed a standardized data interface based on PROFINET:
Using PROFIenergy, loads can be shut down centrally in a coordinated fashion independent of the manufacturer and device. Manual switching – a time-consuming procedure – is eliminated so that energy can even be saved in short nonproductive periods.

Using PROFIenergy, existing hardware and software can be simply integrated in the energy management via PROFIenergy-capable ET 200S power modules as well as function blocks in the controller. In conjunction with the PROFINET functionality I-Device, PROFIenergy also allows complete plant and system sections to be shut down and powered up again in a coordinated fashion. These function blocks that can be subsequently loaded ensure low associated configuring and engineering costs.

Identify Evaluate Realize

B.Data: the management system for a transparent energy balance

With B.Data, we offer an extensive tool for effective energy management at the company level. B.Data allows users to implement an optimized and cost-effective operational energy management in the areas of controlling, planning and energy purchasing – and in so doing, covers all three phases of the energy management process.

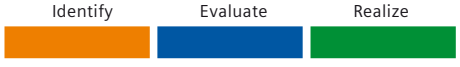
- Energy controlling: B.Data offers seamless data acquisition and processing. It ensures a transparent energy balance and simplifies maintaining legal stipulations, e.g. monitoring and reporting greenhouse gas emissions. Determining specific parameters and integrating production data allows substantiated statements to be made regarding increased efficiency.
- Determining energy costs: The flexible allocation of tariffs and modeling energy and material flows in B.Data allows energy costs linked to the actual loads to be determined and invoiced to cost centers. It also transfers the energy quantities/costs into the ERP system (e.g. SAP R/3 CO).
- Energy planning: B.Data allows the energy demand and load profile to be precisely forecast. This optimizes the budget planning and allows, when required, ongoing production to be quickly adapted at any time – with the highest degree of decision-making reliability.
- Energy procurement: B.Data always supplies all of the relevant up-to-date information for the required energy quantity over the year and over the day: This forms the basis for optimum conditions when purchasing energy.

Identify Evaluate Realize

SIMATIC powerrate: intelligent energy management for WinCC and PCS 7

SIMATIC powerrate in the versions for the SIMATIC PCS 7 process control system and the SIMATIC WinCC visualization software ensures that the energy usage in your plant or system is transparent. Not only that, it allows energy-intensive equipment to be specifically identified. To achieve this, our software acquires all of the energy-relevant usage data of the plant and system and allocates it to the various consumers before it is compressed by the SIMATIC S7 control system (mean values) and is stored in the memory in the case of a communication failure.

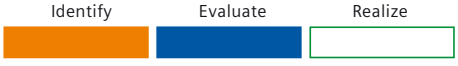
Usage data is clearly and transparently visualized in SIMATIC WinCC and SIMATIC PCS 7 – saved in archives and integrated in the operator and visualization interfaces of the basis system. The automatic allocation to cost centers allows hidden cost-saving potential to be tracked down and utilized by comparing usage profiles and costs. As a consequence, SIMATIC powerrate permits efficient process configuration and optimization of the energy efficiency as originally planned.



SENTRON powermanager: for applications in commercial buildings

SENTRON powermanager is suitable for applications in commercial buildings or in smaller and medium-sized industrial facilities, in which SIMATIC automation is not being used or where it is necessary to separate the automation and power distribution.

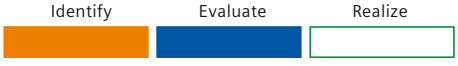
Energy management with functions such as the provision and evaluation of various measured values as well as their monitoring can already be simply implemented in the standard package of our SENTRON powermanager software. Additional customer-specific requirements can be implemented using option packages. This means that a project can be subsequently expanded by additional functions or additional devices at any time without losing any data – last but not least, thanks to a flexible license concept.



Intelligent energy optimization with SIMATIC PCS 7 and SIMATIC WinCC

SIMATIC PCS 7 and SIMATIC WinCC already offer standard functions, which effectively support energy optimization. On one hand, basic functions are used – such as alarm system or archive functions to compress the energy values – that are used by SIMATIC powerrate as basis. In addition, SIMATIC PCS 7 offers higher-level closed-loop control functions (Advanced Process Control – APC), which can be used to implement sustainable energy optimization and to reduce energy costs by between 3 and 10%.

