cosmotec

your cooling solutions

4.plant

The smart cooling solutions

is the control and optimisation solution

designed to manage refrigeration energy in realities where year-round cooling is required

The effort required is significant:

Continuous operation
24-hour operation 365 days a year

Continuity
service continuity guaranteed

Cooperation
coordination of all system components

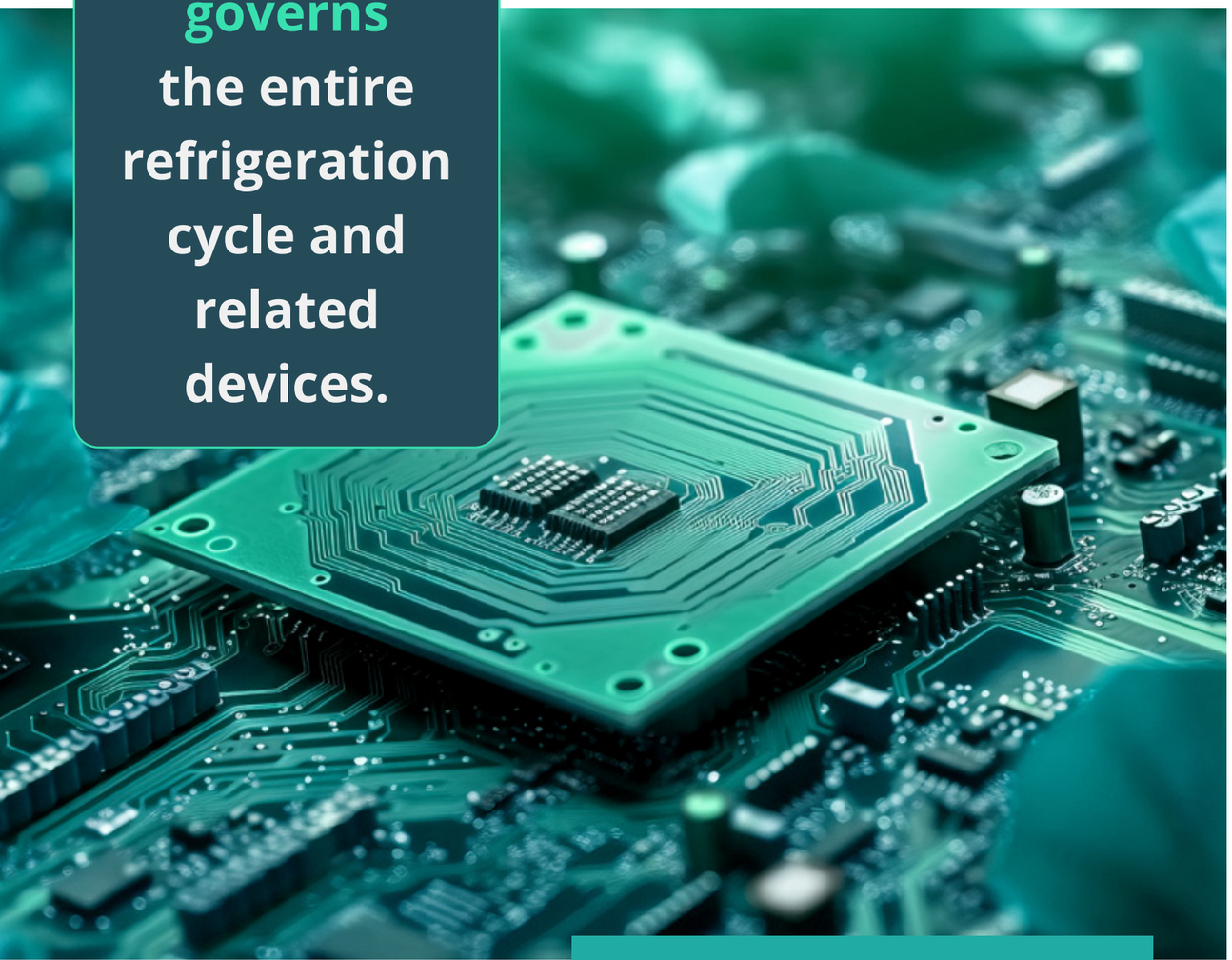
Efficiency
reduced service costs while increasing performance

Ideal for meeting all requirements and efficiently coordinating system components

Why you should choose *4.plant*?

It monitors, plans and governs the entire refrigeration cycle and related devices.

It's a **state-of-the-art** product for the management of industrial hydronic systems



Operational reliability and energy efficiency are at the highest level thanks to a **centralised software solution**

With *4.plant* control is an easy game

Service continuity
Service continuity guaranteed even in the face of possible anomalies

Energy saving
Thanks to advanced optimization strategies for units and systems

Application flexibility
The logical sequences and the graphical interface can be adapted to every system's needs

Performance maintenance
Ensures the same level of performance over time and a significant increase in the overall lifespan of the entire system

Continuous Improvement
Thanks to analysis and reporting tools, it allows for a better understanding of the system/unit and helps identify improvement strategies

Simplified management
Ability to manage complex systems even by non-highly skilled personnel

Monitoring and integration
Easily accessible information and clear graphical layouts that can be visualized both locally and remotely

Financial Investment
Contributes to a decrease in costs related to service management and maintenance. Allows to obtain credits for energy certifications based on efficiency, increasing the overall value of the site (Tier, Leed, Breeam, Industria 4.0, ISO)

