White paper

Energy management in practice

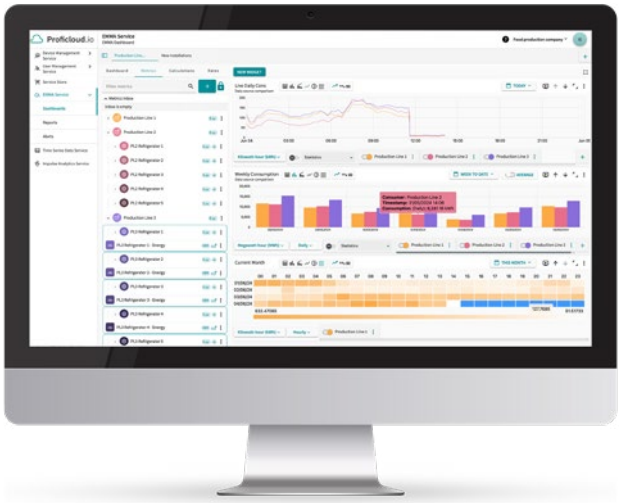
Practical tips and strategies for companies

Find out more about

- Energy management in accordance with ISO 50001
- IIoT-supported energy data acquisition
- Practical examples from industry
- Cloud-based Smart Services

Introduction

Anyone taking on the role of energy manager in their company is responsible for a whole host of tasks. The focus is usually on introducing and controlling an energy management system (EnMS) in accordance with DIN EN ISO 50001:2018. This standard helps to continuously improve all energy-related key figures. But how does this introduction succeed and which technologies help? In this white paper, we will show you the key steps.



In the past, energy consumption played a subordinate role in production. This has changed in the wake of spiraling costs and the introduction of a company's carbon footprint and that of individual products as a relevant key performance indicator. In the meantime, all industries that consume major quantities of energy must ensure that consumption can be measured and analyzed. Small and medium-sized enterprises (SMEs) that have not yet implemented an energy management system, or only have a rudimentary one, will benefit particularly from this. With better data availability and analysis, they will find it easier to comply with standards and legislation – and, of course, identify and exploit internal savings potential.

Can you name the five largest loads in your company? Do you know how you can continuously monitor company-specific key consumption figures?

Here you can find out how to get an overall view with a reasonable effort.

Content

One standard, many key figures and energy sources

The international standard ISO 50001:2018 (DIN EN ISO 50001:2018, “Energy management systems – Requirements with guidance for use”) is a guideline that helps when you are setting up an energy management system. The standard describes a systematic approach to improving energy-related performance and can mean additional cost benefits for certified companies.

However, to evaluate the success of each energy efficiency measure and continuously monitor processes, you must define the correct key performance indicators (KPI) or energy performance indicators (EnPI). In many areas, EnPIs such as consumption/CO_2/costs per m^2 of building space are relevant, or per produced unit in manufacturing industry. Ultimately, however, energy performance indicators should always be determined specifically for each industry and company.

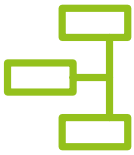
After the definition comes the measurement. During a management review or internal and external audits, these performance indicators show how well your energy management is functioning and whether you can comply with your own requirements and those of the government.

All essential types of energy purchased and self-generated are taken into consideration. This normally involves electrical energy that you purchase as an external electricity mix, but it also involves the energy that you generate, for example in your own production facilities, such as photovoltaic systems, combined heat and power plants, etc. This includes thermal energy for heating and cooling, such as from conventional building heating systems and air-conditioning systems, as well as from combined heat and power plants, or also steam for process heating and pneumatic energy (compressed air from compressors).

1 This is how many energy managers currently work

You need an overview of processes and resource consumption within your company. However, the relevant measurement data is usually collected manually from distributed data sources (energy measuring devices) and imported into energy data systems. Analysis and evaluation are often carried out using self-created MS Excel sheets, from which data flows into the required diagrams. You could also use additional software tools that graphically process the data.

This type of data acquisition and analysis is time-consuming and error-prone. The distances you need to cover between systems, halls, and locations alone prevent continuous energy monitoring. However, this is fundamental for many energy efficiency measures – also in the sense of a solid PDCA cycle (Plan, Do, Check, Act) which allows you to improve systematically.



