Modern and sustainable HVAC strategies

IOT and advanced automation solutions for smart HVAC control systems

se.com/HVAC

EcoStruxure™
Innovation At Every Level

Life Is On | Schneider Electric

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Trends reshaping the HVAC industry

Effects of COVID-19 on HVAC Companies

The coronavirus pandemic has had a significant impact on the HVAC market, demonstrating that more than ever, HVAC systems perform a crucial role in keeping essential services like hospitals, schools, supermarkets and public buildings in general. Ensuring an adequate ventilation rate has never been so essential to reducing the risk of infection in confined spaces.

REHVA, the Federation of European Heating, Ventilation and Air Conditioning associations and ASHRAE, the American Society of Heating, Refrigerating and Air-Conditioning Engineers have provided guidance on the operation and use of building HVAC systems to prevent the spread of COVID-19 related. Recommendations include:

• Increasing fresh air supply (from outside to inside) and limiting air recirculation

• Forcing the exhaust ventilation systems of certain areas (from inside to outside) to reduce concentration of pathogens

• Optimizing humidity to limit the development of viruses

This sanitary crisis revealed that many HVAC installations cannot guarantee optimal comfort for building occupants. It is expected that many HVAC installations will be retrofitted with AHU and heat recovery systems to ensure fresh air supply and energy efficiency.

Trends reshaping the HVAC industry

Benefits of smart technologies and IIoT on HVAC control systems

Designing smart HVAC control systems

Improving compliance with new codes and standards

Smart HVAC systems for smart buildings

Partnerships of the future

Trends that are reshaping the future of HVAC systems

Beyond the pandemic, climate change remains a hot topic around the world. As HVAC systems represent a large part of a building's energy consumption, it's imperative to set up sustainable strategies that help reduce heating and cooling energy use and reduce greenhouse gas emissions.

Smart and environmentally-friendly technological advancements can strongly help the HVAC industry to solve the equation: balancing costs and enhanced comfort while producing lowest emission output possible.

Trends impacting HVAC systems

Climate and regulation

- Directives and regulations that impact HVAC products: F-gas, EcoDesign, Energy Labeling Directives
- Legislation that drives energy efficiency classification
- A2L refrigerants in HVACR
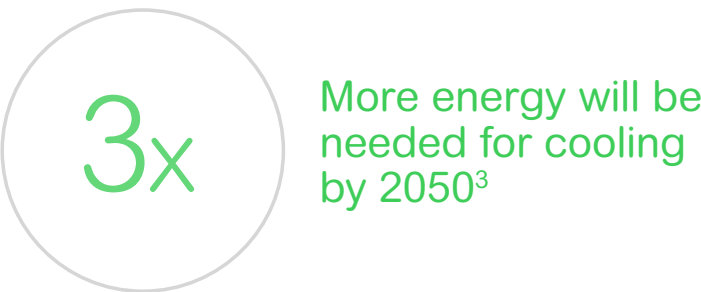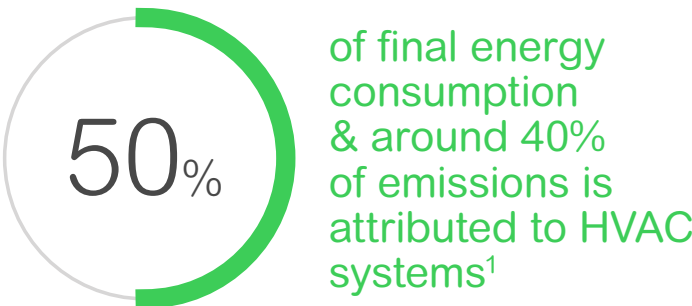- IEC/UL 60-335 Refrigerant Detector Requirements

Urbanization

- Growing demand for cooling in a warming climate and impact on electricity demand

- Growing construction sector
- Government initiatives to refresh or replace old HVAC systems

Digitalization

- Smart HVAC control systems with IoT and advanced automation
- Mobile devices with remote access
- Data services
- Energy management
- Predictive maintenance and analytics

50% of final energy consumption & around 40% of emissions is attributed to HVAC systems[1]

3x More energy will be needed for cooling by 2050[3]

40% improvement in energy efficiency and reduction in greenhouse gas emissions by 2030[4]

Sources:
(2) European Commission - Towards a smart, efficient and sustainable heating and cooling sector (2016)
(3) OECD/IEA - The future of cooling (2018)
(4) European Commssion - 2030 climate & energy framework

Tap into the technology and strengthen your sustainability efforts

Technologies such as Internet of Things (IoT), automated control systems, and remote control access are transforming HVAC equipment. IoT-enabled HVAC system can increase comfort, lower energy consumption, and reduce costs while ensuring compliance with regulations.

What is a Smart HVAC System and benefits?

Compared to a traditional system, a smart HVAC system uses real-time data to improve HVAC system or equipment efficiencies through better connectivity, analytics access, remote control, advanced monitoring, and predictive maintenance tools.

- Achieve optimum HVAC systems efficiencies through IoT and automated control systems for automatic temperature control, fan speed and reducing HVAC system operating hours (nighttime, unoccupied periods)

- Provide a more comfortable atmosphere (air temperature, humidity levels)

- More easily comply with regulations thanks to monitoring and analytics capabilities

- Reduced total cost of ownership and increased maintenance services' efficiency thanks to embedded predictive maintenance tools

- Track usage, waste, breakdown and suggest improvements with access analytics

- Remote control access via mobile devices and wireless systems

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Tap into the technology and strengthen your sustainability efforts

Connected HVAC systems: achieve environmental and business Sustainability!

- Reduced downtime with built-in diagnostics

- Extended HVAC equipment life and fewer on repair costs

- Optimized resource input and reduced waste by avoiding oversizing

- Reduced travel costs through remote maintenance

- Planned maintenance for cost-effective intervention and continuous operation

- Easy integration of HVAC machines into a smart building ecosystem

- Sustainable brand reputation with green HVAC machines

- Remote control access via mobile devices and wireless systems

3x IoT

IoT connections 2018–2025

(*GSMA)

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IoT and advanced controls make your HVAC equipment smarter, more efficient, and sustainable

(1) Improving data management

The analytical software needed to deliver the potential of the IIoT is already in place to help process the deluge of HVAC/R operating data that could be flowing in. Increasingly, this takes place in the cloud, using advanced storage and compression technologies.

Today's systems can collect and archive:

Continuously streaming time-series data from critical control, monitoring, and smart devices

Data for analysis and reporting on asset operations, health, maintenance, and regulatory compliance

The IIoT enables the real-time collection of data on the HVAC/R system operation, which can extend the lifespan of any asset and reduce capital expenses. Improved operating data also helps capture the knowledge of experienced workers, which flattens the learning curve for new hires and helps minimize unplanned downtime.

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(2) **Improving maintenance**

Increasing digitization will impact HVAC/R system maintenance at all levels: reactive, preventive, predictive, and prescriptive.