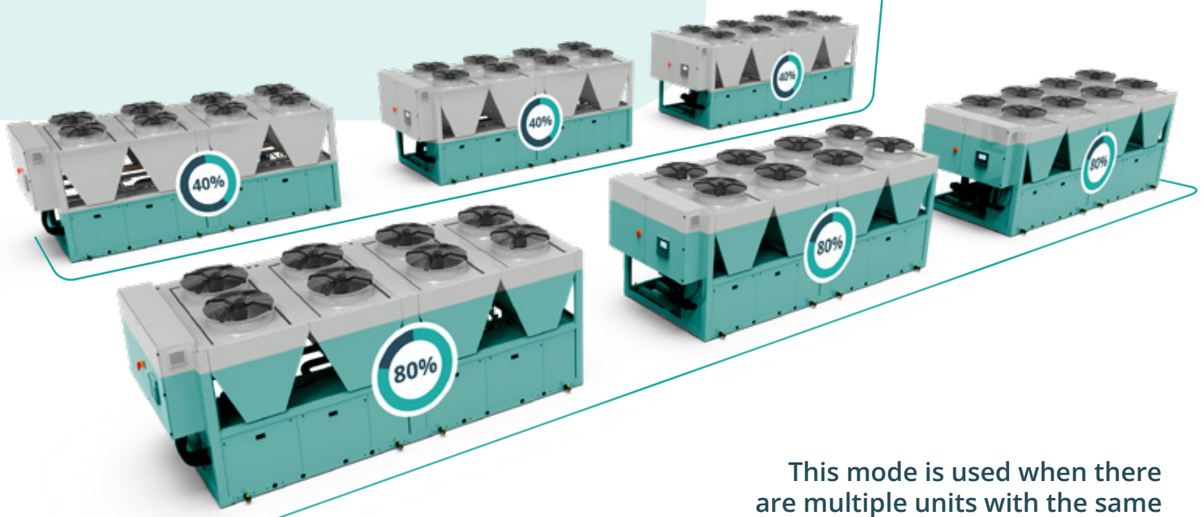
How do we maximize efficiency

Load balancing

Sequencing the available resources in a rational manner based on the plant configuration, user demand, and operating conditions is essential to efficiently meet refrigeration demands while ensuring necessary redundancy. The system working synergy is not compromised even in the presence of units equipped with heterogeneous technologies.

The capacity of each unit is utilized to its maximum performance based on the actual demand of the system.

Condition 1
40%
Required thermal load



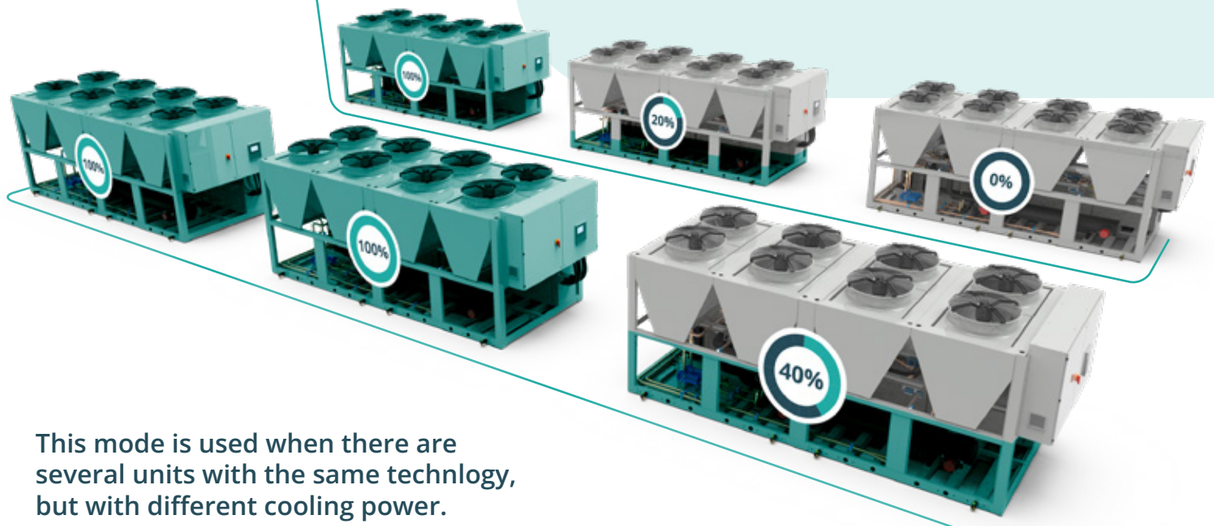
Condition 2
80%
Required thermal load

This mode is used when there are multiple units with the same technology and refrigeration capacity.

The system's demand is evenly distributed among all units. This ensures the best solution in terms of operational reliability balance during operating hours.