An additional example:
Plant Asset Management
Here, in addition to the system components, mechanical components such as pumps and heat exchangers are also monitored. This means that maintenance measures can be taken in plenty of time before a decreased efficiency starts to have a negative impact on the energy consumption.



SENTRON PAC multifunctional measuring devices: extensive information at any time using an intelligent measuring system

If you wish to sustainably reduce energy costs, then you first require an overview of the energy usage and the energy flows in the plant or system. And this is precisely what our SENTRON PAC multifunction measuring devices do – and that, for all applications: They precisely and reliably acquire the energy values for electrical branches or individual loads. Beyond this, they also supply important measured values to evaluate the plant or system status and the quality of the line supply.

Thanks to their diverse range of communication options, these devices can be very simply integrated into higher-level automation and energy management systems so that the measured data can be further processed. Equipped as standard with digital inputs and outputs, both switching devices as well as pulse counters for any media can be simply integrated into the energy management system and correspondingly evaluated.

Identify Evaluate Realize

SENTRON switching and protection devices: more than just switching and protection devices

The seamless and integrated concept of communication-capable products from our low-voltage power distribution portfolio forms a reliable basis to acquire, evaluate and optimize the energy flow – therefore permitting professional energy management for effective cost savings. Our open SENTRON 3WL circuit breakers and compact SENTRON 3VL circuit breakers are more than just pure switching and protection devices. Depending on the functionality required, measured data and switch states are made available to the higher-level automation or management systems via standard bus systems. Our plug-in 3NJ62 and 3NJ4 SENTRON in-line switch disconnectors are not only used to protect plants and loads. With their integrated current transformers, they also supply current values. Supported by the SENTRON PAC multifunction measuring device or the SIMOCODE pro motor management, this data and additional status data (ON/OFF/fuse rupture) are transferred to the management level for further processing – for instance to our SENTRON powermanager software or the add-ons SIMATIC powerrate for WinCC or PCS 7.
All of these products play a role in achieving sustainable energy-related optimization for user-friendly, safe and reliable operation – as well as optimizing maintenance.

Identify Evaluate Realize

SINAMICS: the basis for innovative drive solutions that are fit for the future

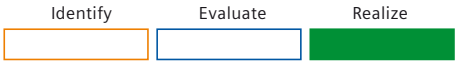
Our complete SINAMICS family has the optimum frequency converter for each and every application. For instance, the G series of SINAMICS converters are especially suitable for applications with a high energy-saving potential: e.g. SINAMICS G110 in the low-voltage range for low power ratings, SINAMICS G120, with energy recovery and Safety Integrated, for applications up into the medium-power range and SINAMICS G120 P for pump, fan and compressor applications.

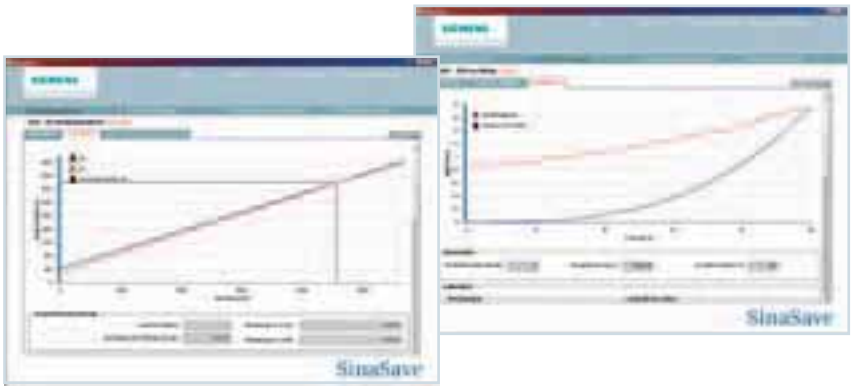
SINAMICS G110D and SINAMICS G120D as single-axis drive up to 7.5 kW are available for distributed applications in a high degree of protection. SINAMICS G130 chassis units and G150 cabinet units have been specifically tailored to address high-rating single-motor drives, which do not require energy recovery.