Are you already using a PDCA cycle for continuous optimization?

Plan phase
Determine the significant energy use (SEU) areas. This is based on significant energy consumption or high potential for improving energy-related performance. Here you can ask yourself questions about specific energy consumption, such as regarding possible wastage and the efficiency of individual systems and system networks.

You can also take a close look at the activities and processes from operational practice. For the measurable evaluation of the individual SEUs, you define energy performance indicators (EnPI) and determine the associated energy baselines (EnB) as reference values for a specific period.

Do phase
Based on the current status and your internal analysis, you derive measures that optimize energy use and eliminate inefficiencies. Then you implement the planned measures in the company during the Do phase.

Check phase
Here, you check whether the measures carried out actually lead to the planned result. To do this, use the defined EnPIs in comparison with the EnBs and the set energy target. Determine where the planned target has not been achieved and specify the appropriate corrective measures.

Act phase
These corrections are made during the Act phase. Here, you can respond to the results so far in such a way that you can achieve the original targets in the future, if necessary.

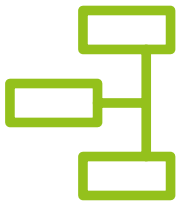
After this phase, you start the cycle again. This makes this approach effective and leads to iterative, continuous improvement and sustainable business practices.

Plan

- Identify significant energy use (SEU) areas
- Define energy performance indicators (EnPI)
- Measure the energy baseline as a future quantitative reference (actual state)
- Define energy targets

Do

- Derive and prioritize obvious measures
- Implement selected measures



Check

- Compare the values of the energy performance indicators and the energy baseline
- Evaluate the achievement of energy targets
- Derive necessary corrections, correct unrealistic energy targets if necessary

Act

- Implement selected corrections
- Start again from the Plan phase

2 This is how energy managers could work

As an energy manager in your company, you should be able to acquire all relevant consumption data digitally and conveniently. Digital electricity meters attached to machines and systems can generally be connected to the IT infrastructure via protocols. However, different systems and the structural separation of the local IT networks make it difficult for you to combine the data.

Furthermore, additional storage options and suitable analytics software are required for evaluation purposes. Until now, a great deal of effort and know-how was required to connect dozens of devices, collect and evaluate relevant data, and draw intelligent conclusions from that data. This poses a challenge for energy managers who must work with limited means and also across different locations.

In this scenario, IoT-based energy management comes into its own:

- Fast availability of measurement data, without special knowledge of complex networks, through simple plug-and-play integration of IoT-capable measuring devices in the cloud system
- No need to maintain in-house IT resources or have extensive IT knowledge due to automated data storage directly in Proficloud.io
- Fast, cross-site reports with the ability to access energy and power data anywhere and at any time
- Data security is always up to date with regular, automated security updates of the IoT platform in the cloud environment
- Access to new functions with the dynamic release cycles of the IoT platform and Smart Services

One example of an IoT-based energy management system is the combination of EMpro energy meters and the Energy Management Service of the Proficloud.io IIoT platform – Phoenix Contact provides both of these.

The Energy Management Service is one of the Smart Services provided by Phoenix Contact. The Smart Service can be operated intuitively as an app and visualizes energy and performance data on the (mobile) device that you are currently using in your role as energy management officer – regardless of the location of the measuring devices and without an additional gateway. With the information obtained in this way, you can derive and plan effective measures, and make the impact measurable.