Saturation

Condition 1
40%
Required thermal load

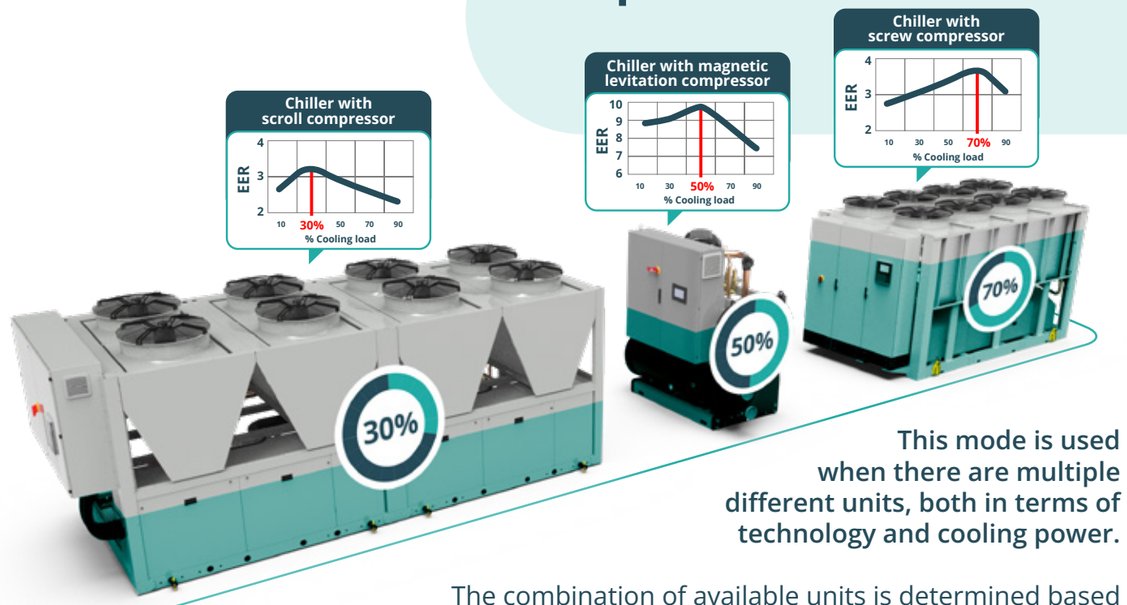


This mode is used when there are several units with the same technlogy, but with different cooling power.

The selected unit is brought to its maximum operating point before activating another one. This way, only the necessary resources are used to meet the required thermal load, and one unit can be reserved as a backup in case of a fault.

Condition 2
80%
Required thermal load

Optimised



This mode is used when there are multiple different units, both in terms of technology and cooling power.

The combination of available units is determined based on their maximum efficiency point. This allows for the best control strategy in term s of performance, redundancy, and adaptation to load fluctuationss.

80%
Required thermal load

Free cooling

When it comes to reducing energy consumption and costs, Free Cooling technology offers the greatest potential for savings. **Free Cooling utilizes external temperatures to air condition, using the cold air directly from the outside**. If the environmental conditions allow it, chillers and dry coolers can take advantage of Free Cooling capabilities by setting a startup sequence that maximizes the use of this resource before enabling compressor operation.

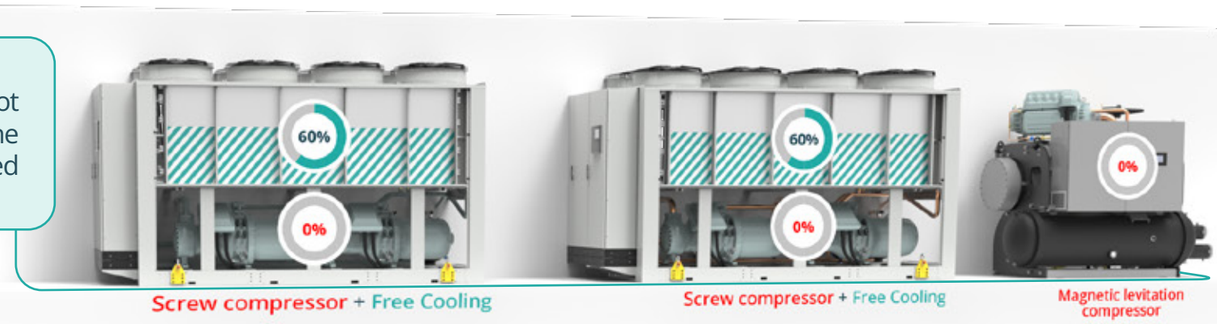
With ***4.plant*** it's also possible to set a mode that prevents the startup of the compressor in the already operational unit for Free Cooling, in order to prioritize the use of the chiller with better performance.

Depending on the conditions of the system, free cooling chillers are used to limit the overproduction of energy.

This strategy reduces the number of compressors in operation, increasing the efficiency of the system.

Condition 1
20%
Required thermal load

When the system load demand does not exceed the free cooling capacity of the chillers, the compressors remain switched off.



Condition 2
40%
Required thermal load

Only when the load of the system increases and the energy from free cooling is not sufficient, the first compressor with higher efficiency will be turned on.