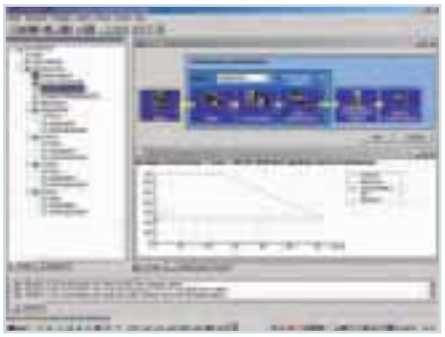
In the medium-voltage range for power ratings up to 120 MW, we offer SINAMICS GM150, SINAMICS GL150 and ROBICON Perfect Harmony. ROBICON Perfect Harmony is a transformer, power unit and closed-loop control in one unit. Its innovative concept ensures that the highest availability values are reached. The DYNAVERT T frequency converter is especially suitable for sector-specific applications – especially in the chemical industry and in the power station sector.

The modular SINAMICS S120 drive system addresses high-performance applications in plant and machinery construction – in the power range from 0.12 kW to 4500 kW. Whether continuous material webs or cyclic high-dynamic processes, SINAMICS S120 packs more performance in machine tools and production machines. In addition to integrated safety functions, this is achieved using energy-saving system functions:

- Optimum energy utilization through energy recovery, automatic energy equalization in the drive group and energy-saving system functions
- High line supply compatibility and elimination of losses by compensating harmonics
- Closed-loop flux control for optimum energy utilization of converter-fed induction motors
- Line reactors and braking resistors are not required
- Integrated reactive power compensation







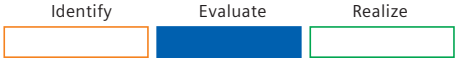
SinaSave: determining the energy-saving potential in drive technology

Drive applications represent up to 70% energy-saving potential. SinaSave calculates just how high the energy- and cost-saving potential is in a specific case. This is based on plant and system parameters. Our software tool, which is just as innovative as it is user-friendly – can be downloaded at no charge from the Internet and informs you just how fast the payback time is when investing in an energy-efficient motor – either for line operation or frequency converter operation for variable-speed operation. The payback time is often just a few months.

For line operation, SinaSave calculates the cost saving and payback time of our energy-saving motors in the high IE2 efficiency class or NEMA Premium – when compared to motors in the standard efficiency class IE1 or EPAct, individually selected and known motors or known motors within a complete plant evaluation. Comparing the efficiency of conventional motors and HT-direct torque motors is also an integral component of SinaSave. As direct drives using permanent magnet technology, HT-direct torque motors set themselves apart as a result of their especially high efficiency.

For frequency converter operation – for which all of the important low-voltage and medium-voltage products are included in SinaSave – the tool takes into account all of the necessary plant- or system-specific parameters – as well as the values required for the process. Additional basic data that the program requires are the number of working days and working shifts as well as the load profile over a day and a year, which are decisive for the energy-saving impact. Using the plant- or system-specific data, SinaSave identifies the optimum drive system, calculates the price of a suitable frequency converter and determines the energy demand of the variable-speed drive system in comparison to all other alternative concepts that could possibly be considered.

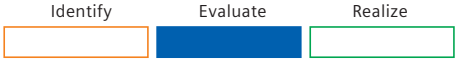
SinaSave itself not only offers user-friendly functions, such as the automatic update, but also all of the languages important worldwide, electrical and mechanical units as well as currencies. The latter are dynamically updated through the Central European Bank.



SIZER: comparing the energy efficiency of drive solutions

Our SIZER engineering software supports you when selecting the optimum drive configuration – also when it comes to energy efficiency. Drive solutions can be quickly and simply compared and the energy-saving potential determined. The result: a transparent comparison calculation for two drive configurations. The expected annual energy demand for the specified load profile is displayed for each drive version. In addition, using the practical conversion function, you can check whether significant energy savings can be achieved with a modified drive configuration.

Presently, the functionality is available for SINAMICS G120, G130 and G150 frequency converters as well as the SINAMICS S120 and S150 motion control systems. The standard 1LA and 1LE motors as well as the 1FK7, 1FT7 and 1PH8 series of servo motors from Siemens are also taken into consideration.