Reactive maintenance Things are not fixed until they break – probably the most widely used strategy	The IIoT can improve reactive maintenance by enabling a more efficient, more informed response. Instead of traveling to a remote site when an alarm goes off, maintenance engineers or technicians can see documentation, review codes and connect to the PLC – all with a click. They could then engage local maintenance personnel to address the issues.
Preventive maintenance Performed on a given schedule to reduce the likelihood of failure	Smart machines powered by the IIoT can help ensure that routine service schedules and protocols are carried out correctly and on time.
Predictive maintenance Based on the assumption that assets deteriorate at predictable rates based on age and utilization	The IIoT may improve tracking, scheduling and other aspects of predictive maintenance, and promises to enable condition monitoring based on the analysis of complex variables.
Prescriptive maintenance Process data is monitored to identify trends and issue alerts prior to failure	Prescriptive (sometimes called proactive) maintenance strategies stand to gain the most from the IIoT, which delivers advanced data and analytics – increasingly in the cloud. • For simple systems, single variable math can be used to predict failure. • More complex systems involve prescriptive condition monitoring where multiple variables are analyzed to predict failure.

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③ Improving control technology

HVAC/R control technology is evolving as programmable logic controllers (PLCs) have evolved into more powerful programmable automation controllers (PACs), capable of implementing preprogrammed application libraries and open, advanced, object-oriented engineering environments.

Today's systems can collect and archive:

Advances in edge control enable flexible deployment of control systems with the power and flexibility to handle advanced analytics and the big data needed to support them.

Expanded use of Ethernet connectivity in controls is making it easier to capture and share data, then analyze it with advanced applications.

Deeper cybersecurity protection leverages the value of open standards that are essential to realizing the full potential of IIoT with less vulnerability to cyberattack.

Advanced object-oriented engineering environments are simplifying the deployment of strategic asset management models.

Asset management models themselves are evolving.

Cloud-based architecture scalable and based on open-source technology

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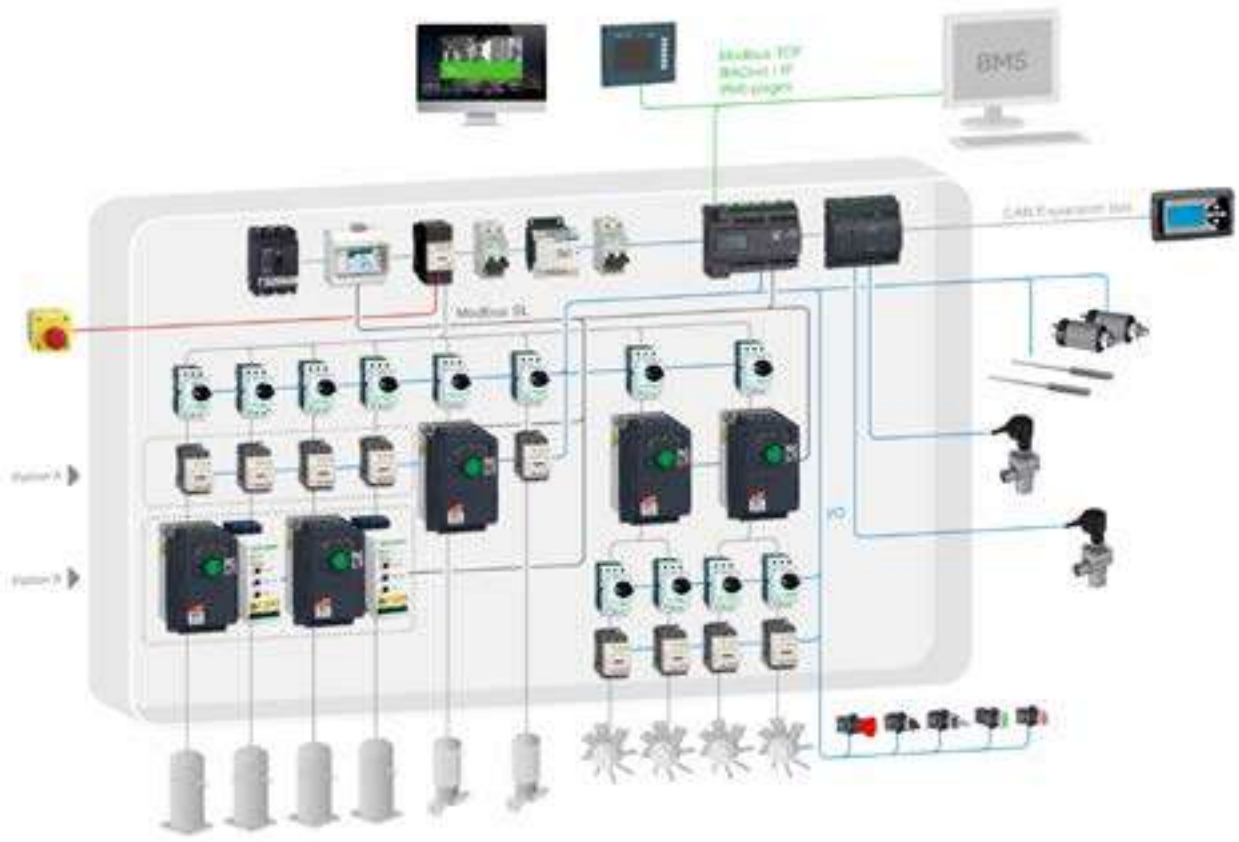Smart HVAC systems for smart buildings

Partnerships of the future

IoT and advanced controls make your HVAC equipment smarter, more efficient, and sustainable

④ **Improving energy efficiency**

HVAC/R functions can represent over 40% of energy consumption in many buildings and facilities. Improved control and management of ventilation, temperature, and system usage will reduce energy consumption and sustain it at the optimal level.