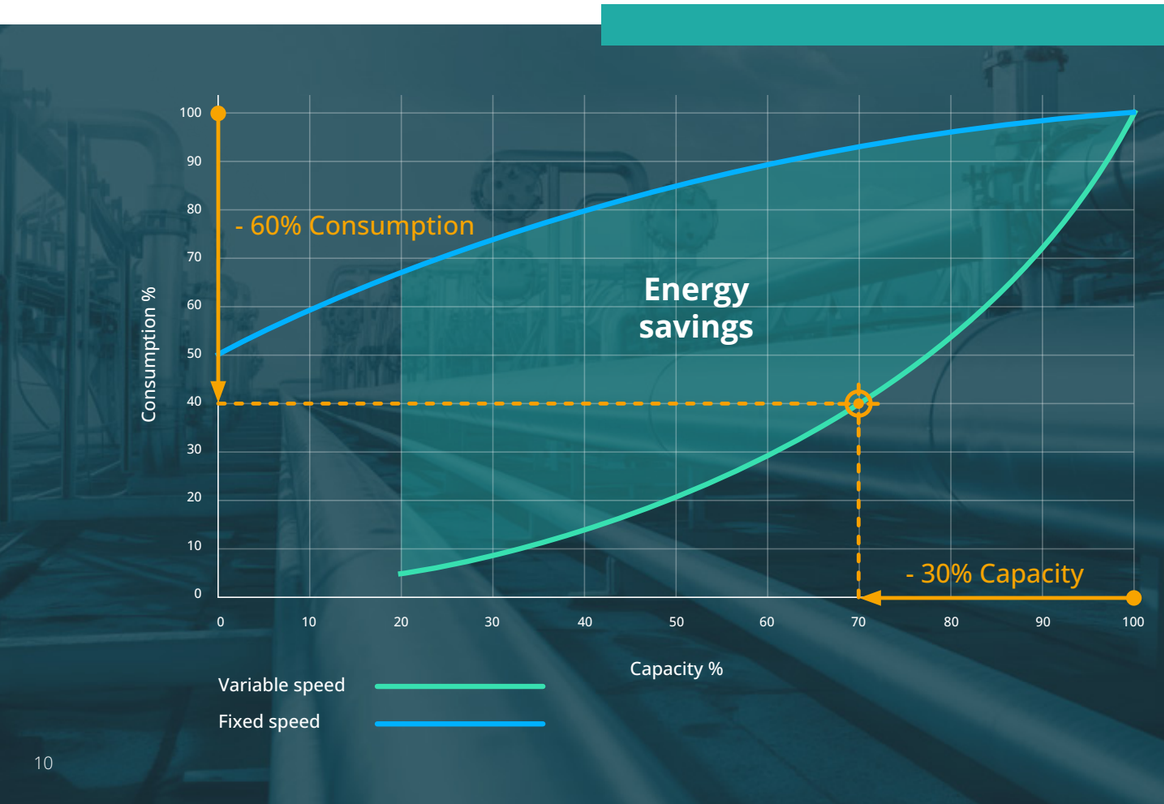
Condition 3
80%
Required thermal load

With further increase in load, compressors with lower efficiency will also be enabled to meet the peaks of energy demand.

Pump management

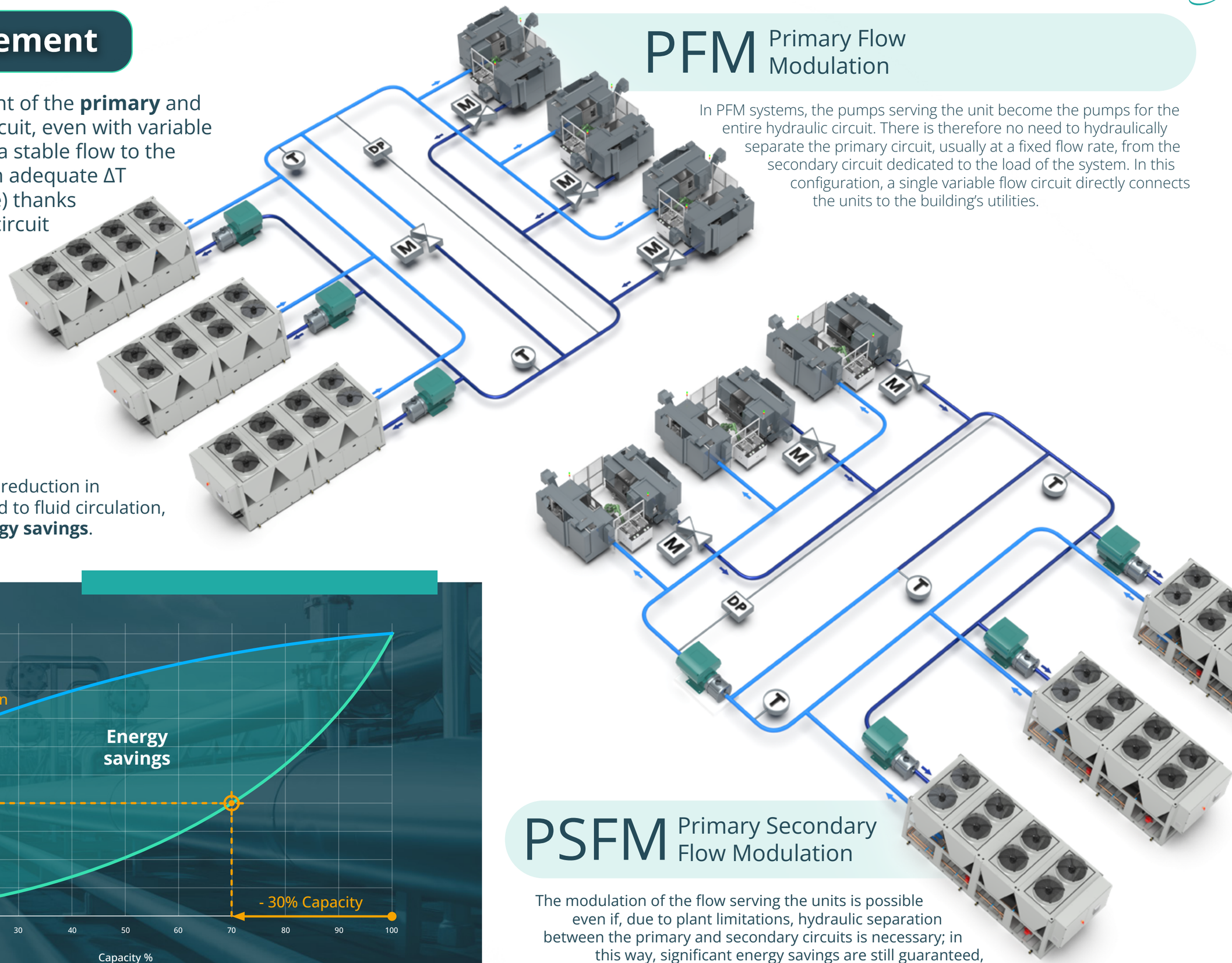
The precise management of the **primary** and **secondary** pumping circuit, even with variable flow solutions, ensures a stable flow to the units and guarantees an adequate ΔT (temperature difference) thanks to direct control of the circuit pressure.