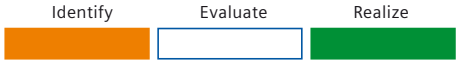
SIRIUS switching and protection devices

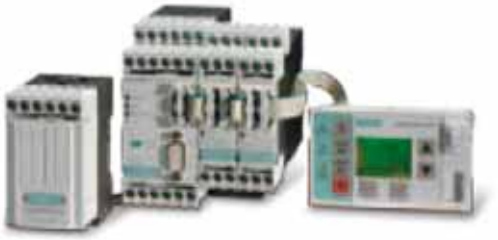
SIRIUS Innovations has an extremely low intrinsic power loss. An additional and significant reduction – which is on the average 10% – has been achieved with the new generation. This means that you not only save energy costs, but also reduce the amount of heat generated in the control cabinet. As a consequence, you can achieve a higher packing density in the control cabinet and reduce the cooling power required.

Examples:

- Contactors: Our most energy-efficient contactors have an electronic coil control. This significantly reduces the power loss by up to 92%.
- Soft starter: Our soft starters have an intelligent, integrated power bypass function. This reduces the power loss in operation by up to 92%.
- Overload relay: Overload relay with electronic release instead of a bimetal release set themselves apart not only as a result of the wider setting range, but also due to the fact that their intrinsic power loss is reduced by up to 98%.
- Compact load feeder: Contrary to conventional load feeders, the power loss in the compact load feeder has been reduced by up to 80%. The basis for this is the product combination of the most efficient technologies in one device.
- Circuit breakers:
  Our energy-efficient circuit breakers are convincing also as a result of the new bimetallic trip, which reduces the intrinsic device power loss by 14%. This means that a wider power range can be covered with the same device size.

In the Identify phase, all of the communication-capable switching and protection devices supply continuous energy values without incurring any additional installation costs, e.g. to a higher-level energy management system. As a consequence, they provide the necessary transparency of the energy usage.





Communication-capable motor starters and soft starters: avoid current peaks

Communication-capable SIRIUS motor starters and soft starters are the optimum choice when it comes to switching, protecting and monitoring motors. Direct and reversing starters, as well as also soft starters, cover the complete range – from the high number of switching operations up to soft starting and stopping without mechanical and electrical peaks. This allows peak loads to be reduced by up to 60%. The extremely low intrinsic power loss of SIRIUS Innovations is also convincing. From basic SIRIUS contactor combinations through pre-wired, fuseless load feeders and soft starters up to motor starters for the distributed SIMATIC ET 200S and ET 200pro distributed I/O: All of our motor starters and soft starters are especially space-saving, fast to install and can be simply integrated into the automation level via AS-Interface, PROFIBUS or PROFINET.

Thanks to their measuring and communication capability, SIRIUS 3RW44 soft starters, M200 D motor starters and SIMATIC ET 200S can supply measured energy data to higher-level energy management systems. This makes them a simple and practical solution for continuous duty and for fixed-speed operation. This plays a decisive role in reducing the energy costs.

Identify | Evaluate | Realize

SIMOCODE pro: flexible, modular motor management system

SIMOCODE pro optimizes the connection between the process control technology and the motor feeder, increases the plant availability and the same time results in significant cost savings in construction, during commissioning, in operation and when maintaining a plant or system. Installed in the low-voltage switchgear, our flexible and modular motor management system for constant-speed, low-voltage motors. It is the intelligent link between a high-level automation system - e.g. with a load management system - and the motor feeder.
The measuring functionality integrated in SIMOCODE supplies the energy measured data required for the energy management without any additional cabling. Using the integrated actuators, loads can be shut down, e.g. using a load management system.

Identify | Evaluate | Realize

SITOP power supply

Controlled SITOP power supplies operate according to the principle of primary clocking and therefore achieve a significantly higher efficiency than uncontrolled power supplies.

An example: The new 3-phase SITOP PSU300M 24 V/20 and 40 A power supplies are convincing as a result of their high efficiency of 93%. This saves energy and reduces the amount of heat that is generated – which in turn facilitates an extremely compact design.

The new series of SITOP compact power supplies set themselves apart as a result of the high efficiency over the complete load range. They save 28% energy when compared to conventionally controlled power supply units. The low power loss under no-load conditions slashes energy usage by 53%.