1. Measure energy use with expert auditing and energy meters to identify potential savings on the machine.

2. Fix the basics and reduce energy consumption by choosing the right devices.

1. Measure — Energy audit and measuring

Compliant with the ISO50001 standard

Passive energy efficiency | Active energy efficiency

2. Fix the basics

3. Optimize

4. Monitor, maintain, improve
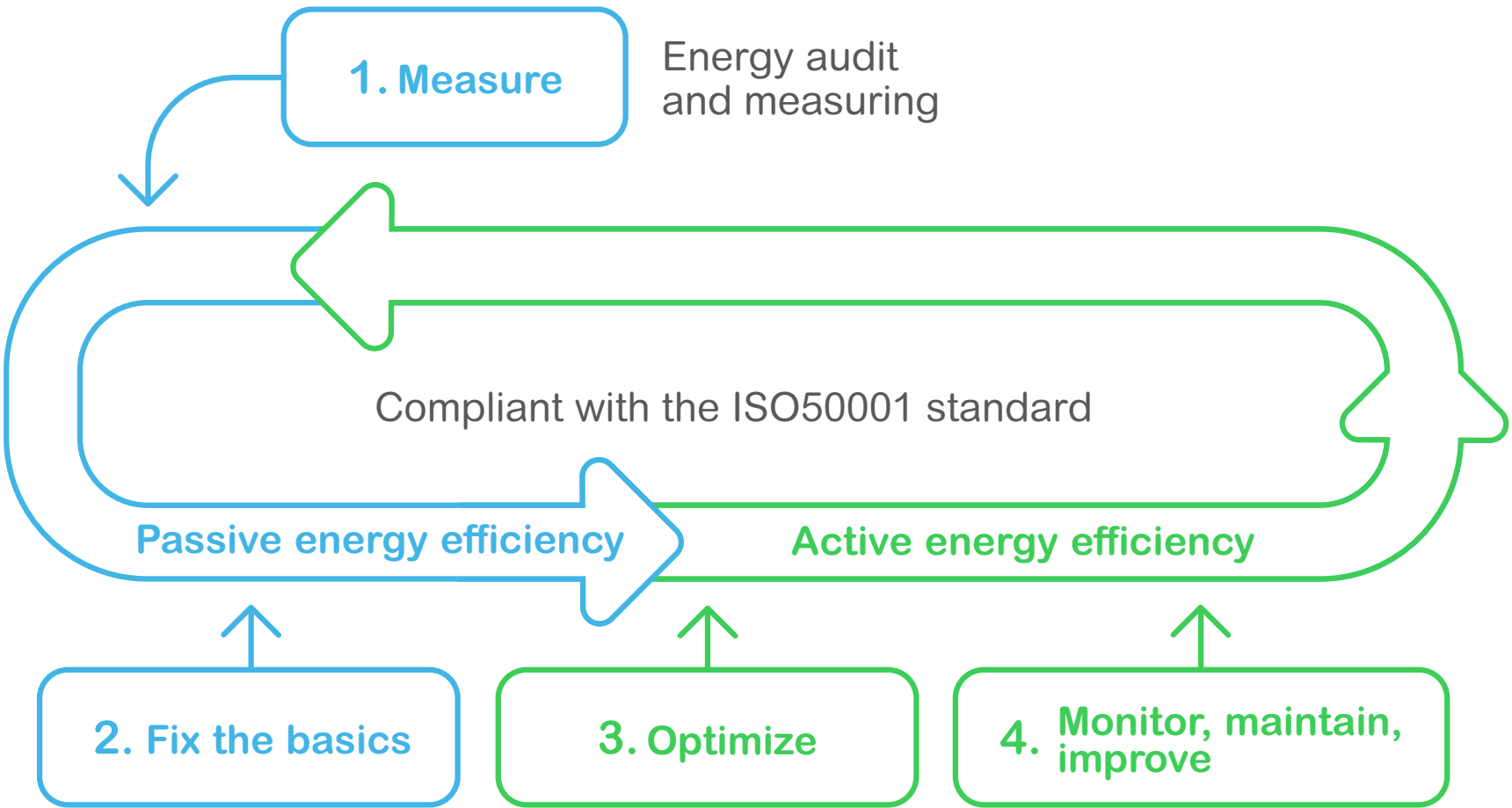
3. Optimize your machine's power consumption with energy operation modes or application function blocks designed for energy efficiency.

4. Monitor electrical energy consumption with power meters and correlate with thermal energy

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(5) **Improving diagnostic and contactless maintenance with Augmented Reality (AR)**

EcoStruxure™ augmented reality solutions **offer immediate, real-time access to relevant information** in the field, making both operation and maintenance easier. By combining contextual and local dynamic information, this custom application enables users to experience a fusion of the physical, real-life environment with virtual objects. This new solution allows users to reduce downtime, speed up operation and maintenance, and reduce human error.

The following useful data is available on demand, right on the equipment:

• Machine log

• Sensor values

• Access to manuals, electrical diagrams, and other documents

Designing smart HVAC control systems

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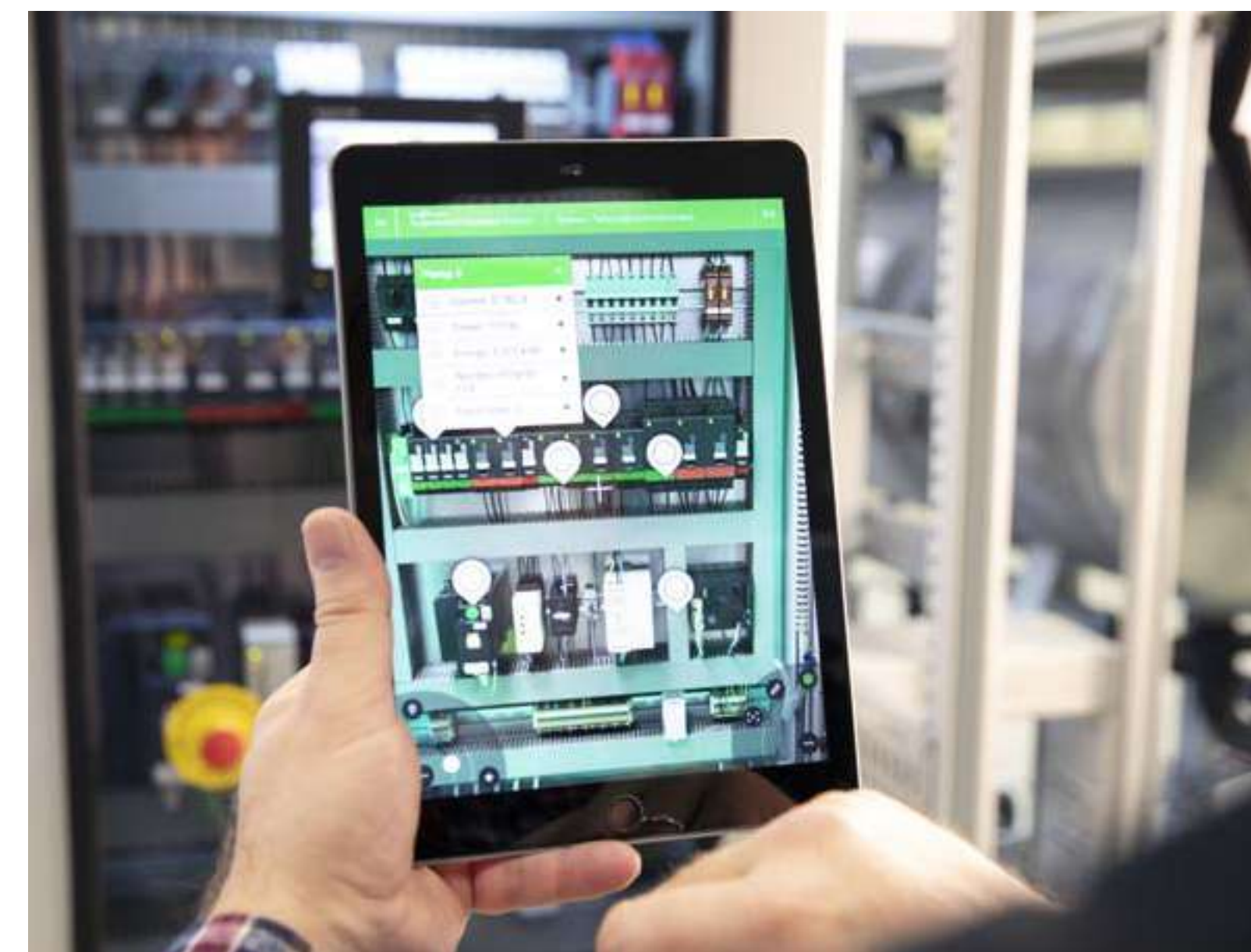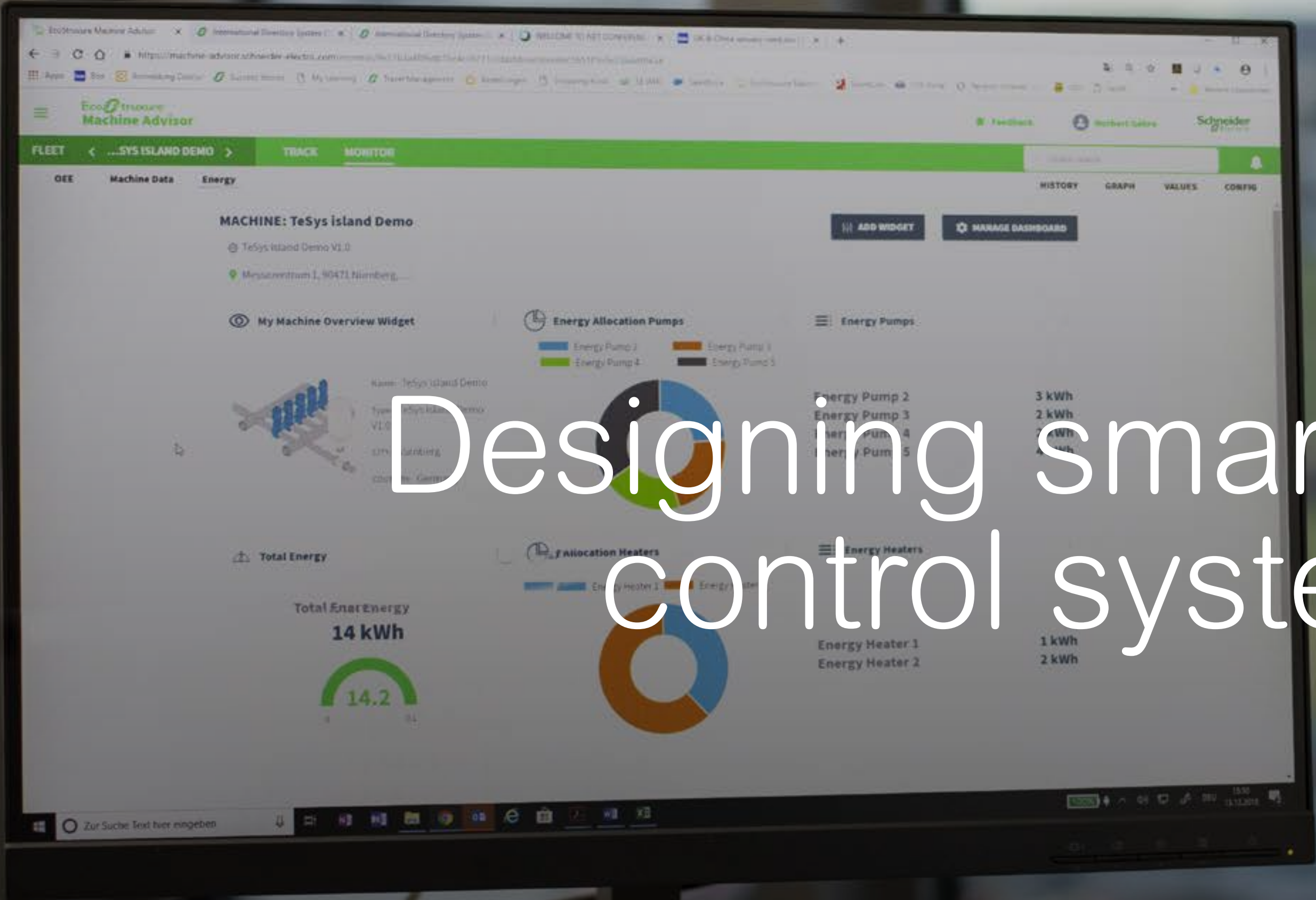
Machine builders: Quickly build your smart HVAC control system