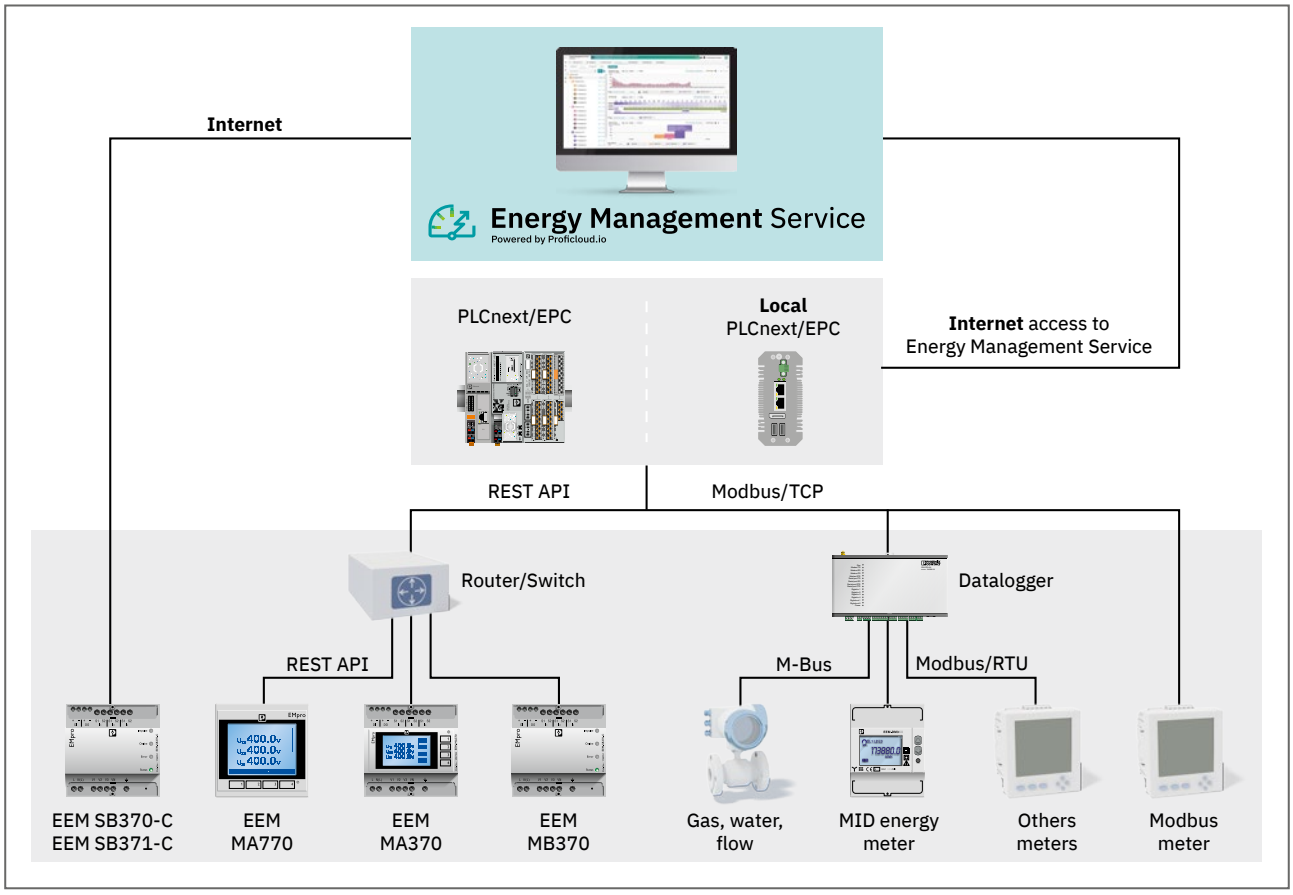
Energy Management Service

The implementation of an energy management system (EnMS) with the Energy Management Service is feasible with just a few IT resources and follows these four steps:

1. Use of IIoT-capable measuring devices in the respective control cabinet
2. Connection to a router
3. An account with a cloud service that receives the data
4. Evaluation via analytics software which presents the results clearly

The Energy Management Service supports you in the familiar steps of the PDCA cycle (Plan, Do, Check, Act) in accordance with the international standard ISO 50 001:2018. This is because comprehensive energy monitoring with reliable and continuous recording of measured variables lies at the heart of the Check phase.

3 Energy Management Service: The technical implementation



The necessary IIoT-capable devices are connected directly to the Proficloud.io cloud platform via an Ethernet interface and the MQTT protocol using plug-and-play. Within the cloud environment, all devices can be managed and integrated into a new or existing system. There are various connection options depending on the specific project. The Energy Management Service can easily connect to EMpro energy measuring devices, PLCnext controllers, or EPC (industrial PC) as hardware. The PLCnext controllers or EPCs can also act as a gateway so that third-party devices can also be integrated.