Identify | Evaluate | Realize

The most comprehensive range of efficient low-voltage induction motors

We can offer you high-efficiency aluminum and cast-iron motors for the widest range of applications and for all international markets: For voltages from 230 V to 30.2 kV and power ratings from 0.09 kW up to 100 MW – and in versions that comply with the different international efficiency classes.

Our spectrum according to the new international efficiency standard IEC 60034-30 includes a seamless range of induction motors with power ratings from 0.75 to 375 kW, with 2 up to 6 poles in efficiency classes IE1 to IE3. When compared to IE1 motors, these high-efficiency IE2 motors have an efficiency that is up to 7% higher. This has been achieved by using a sophisticated mechanical design and special materials. Based on the same technological platform, we offer motors with EPAct and NEMA Premium efficiencies for the NEMA market.

Our motors are available up to 690 V – both for line as well as frequency converter operation – and perfectly match our SINAMICS converters and SIRIUS motor starters. Siemens and its daughter company, Loher GmbH have a seamless range of explosion-proof motors in the high IE2 efficiency, which extends over the complete range of validity of the IEC 60034-30 standard – from 0.75 to 375 kW. For Zones 2 and 1, in all of the usual types of protection.

Identify | Evaluate | Realize

High-torque motors HT-direct – direct drives with a high efficiency

Our series of HT-direct motors are permanent-magnet synchronous motors. They provide high torques at low speeds directly at the driven machine. As a result of the permanent-magnet rotors, high efficiencies and good power factors can be achieved even at low speeds. We offer these motors together with our SINAMICS frequency converters as harmonized and coordinated system – as a drive solution with a long service life, low life cycle costs and a high efficiency. For slow-speed drives, the efficiency of these motors is approximately 2 to 3% higher than comparable, conventional drive concepts. In a power range extending up to 2080 kW, HT-direct can provide torques of up to 42,000 Nm and in addition to its energy efficiency it also sets itself apart as a result of its high reliability and low maintenance.

Identify | Evaluate | Realize

High-efficiency geared motors in IE2

We have a complete range of MOTOX geared motors in the power range from 0.09 to 200 kW. You can reap the benefits of these units – in all applications and in any sector – from the extremely high rated gear torques, wide range of options and high efficiencies. The efficiency for helical, parallel shaft and helical bevel gear units is generally 98% (1-stage), 96% (2-stage) or 94% (3-stage). From frame size 180 and higher, the geared motors are implemented as standard in efficiency class IE2.

In addition to the energy costs, the operating costs over the complete life cycle are important. These can be optimized when precisely engineering the application (mounting position, gear ratio, drive speed etc.). The gear mounting using a slip-on design also results in more efficient drive solutions.

Identify | Evaluate | Realize

Application examples

Predestined for energy-saving: pumps, fans and compressors

Pumps, fans and compressors that are operated with mechanical throttles and valves, represent a huge cost-saving potential. In this case, the changeover to variable-speed drives with frequency converters provides enormous economic benefits: Different than with mechanical controls, the power drawn is always immediately adapted to the actual demand. This means that energy is no longer wasted, which in turn permits savings of up to 60% – in extreme cases, even up to 70%.

Also when it comes to service and maintenance, variable-speed drives offer some significant advantages when compared to mechanical controls: Current peaks when the motor accelerates and high torque surges are a thing of the past. This also applies to pressure waves in piping systems (water hammer), cavitation and vibration that continually take their toll on the plant or system. The soft starting and stopping relieves the load on the mechanical system and ensures a longer service life of the complete drive train.

Even higher cost savings with energy recovery

Whether in hoisting applications, centrifuges or conveyor belts: Wherever large masses must be frequently braked, our frequency converters capable of energy recovery significantly reduce the energy demand. The reason for this is that in contrast to conventional drive systems, the braking energy is not simply dissipated and wasted in braking resistors. Instead, it is fed back into the line supply. By using this so-called intelligent infeed technology, for instance, in hoisting applications up to 50% of the energy can be saved. An additional positive spin-off: Components such as line reactors and braking resistors can be eliminated and the required current drain is reduced by approx. 20%. The amount of space required for the drive system is also correspondingly lower and the amount of heat generated is reduced. We have converters capable of energy recovery for installation in control cabinets as well as in a high degree of protection for use in distributed architectures.

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