Technologies such as Internet of Things (IoT), automated control systems, and remote control access are transforming HVAC equipment. IoT-enabled HVAC system can increase comfort, lower energy consumption, and reduce costs while ensuring compliance with regulations.

Unlock new business opportunities

Create new service-related revenue through data-driven business model (additional maintenance contract services)

Reduce time to market

- Ready-to-use applications for core applications (AHU, chillers)
- Flexible and scalable machine control specifically designed for HVAC systems

Simplify maintenance

- Added value from machine monitoring and learning apps
- Preventive maintenance
- Global services and full technical support

Improve profitability

- Easy integration to any Building Management System thanks to the controllers' embedded communication protocols (BACnet, Modbus, LonWorks)

Improve comfort and efficiency

- Compliant HVAC machine design
- Optimal air renewal
- Efficient temperature and humidity control
- Integrated air quality control to maintain adapted pressure and proper airflow

Improve — Design — Build — Operate

Hardware — Software — Added-value services

Your machine

Our solution for Smart HVAC Control systems

EcoStruxure™ Machine, our open, interoperable, IoT-enabled system architecture, helps OEMs quickly build smarter cost-optimized HVAC control systems with onboard energy-efficiency solutions while reducing maintenance and improving reliability. EcoStruxure Machine encompasses key technologies for product connectivity and edge control on premises, using cloud technologies to provide analytics and digital services.

EcoStruxure™ Machine

EcoStruxure™ Architecture

HVAC

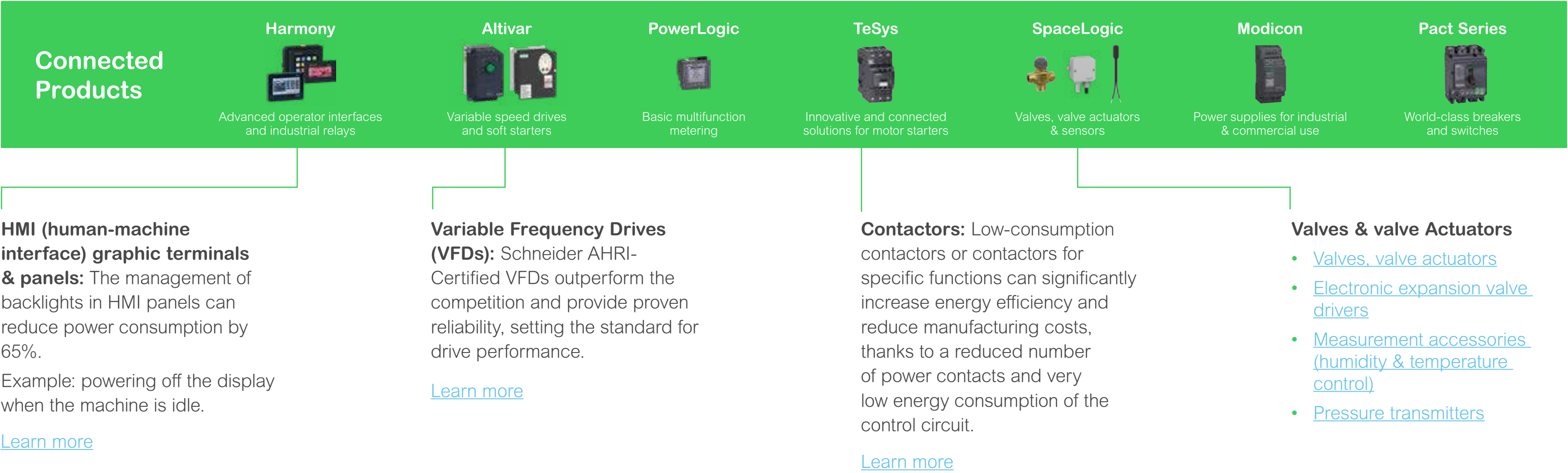|	
Apps, Analytics & Services	EcoStruxure Machine Advisor · EcoStruxure Secure Connect Advisor · EcoStruxure Augmented Operator Advisor · **Field Services**
Edge Control	ModiconM171/172 Industrial Edge Control for IIoT · EcoStruxure Machine Expert
Connected Products	Harmony · Altivar · PowerLogic · TeSys · SpaceLogic · Modicon · Pact Series