This allows for a significant reduction in energy consumption related to fluid circulation, **ensuring immediate energy savings**.



PFM Primary Flow Modulation

In PFM systems, the pumps serving the unit become the pumps for the entire hydraulic circuit. There is therefore no need to hydraulically separate the primary circuit, usually at a fixed flow rate, from the secondary circuit dedicated to the load of the system. In this configuration, a single variable flow circuit directly connects the units to the building's utilities.



PSFM Primary Secondary Flow Modulation

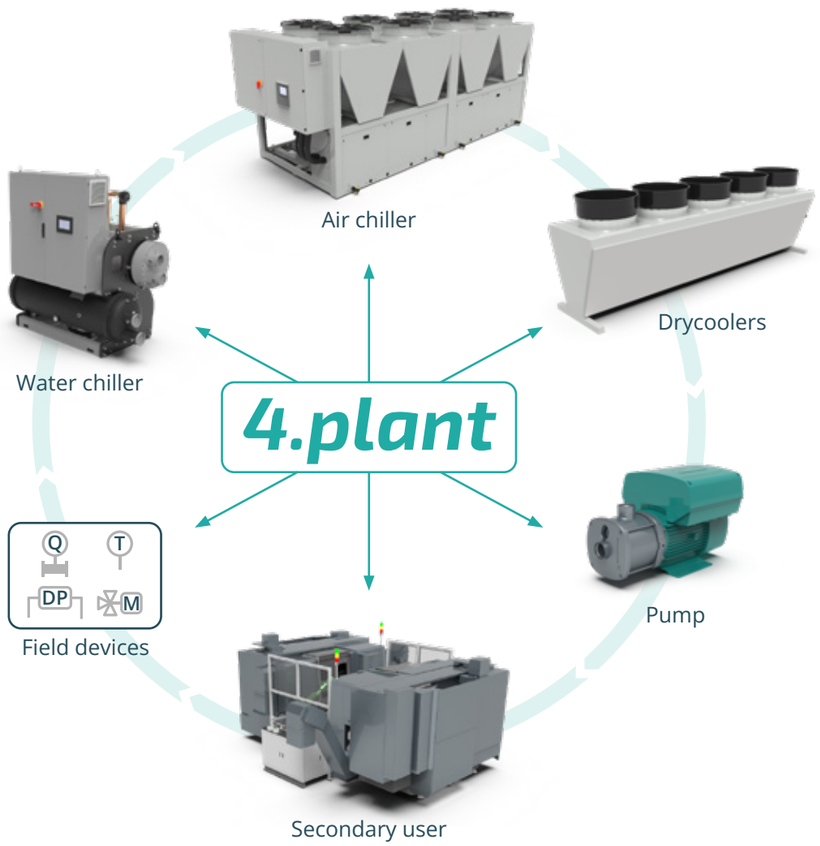
The modulation of the flow serving the units is possible even if, due to plant limitations, hydraulic separation between the primary and secondary circuits is necessary; in this way, significant energy savings are still guaranteed, especially under partial load conditions.

Service Continuity

Full control

The developed architecture ensures interaction between the secondary utilities and the hydronic system serving them (chillers, pumps, valves, dry coolers), in order to create a single system that aims to maximize performance while maintaining service continuity and avoiding overlaps and duplications of functions.

The goal is to promptly meet the energy demand
A system that integrates all components responds more effectively to load fluctuations



This allows for the mitigation of dangerous fluctuations and avoids costly energy waste. The efficiency of individual components is no longer a determining and differentiating factor in the energy efficiency process. By using a collaborative integration approach of technological systems and advanced information exchange, **overall performance is amplified through mutual synergy**.

Fault management

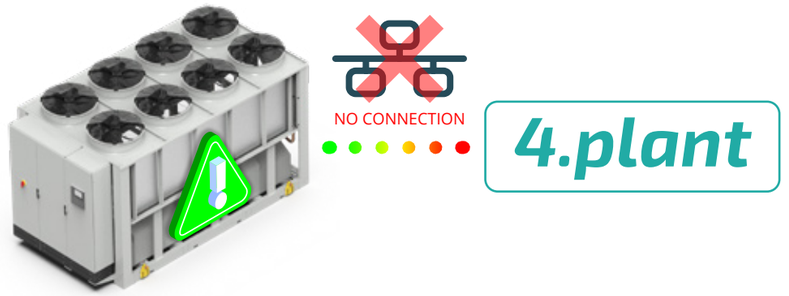
Service continuity at all costs

4.plant is designed to ensure the continuity of production, distribution, and use of thermal energy even in the partial or even total absence of field control.