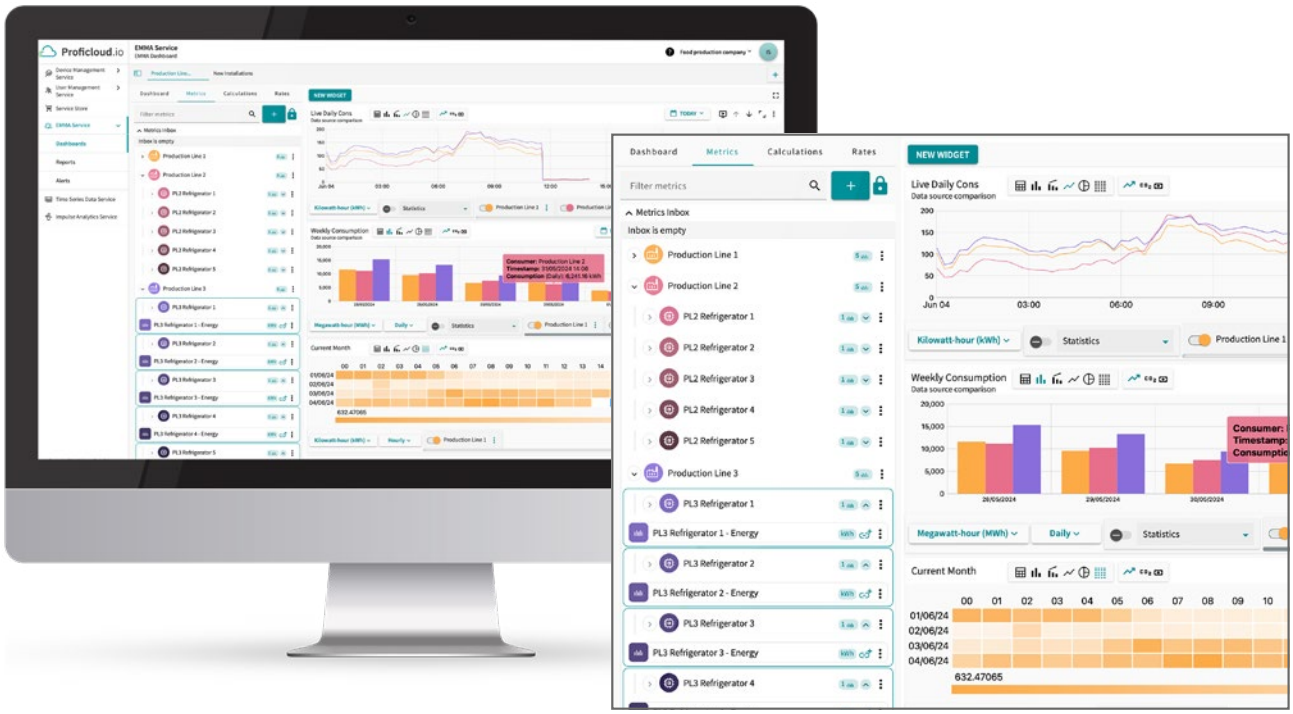
The desired measured values are automatically transferred and stored. You have access to this data via the Energy Management Service and can use the data directly. Complex configurations of classic industrial networks (e.g., Modbus or PROFINET) are not necessary for this.