End-to-end Cybersecurity

Cloud and/or On-Premise

Harmony — Advanced operator interfaces and industrial relays
Altivar — Variable speed drives and soft starters
PowerLogic — Basic multifunction metering
TeSys — Innovative and connected solutions for motor starters
SpaceLogic — Valves, valve actuators & sensors
Modicon — Power supplies for industrial & commercial use
Pact Series — World-class breakers and switches

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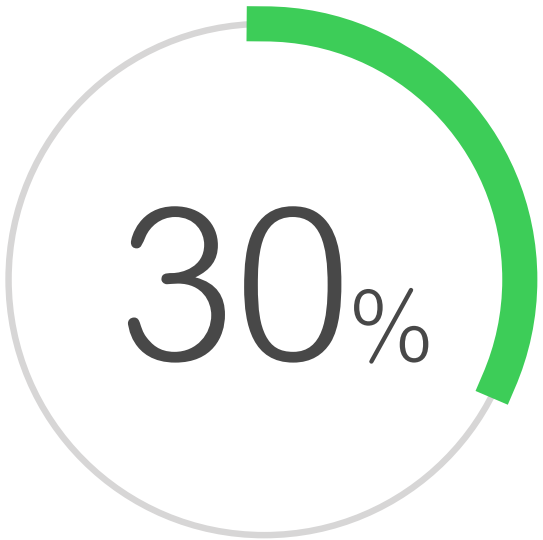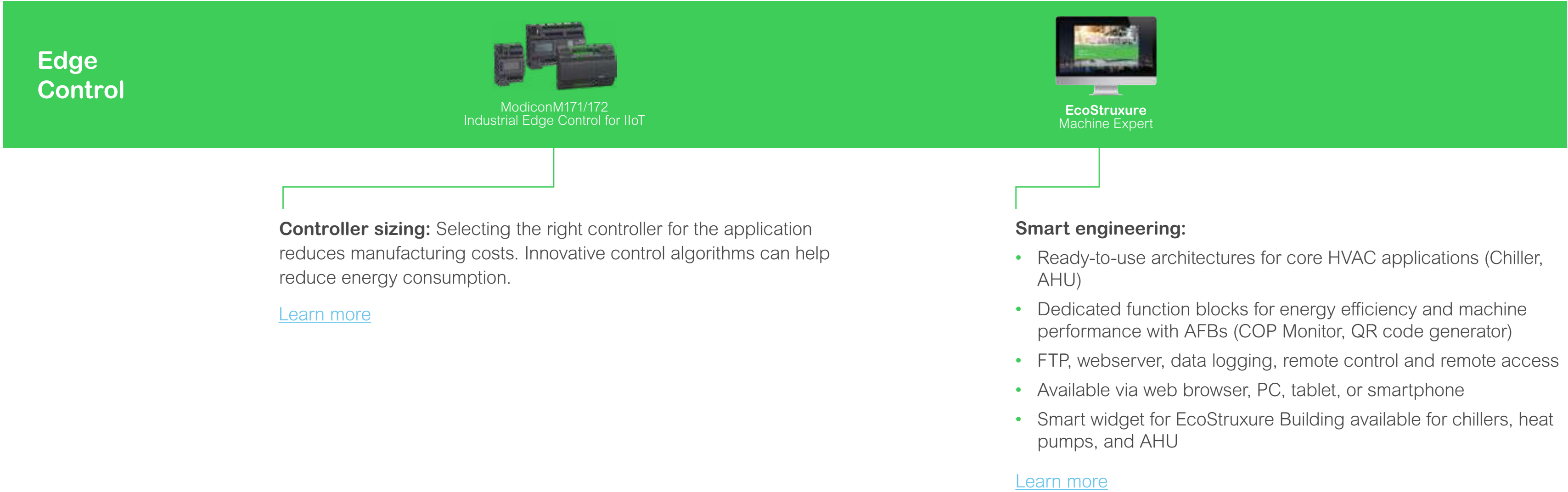Partnerships of the future

EcoStruxure Machine - HVAC

1 IoT starts with the best things. Our IoT-enabled best-in-class connected products, from variable speed drives to power monitoring, enable improved energy efficiency in your HVAC systems.

Connected Products

Harmony	Altivar	PowerLogic	TeSys	SpaceLogic	Modicon	Pact Series
Advanced operator interfaces and industrial relays	Variable speed drives and soft starters	Basic multifunction metering	Innovative and connected solutions for motor starters	Valves, valve actuators & sensors	Power supplies for industrial & commercial use	World-class breakers and switches

HMI (human-machine interface) graphic terminals & panels: The management of backlights in HMI panels can reduce power consumption by 65%.

Example: powering off the display when the machine is idle.

Learn more

Variable Frequency Drives (VFDs): Schneider AHRI-Certified VFDs outperform the competition and provide proven reliability, setting the standard for drive performance.

Learn more

Contactors: Low-consumption contactors or contactors for specific functions can significantly increase energy efficiency and reduce manufacturing costs, thanks to a reduced number of power contacts and very low energy consumption of the control circuit.

Learn more

Valves & valve Actuators
- Valves, valve actuators
- Electronic expansion valve drivers
- Measurement accessories (humidity & temperature control)
- Pressure transmitters

Did you know?

Replacing conventional PID (proportional-integral-derivative) control systems with new energy-efficient predictive control loop systems can bring more than 20% in added energy efficiency, as well as extend the useful life of the equipment.

up to
50%
of energy saved in applications that use pumps or fans with a VFD

EcoStruxure Machine - HVAC

2 Edge control provides real-time solutions that enable local control at the edge, protecting safety and uptime.

**30%**

reduced time-to-market through smart design and engineering

Edge Control

ModiconM171/172
Industrial Edge Control for IIoT

EcoStruxure
Machine Expert

Controller sizing: Selecting the right controller for the application reduces manufacturing costs. Innovative control algorithms can help reduce energy consumption.