With the occurrence of hardware, electrical, or communication failures, every device under the control of ***4.plant*** is commanded to turn on, temporarily sacrificing optimal management to avoid service cessation.

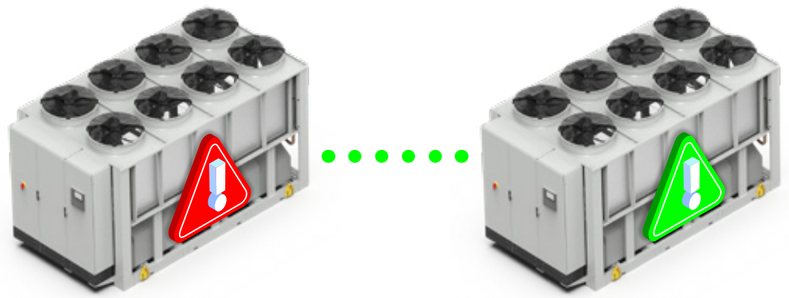
Reliability

Service continuity is also guaranteed in the event of a lack of communication with a device. The **unit** that loses communication with the central system **starts in autonomous mode** independently of the system's commands..



Backup

It is possible to define a rotation of available resources when a time threshold is reached in order to maintain equal wear among the components. Additionally, in the event of a critical alarm from an active resource, another resource is immediately activated to **avoid dangerous temperature fluctuations** in the circuits.



Diagnostics

4.plant constantly detects operational data from each individual device through dedicated sensors and serial interface channels.
The obtained measurements are compared with the device's specifications and the overall system's design data. **Thanks to this comparison under different operating conditions, it creates the possibility to adapt control strategies by evaluating the actual load conditions**. With the use of an advanced diagnostic model, designed to convert the large amount of collected data into information necessary for a better understanding of the refrigeration system's performance level, **scheduling different maintenance levels will no longer be a problem**.

Efficiency check

The operation of the refrigeration circuit is constantly verified to ensure the maintenance of the same level of performance over time.
It is possible to make an instantaneous comparison of the actual performance of the machine based on the efficiency curves of the units at different operating points, in order to highlight any performance deficiencies.