Savings potential and load management

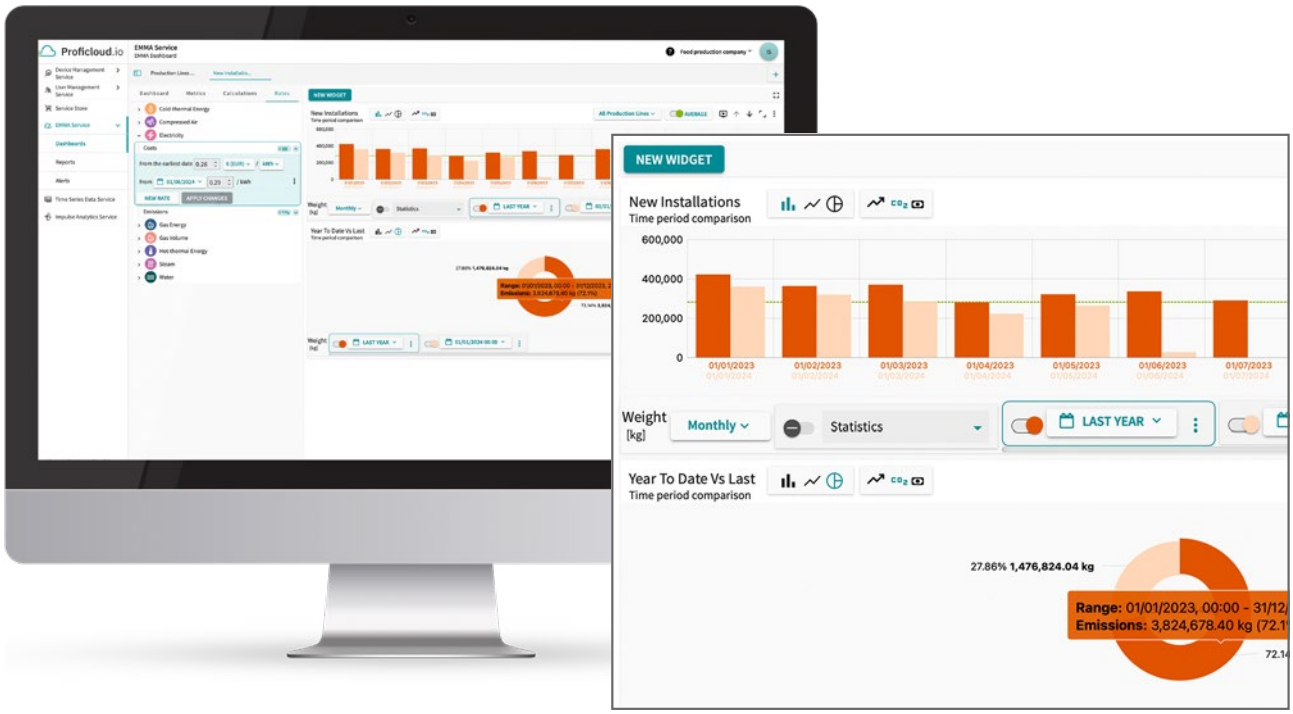
Continuously recorded energy flow provides the basis for each effective operational energy management system. In addition to identifying savings potential, there are other advantages of automated energy data acquisition on machines and systems: You can reduce peak loads with intelligent trend calculation and load management. This peak shaving by means of load shedding or starting machines in a different order prevents retroactive payments of a higher grid fee to your power provider.

The first steps

An energy management system based on the Energy Management Service and Proficloud.io can be set up step-by-step and scaled as needed. Our tip is to start with a small proof of concept: Connect a machine or production line to the Smart Service and use the intuitive operation and evaluation options. Especially when it comes to newly recorded key figures, energy managers first need to gain an understanding of the relevance and the evaluation standards. Then you can gradually expand the number of measuring points and increase the complexity and, in turn, the informative value of your energy monitoring. We'll be happy to support you during the transition.



Energy Management Service provides clarity:
The associated elements and metrics are marked with a clear frame in the tree structure



Get started immediately: The Energy Management Service provides a default reference value for energy costs, which enables you to easily adjust your standard costs or add cost changes over time in chronological order

Easy introduction
Anyone can easily acquire the knowledge related to Proficloud.io and the Energy Management Service. The Knowledge Hub bundles all relevant information about Proficloud.io, new developments, Smart Service releases, and more. The FAQs give you an impression of how you can use our Smart Services before you actually start. In addition, you can become an expert with our e-learning courses.

› https://proficloud.io/knowledge-hub/

Our mission

"Helping companies move toward a sustainable future by unlocking the full value of their data and technology."

Industrial cloud-based smart services for small and medium-sized enterprises

Phoenix Contact Smart Business GmbH is Phoenix Contact's center of excellence for industrial cloud-based smart services and data analytics. The growing team in Bad Pyrmont and Berlin develops standardized, scalable Software-as-a-Service solutions: our Smart Services. They enable small and medium-sized enterprises to exploit the advantages of digitalization and of Industrial IoT.

Cloud-based smart services based on Industrial IoT technology enable users to acquire an overview of the status of their devices and systems – from anywhere, at any time. By using the cloud services for forecasting, optimization, and control, users of Proficloud.io and Smart Services can manage operations and maintenance processes as efficiently as possible. Remote monitoring reduces downtimes and replaces previously redundant/manual workflows. The availability and preparation of valuable information make it possible to react quickly.