Learn more

Smart engineering:

• Ready-to-use architectures for core HVAC applications (Chiller, AHU)

• Dedicated function blocks for energy efficiency and machine performance with AFBs (COP Monitor, QR code generator)

• FTP, webserver, data logging, remote control and remote access

• Available via web browser, PC, tablet, or smartphone

• Smart widget for EcoStruxure Building available for chillers, heat pumps, and AHU

Learn more

EcoStruxure Machine - HVAC

3 Seamless integration of machines to the IT layer allows the collection and aggregation of data that's readyfor analysis. For machine builders and end users alike, this means increased accessibility to information that can lead to faster, efficient operations and greater maintenance uptime.
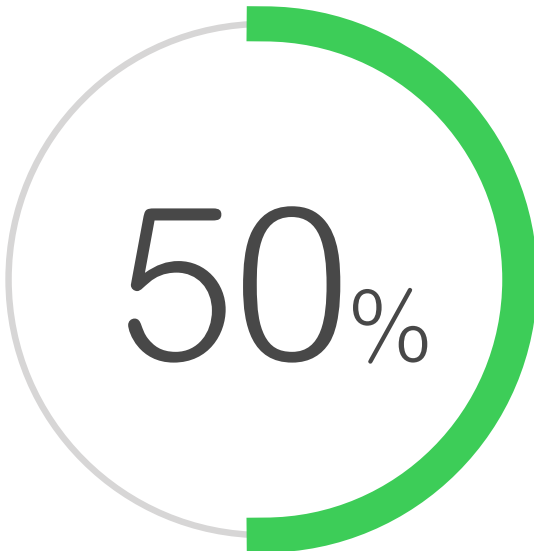
50%
time savings for corrective actions through smart maintenance and services

Apps, Analytics & Services

EcoStruxure
Machine Advisor

EcoStruxure
Secure Connect Advisor

EcoStruxure
Augmented Operator Advisor

EcoStruxure Machine Advisor for increasing operation efficiency:
EcoStruxure Machine Advisor is a digital cloud-based services platform

- Enables machine builders to provide new services to machine operators for each installed machine in any production site worldwide.
- Includes digital service with fleet management capabilities that make it possible to track, monitor and fix machines in the field while reducing support costs by 20 to 50%.

Learn more

EcoStruxure Secure Connect Advisor for unlocking new service model revenue streams:
Provides the ability to remotely access machines to extend OEM services — like online troubleshooting, firmware updates, and diagnostics analysis — all of which enrich engagement with the end user´s staff.

Learn more

EcoStruxure Augmented Operator Advisor for developing remote service efficiency:

- Superimposes real-time data and virtual objects on reality
- Helps avoid unnecessary and costly machine downtime by enabling the opening of the electrical cabinet doors virtually.
- Speeds up maintenance by finding information faster through providing immediate, relevant access in the field (user manuals, instructions, diagrams)

Learn more

Cybersecurity for smart HVAC systems

IoT-enabled HVAC systems are exposed to other devices and networks, which potentially increases the risk of cyberattacks and data privacy breaches. HVAC machine builders need to implement mechanisms and cybersecurity best practices to ensure data protection, prohibit unauthorized access, and comply with the evolving regulations.

Compliance to IEC 62443 standard for cybersecure control system components

A secure IIoT architecture starts with design, is refined through the development, and evolves during the whole lifetime of the product:

• Authentication

• Authorization

• Encryption

• Violations logging and notification

Our cybersecurity solutions

• Secure Development Lifecycle (SDL) process
• A framework for secure product design
• Allows the controller to connect to secured networks

VPN

• Enables secure connection to the cloud
• Alternative to more complex and expensive gateway

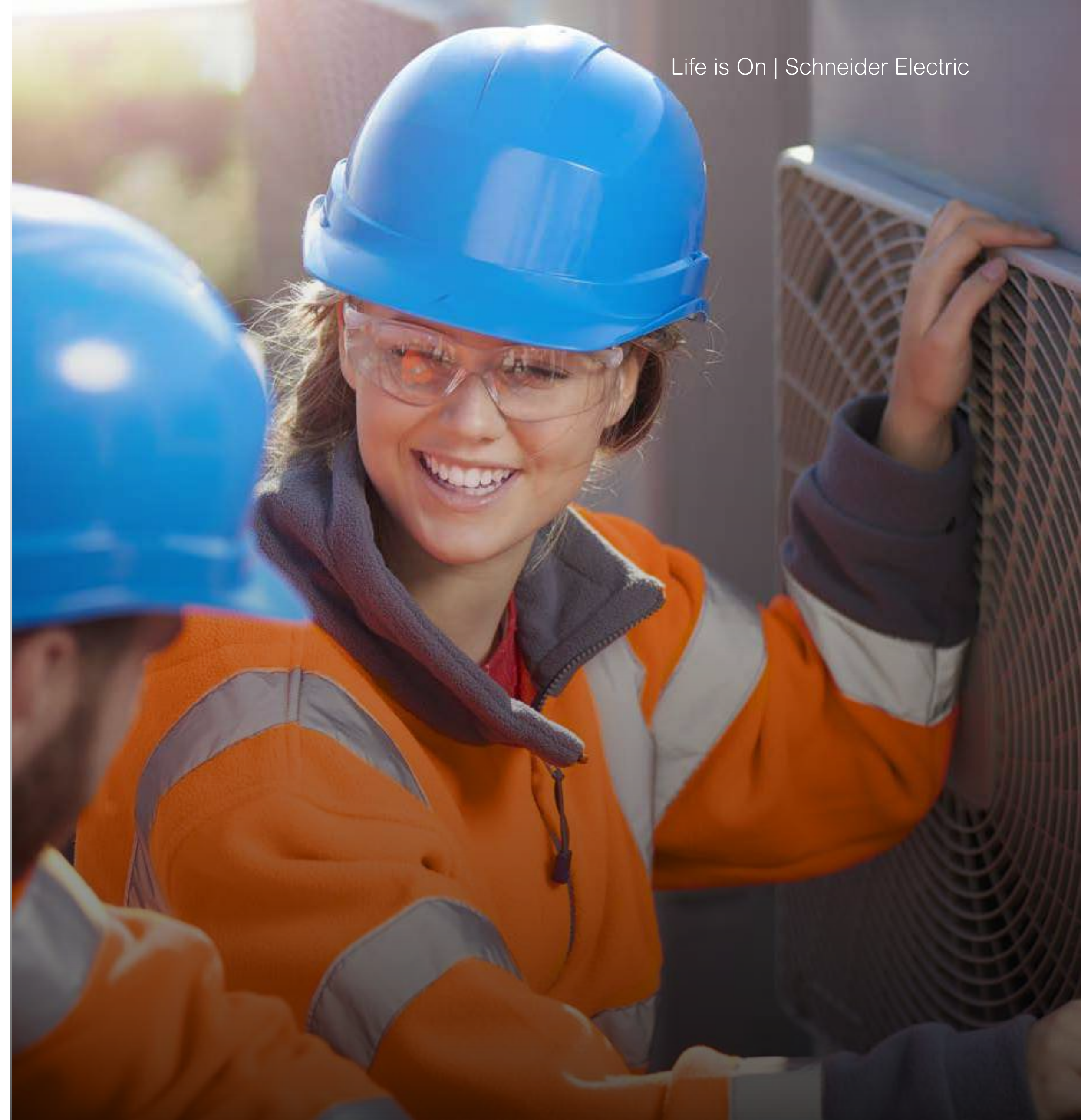Learn more

Solution architecture experts support

- Schneider Electric's solution architecture experts provide worldwide support for your HVAC machines, from design to maintenance

- With our expertise, you can engineer customized architectures tailored to specific environments and applications even more easily

- Comprehensive training provides advanced know-how and helps broaden employees' technical expertise

- Collaboration — from design to programming — and the commissioning of turnkey installations

- On-site assistance, a 24/7 hotline, and replacement parts centers around the world

Trends reshaping the HVAC industry

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Designing smart HVAC control systems

Improving compliance with new codes and standards

Smart HVAC systems for smart buildings

Partnerships of the future

Improving compliance with new codes & standards

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Improving compliance with new codes & standards

Working with the right solutions provider can help you be aware of – and ready to meet – new codes and standards impacting the HVAC/R industry. One primary example is California Prop 39, Title 24 – the first state industry efficiency regulation, expected to expand to other states or become national in the future.