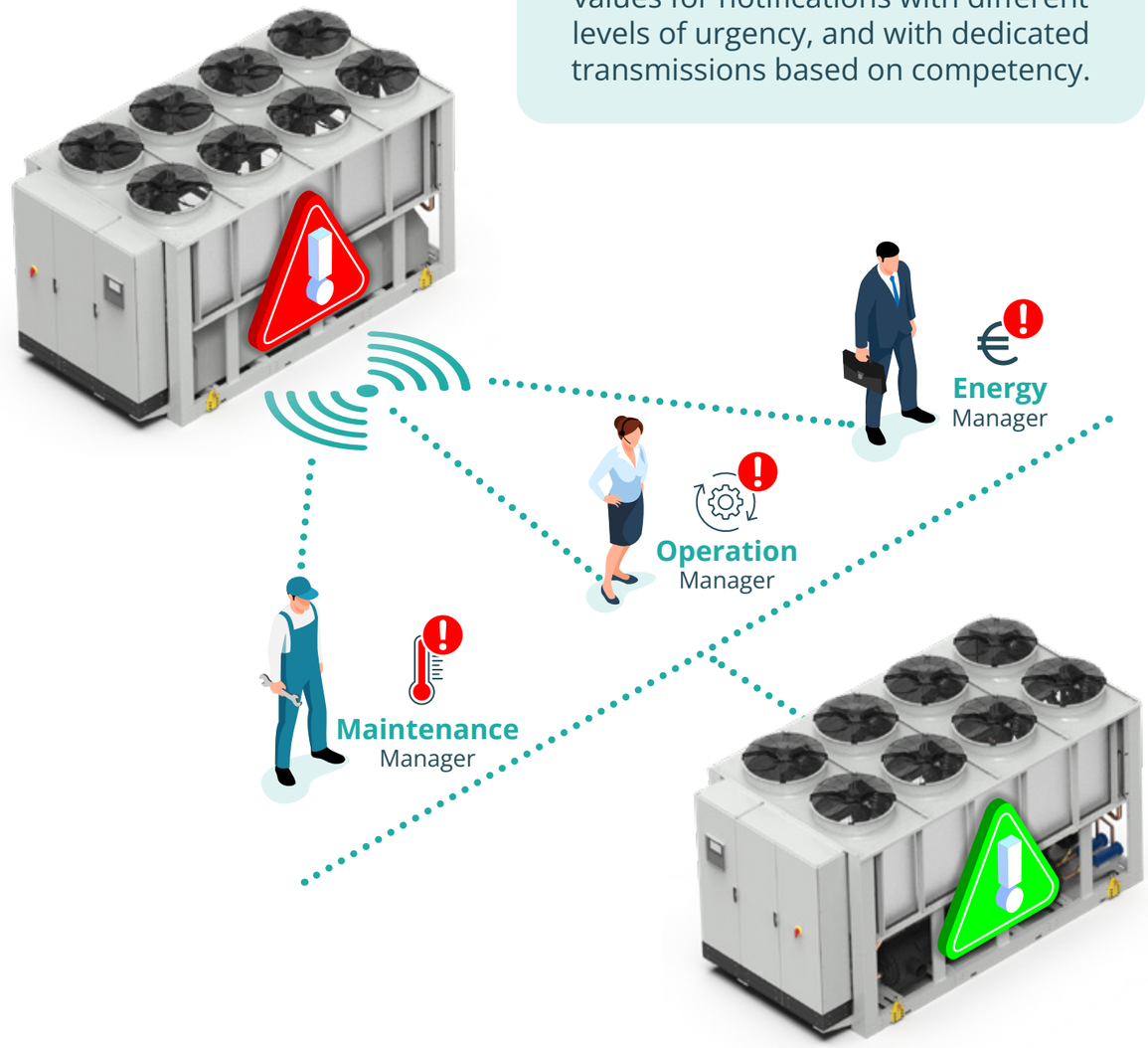
Preventive maintenance

Continuous analysis of internal variables of the unit to prevent potential failures.
By having a deep understanding of the operation of the units and their working processes, it is possible to anticipate any anomalies due to inadequate conditions.

Alarm Manager

There is a dedicated section for the visualization and management of alarms and manual override conditions.

It is possible to configure distinct limit values for notifications with different levels of urgency, and with dedicated transmissions based on competency.

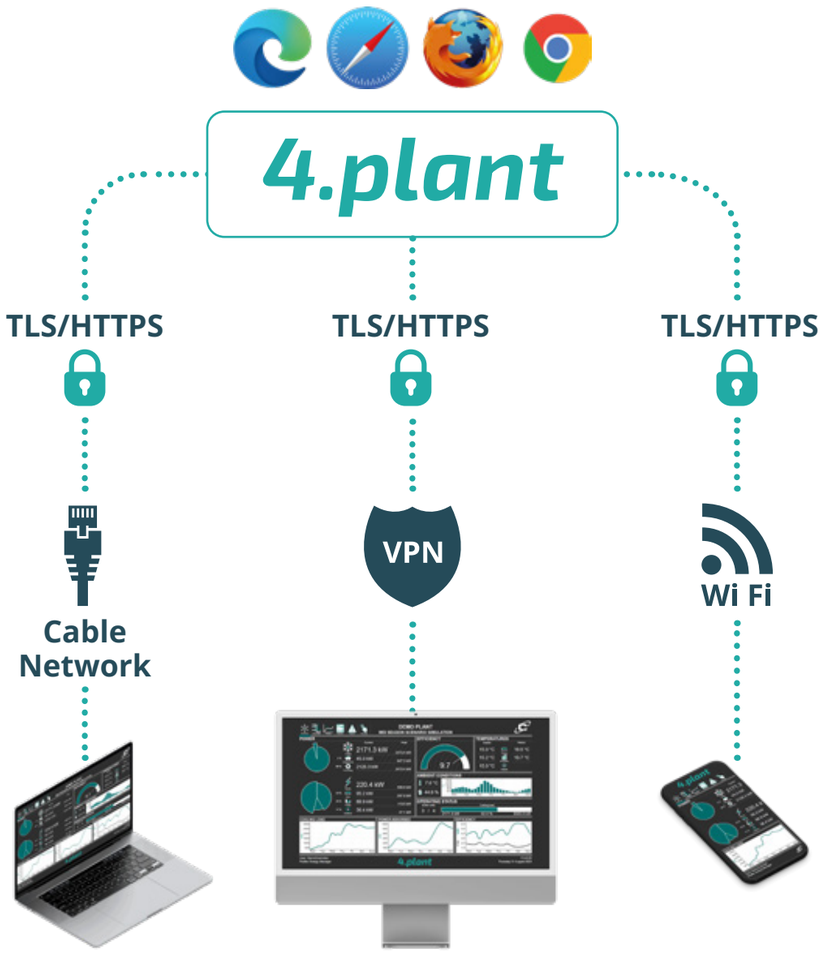


As a guarantee that no event can go unnoticed, the escalation function includes specific actions until the alarm is acknowledged.
This automation ensures **careful management of anomalies,** contributing to the **reliability of the service**.

Data Sharing

Connectivity

Accessibility to the system is available locally, through wireless connection or LAN network, and remotely, through VPN or public IP.