Offering a combination of hardware and software solutions, the electrical engineering specialist Phoenix Contact is a full-service provider for Industrial IoT applications.

Smart Services
Powered by Proficloud.io

4 Application examples

Application example 1

Cool potato: operating cold stores efficiently at last

The challenge

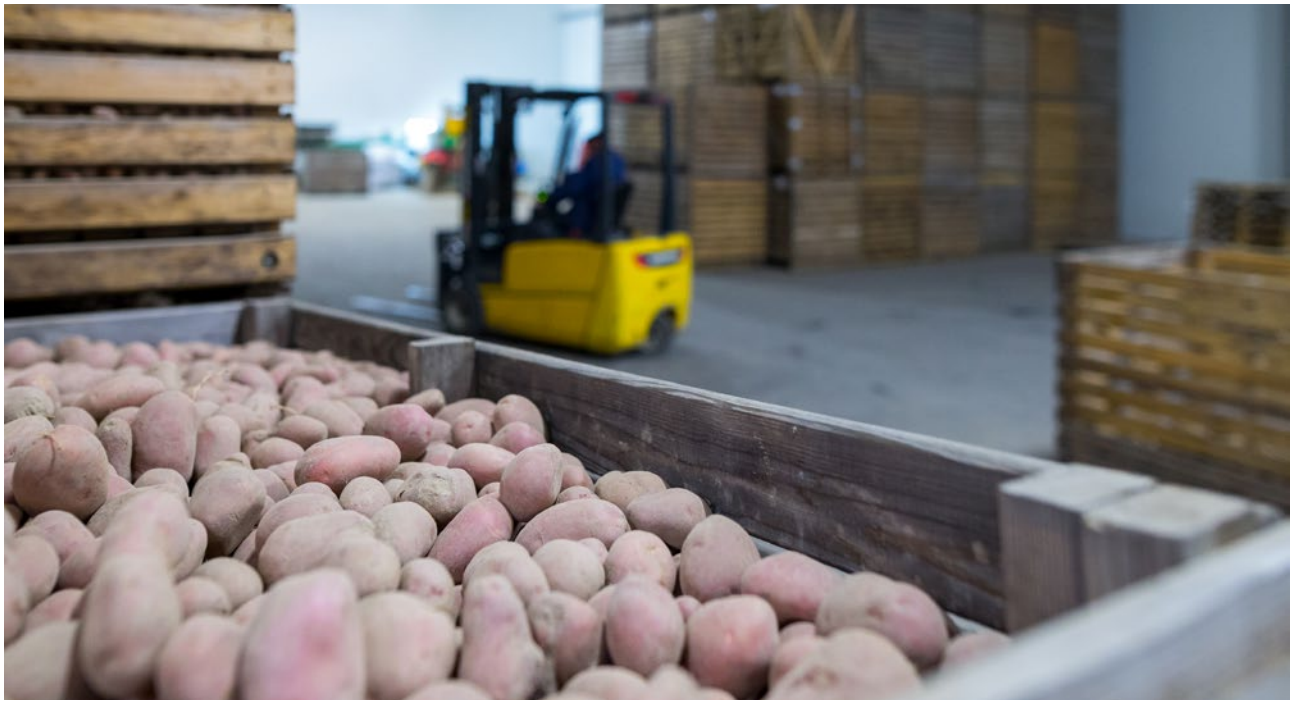
Anyone looking to produce potato chips with consistent quality all year round will inevitably become specialists in the best way to store potatoes. One of our customers is also at home in this discipline and stores tons of potatoes in cold stores all year round – with the corresponding costs for electrical energy.

The company therefore wanted to know how to reduce electricity consumption without restricting the cooling – especially whenever the potatoes are moved. In addition, the energy consumption per kilogram of the finished product was a factor, as the company was aiming for carbon-neutral production. The usual weekly evaluations using Excel lists meant the two targets had not been achieved so far. The low project budget and limited IT resources also imposed limits.

Solution

EMpro measuring devices (EEM-SB370-C) combined with Rogowski coils and the Energy Management Service were used to acquire and evaluate the energy data. The simple prerequisite was a direct connection to the Proficloud.io platform via an Ethernet interface and the MQTT protocol using plug-and-play. Within the cloud environment, the Device Management Service helped integrate and manage the measuring devices.