Schneider Electric offers products that allow you to be dynamic, with easy programming to facilitate quick updates and versatile hardware for use in an array of machines (or in the same machine as it evolves to meet these challenges). We also offer engineering expertise to support you and help you stay competitive as you update your product designs and production facilities in response to changing environments.

For example, incorporating the Schneider Electric Modicon M172 controller could enable your machine to meet the energy-efficiency regulations under California Prop 39, Title 24.

Smart HVAC/R solutions provide the flexibility to help you comply with evolving applicable regulatory requirements, and working with the right manufacturer can make it simple to bring machines up to code easily.

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A closer look at California Prop 39, Title 24

The HVAC/R requirements of California Prop 39, Title 24 are intended to lower operating costs for building owners, as well as to improve occupant comfort and indoor air quality. Below is a high-level summary of some of the mandatory requirements related to condenser fan control and compressor systems.

- Condenser fans for new air-cooled or evaporative condensers, or fans on air- or water-cooled fluid coolers or cooling towers, must be continuously variable speed. To minimize overall system energy consumption, the condensing temperature control setpoint must be continuously reset in response to ambient temperatures, rather than using a fixed setpoint value.

- The SCT (saturated condensing temperature) control setpoint for evaporative condensers or water-cooled condensers must be reset according to ambient wet bulb temperature, and the SCT control setpoint for air-cooled condensers must be reset according to ambient dry bulb temperature.

- The control temperature difference over a period of time should be optimized such that the fan speed is in a range of approximately 60-80% during normal operation.

- Split air-cooled condensers are sometimes used for separate refrigeration systems, with two circuits and two rows of condenser fans. Each condenser half is to be controlled as a separate condenser.

- Compressors and multiple-compressor suction groups must have floating suction pressure control to reset the saturated suction pressure control setpoint based on the temperature requirements of the attached refrigeration display cases or walk-ins.

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Smart HVAC systems for smart buildings

Easy integration into BMS architectures

From HVAC & R machines to global building management systems, Schneider Electric provides a single, fully coherent system.

Your customers demand comprehensive solutions that include enterprise-wide management of power, IT, HVAC, and security and a level of efficiency that includes system dynamics across segments, platforms, and providers. That's why EcoStruxure Machine architectures can be easily integrated.

Compliance with open BMS standards:
- BACnet/IP, BACnet MS/TP (B-AAC profile), Modbus TCP, Modbus RTU, and LonWorks
- BACnet/IP & Modbus TCP Ethernet modules offering easy maintenance through embedded data logging, text e-mail, and web servers

Maintenance and monitoring efficiency:
- Provided on Ethernet modules, offering embedded data logging, e-mail notification, and web server capabilities
- Late-point configuration with Modicon M171/M172 interchangeable communication plug-in
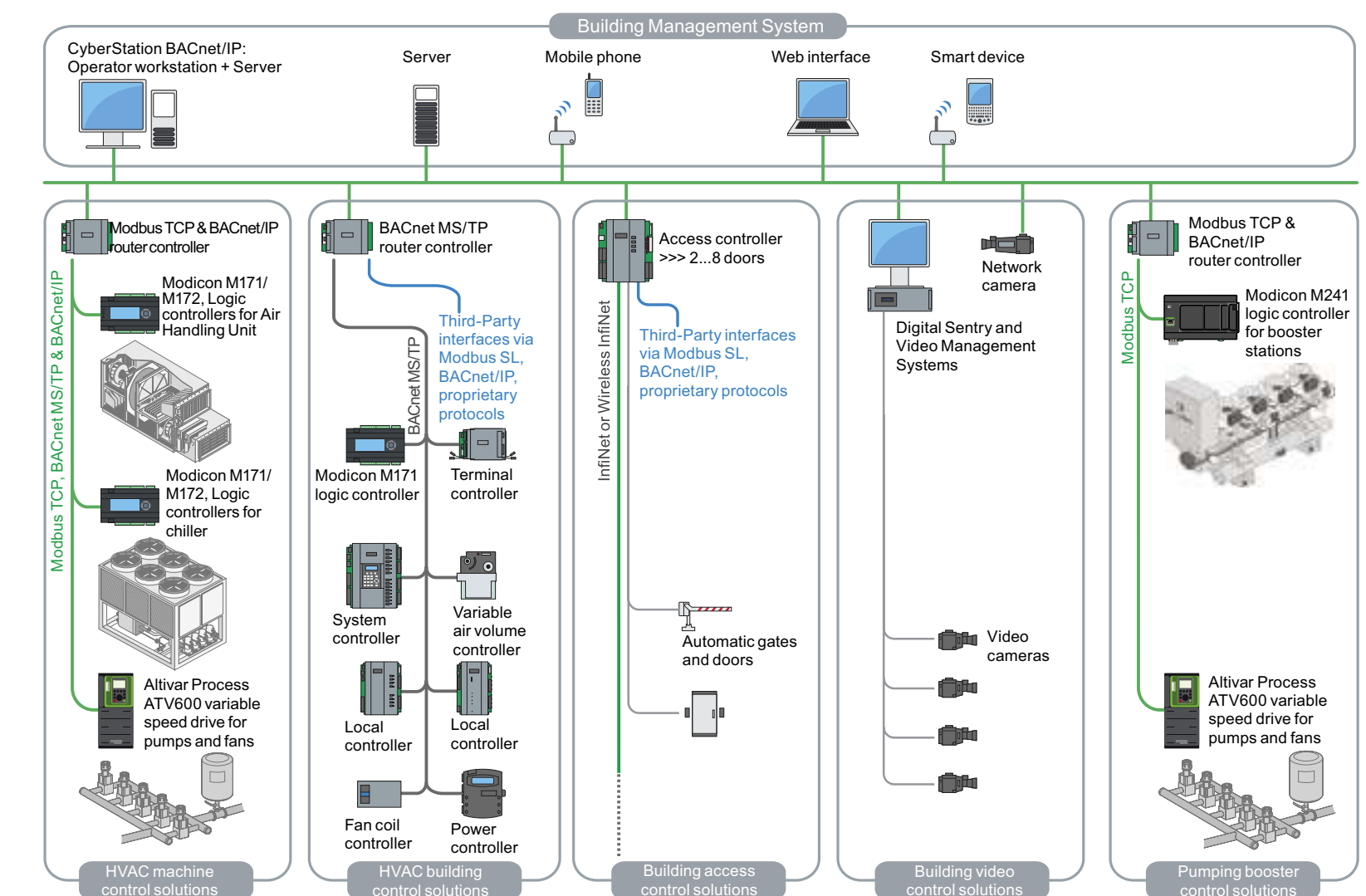
Building the future — together

Buildings consume about 30% of the world's energy according to the IEA, and account for almost 40% of annual global greenhouse gas emissions. To be sustainable, buildings – both new and retrofit – need to change. This can be achieved through a close collaboration between energy management and automation providers, OEMs, building owners, property managers, and end users.