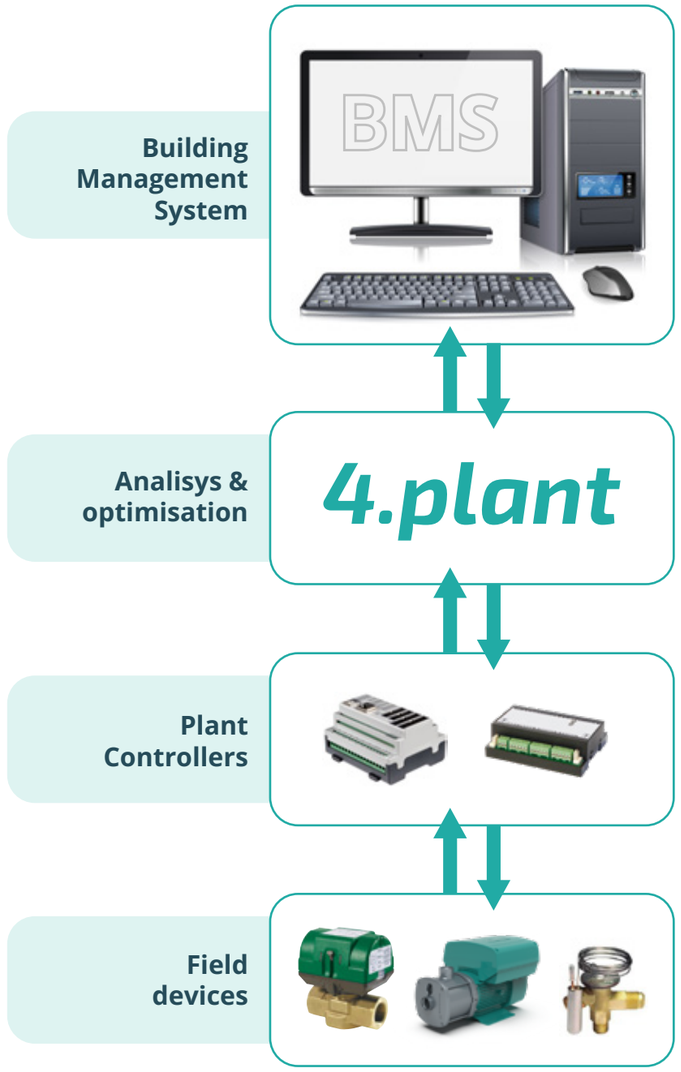


The visualization, regardless of the connection mode used, is available on PC, tablets, and smartphones without the installation of any software components. All connections use the latest cybersecurity protocols, leveraging sophisticated encryption algorithms (TLS-HTTPS) **to ensure the highest levels of data protection.**

Integration

4.plant can operate stand-alone or interface with BMS both bi-directionally through the main standard communication protocols (Modbus, Bacnet, SNMP), as well as via serial network or TCP-IP network.

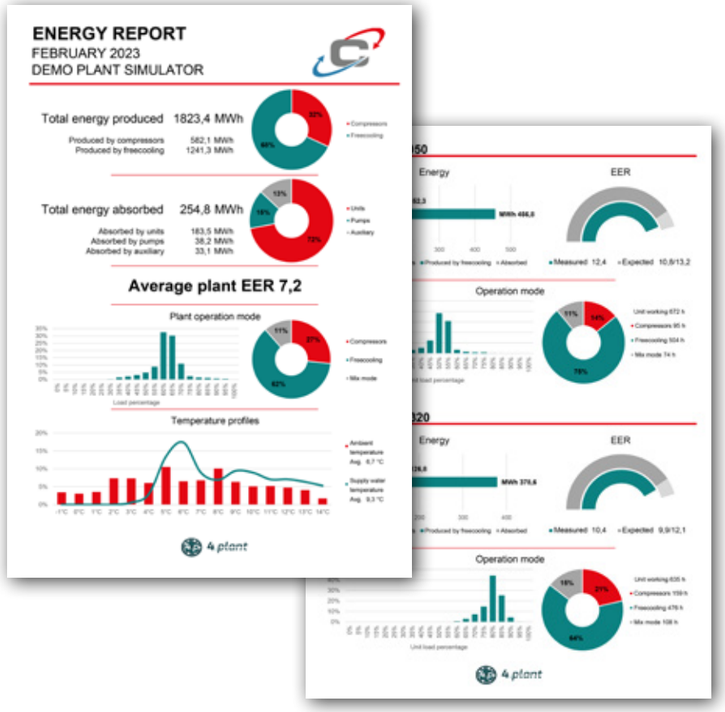
All the datapoints that *4.plant* manages are made accessible to the BMS for easy monitoring and control of the component's status.



When ***4.plant*** operates stand-alone, it uses its own control strategies to autonomously command the devices directly connected to it, without interfering with the regulation and safety logics of the controlled units.
In case it is interfaced with the BMS, it shares its control logics with it, leveraging the already wired infrastructure to propagate the appropriate commands to the field. This results in **minimal installation effort**.

Reporting

This function allows for **comparing the theoretical analysis** done during the design phase with the actual post-installation results. Additionally, it enables the **development of further energy optimization strategies** based on real-time information about the usage of the systems.



Programmed generation of energy reports that provide the key data of the units and the entire system, allowing for an immediate understanding of the actual performance and usage condition of the system.

Detailed indication of energy totals divided for each unit

Pre-configured graphs to evaluate the produced thermal loads and the absorbed electrical powers

Clear breakdowns based on unit utilization indexes

If the result of the report highlights inefficiencies, algorithms aimed at correcting anomalies are studied and adapted. The effectiveness of this approach will then be monitored in the subsequent period of activity to acquire adequate information that will form the **knowledge base for a continuous improvement process based on real data**, rather than just preventive assessments.

Monitoring

The graphical interface makes all key information easily accessible, such as operating states, control variables, and critical alarms, in order to meet the needs of both expert users, such as maintenance personnel or energy managers who need to easily find all the detailed information they require, as well as less experienced users who still want to easily visualize the system status.

Through appropriate levels of access, it also allows for the modification of parameters and, if necessary, manual command override.

Furthermore ***4.plant*** system offers the possibility **to remotely manage all connected devices, providing significant advantages in terms of time and cost savings.**

A dedicated page for the consultation of preconfigured and customizable graphs allows for the visualization of the trend over time of the main operational variables, **enabling precise analysis of the operating history of the system**.

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