The energy management team then experimented with the logistics processes for the cooling system, finding out what quantity of potatoes is ideally moved into and out of which cool stores to maintain the required cooling using a minimum of energy.



Application example 2

Beverage bottling: achieving more with less energy

The challenge

Beverage manufacturer B set itself the goal of reducing its CO_2 emissions by 25% by 2025. To achieve this, the aim was to measure and optimally control primary and secondary energy sources, such as electricity, water, heat, and compressed air.

Solution

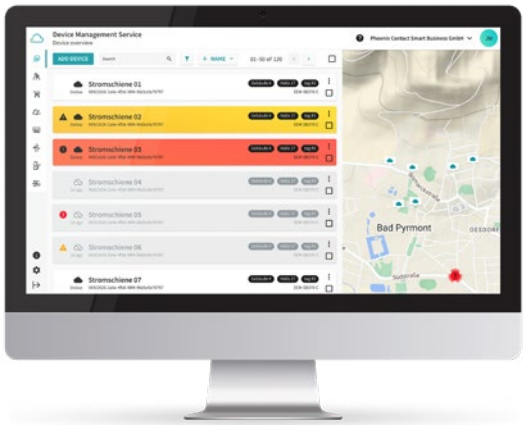
The company created a measuring point concept and installed measuring devices accordingly. The consumption figures visualized on a dashboard provide energy managers with a real-time overview. Corporate management in the United States considers it particularly important to gain insights into the European locations as well. The Smart Services and Proficloud.io, which can display the data in long time series and worldwide, offer advantages here. If required, users can view consumption figures globally, by region, location, and building down to the individual measuring device. The energy generated locally via photovoltaic systems is also visible and taken into account.

As a full-service provider, we also supplied the hardware components (programmable logic controllers, gateways, energy measuring devices) that enable cloud connectivity in both cases.

Smart Services – powered by Proficloud.io

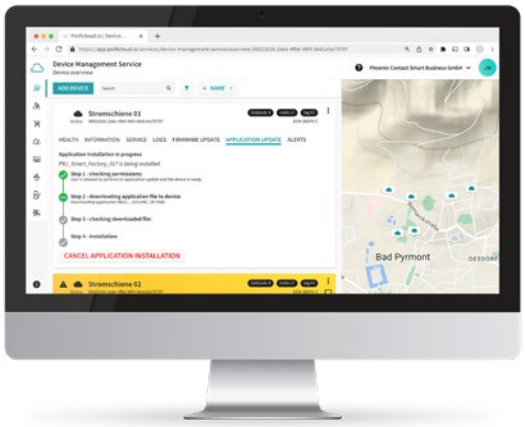
Device Management Service

With this Smart Service, users can add and manage their devices, machines, and systems. It provides standardized device information in real time, with users able to see the status at all times on a clear interface. Firmware updates and updates of the PLC program for Phoenix Contact hardware can be installed centrally. To do this, the controller is automatically shut down so that the machine is in safe mode. It will then receive the new firmware via Proficloud.io.



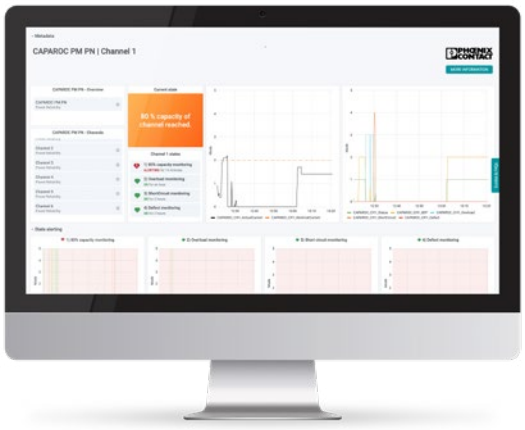
DMS Basic Add-on

The first DMS add-on provides additional functions for monitoring distributed systems. Particularly useful features include the automatic firmware updates; the notification system for notifications in the event of changes to a device's state of health; remote application update (currently only for PLCnext hardware); the creation of device groups.



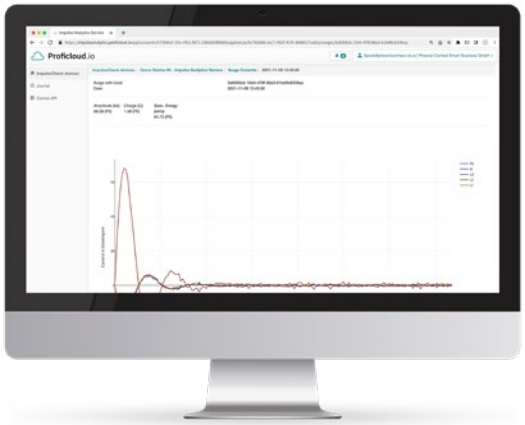
Time Series Data Service

This enables the access, monitoring, and recording of process data of all types. It includes, for example, the flow rates, temperatures, and energy profiles of machines that can be used for long-term data-driven decisions. An alert function informs users as quickly as possible if defined threshold values are exceeded somewhere.



Impulse Analytics Service

In combination with the IoT-capable devices for ImpulseCheck, this service is the first intelligent assistance system for surge protection. The state of health of all protective devices integrated into the cloud is visible, enabling the service life to be predicted much more easily.

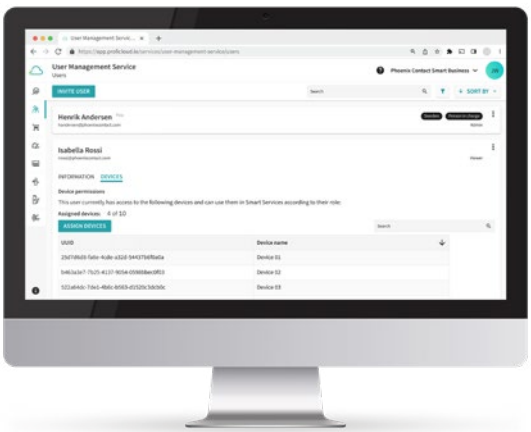


Energy Management Service

The Energy Management Service provides energy monitoring, energy management, and energy analysis with user-friendly dashboards that provide a quick overview and detailed analyses of energy consumption. This helps companies to make informed decisions and to optimize their energy efficiency.

User Management Service

With this core service, the company organizes its users on Proficloud.io. They can be assigned individual profiles, roles (Admin, Editor, Viewer), and approvals so that users can access the dashboards and data that are relevant to them.



5 Phoenix Contact – Smart Services for industry

About Phoenix Contact

Phoenix Contact is a global market leader headquartered in Germany. Our group is synonymous with future-oriented components, systems, and solutions in the fields of electrical engineering, electronics, and automation. A global network across more than 100 countries and 17,600 employees ensures close proximity to our customers, which we believe is particularly important.

Take back control of your maintenance and operations

Smart Services are standardized, scalable cloud services for industry that enable small and medium-sized enterprises to manage their processes in operations and maintenance as efficiently as possible.

Reduce manual and redundant work steps with remote monitoring across locations. Increase the availability of your systems with early error detection and automatic alerts. Make better data-based decisions and create total transparency of the status of your systems – at any time, from anywhere.

Smart Services
Powered by Proficloud.io

Your ticket to Industrial IoT

Proficloud.io is a plug-and-play IIoT platform that allows small and medium-sized enterprises without their own or with only limited IT resources to connect their devices to a cloud infrastructure easily and smoothly. The goal? Utilize the full potential of Smart Services for your business!

Through intuitive web interfaces and dashboards, Proficloud.io offers maximum simplicity when using the cloud platform. Registration takes just a few minutes, and no previous (IT) knowledge is required to use the platform. Furthermore, the Proficloud.io Service Store with its familiar web shop features offers full transparency on functionality and pricing models when purchasing Smart Services. And all this in a high-availability cloud environment that meets the highest available security standards. What are you waiting for? Find out for yourself!

Proficloud.io
Designed by Phoenix Contact Smart Business

Contact

Would you like to learn more about our Smart Services?
Talk to us about your individual needs, arrange a personal demo, or set up a non-binding consultation. We look forward to exchanging ideas with you!

› More information on our website: proficloud.io

Dietmar Knecht
Business development
Phone: +49 5281 946-2460
Cell: +49 171 9783840
Email: dknecht@phoenixcontact-sb.io

2025-06-10/00
3012507120