At Schneider Electric, we believe that an all-digital, all-electric world can drive an entirely new level of efficiency and sustainability for buildings.

Enable smart buildings with EcoStruxure Building

Commercial and industrial buildings and facilities can be built or renovated to be safer, smarter, and more sustainable in order to better meet the needs of their occupants and increase their value.

Learn more

Buildings of the future

Capture the power of an all-digital, all-electric infrastructure for a more sustainable, resilient, efficient, and people-oriented building

Get ready!

4 ways
that connected hotel technology improves HVAC

Learn more

Top predictions
for smart building technology

Read the blog

How HVAC and IAQ
optimization supports healthy buildings in the long term

Explore more

Partnerships of the Future

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Let's grow together

Join our OEM/Machine Builders Partner Portal today

From design to commissioning to maintenance, our worldwide network of training programs, solution design centers, distribution, and aftersales services are ready to help.

- Get direct access to exclusive resources, technical support, and other useful tools to help grow your business

- Learn about the latest trends, read technical guides, watch videos, and more

- Find the right products with catalogs, selectors, and configurators

- Manage your orders (draft and submitted), quotes, and financial information

- Access your training program and track your progress

- Participate in partner programs designed to drive your business growth

- Engage in opportunities to increase your revenue

- Reap the benefits of rewards and loyalty programs
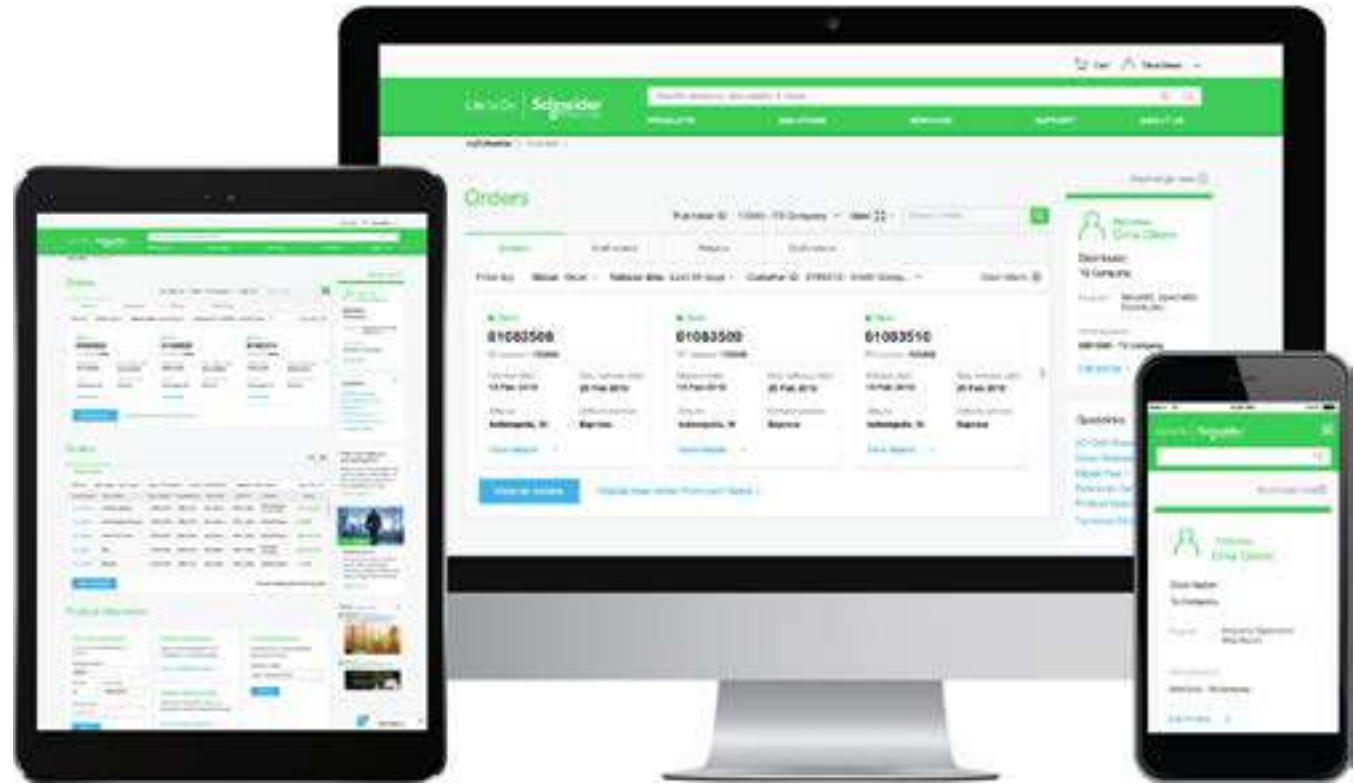
Register today

Let's grow together

Helping you navigate the new digital world

Exchange is a digital business platform that can help the business of Original Equipment Manufacturers (OEM) as follows:

- Forums for discussions with customers, experts & peers

- Provide complementary digital offers, free trials, and resources from Schneider Electric and Technology partners for your business

- Reach new market opportunities by connecting with End-Users and service providers such as System Integrators, Panel Builders, Contractors, and Specifiers

Join now

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Green Premium ecolabel

The Green Premium ecolabel was created to provide Schneider Electric customers with smarter products and be transparent with environmental and regulatory information. It signifies Schneider Electric's efforts to reduce energy and carbon footprints, optimize the total cost of ownership of our technologies through IoT and circular services, and helps to protect people from chemical substance risks.

. . . a driver of sustainable business performance.

Learn more

Green Premium™
Sustainable performance, by design

Today, more than 75% of Schneider's product sales come from Green Premium solutions, which offer superior transparency and environmental stewardship.

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Transstherm Cooling Industries

Pioneering the technological advancement of commercial heat exchangers, refrigerant, and water-cooling systems since 1989. Its dry-air-blast cooler and adiabatic cooler machinery is available all over the world, and serves customers in both the commercial and industrial sectors.

Designed for customers who need:
A remote maintenance solution for their adiabatic chiller using a 4G connection

Benefits:
• Remote monitoring
• Machine feedback and data analysis
• Reduced site visits
• Longer life for machine fans
• Greater savings and reduced carbon footprint

EcoStruxure™ Machine - HVAC

Apps, Analytics & Services	EcoStruxure Machine Advisor
Edge Control	ModiconM171/172 Industrial Edge Control for IIoT EcoStruxure Machine Expert
Connected Products	Altivar 212 HVAC Variable Speed Drives

Watch the video

Oxford Energy Solutions Inc.

Oxford Energy Solutions Inc./Oxford Refrigeration Inc. is a privately owned and operated company that develops and promotes Canadian-designed and built refrigeration systems for the agricultural, food processing, and healthcare sectors.

Designed for customers who need:
A competitive, digital remote maintenance solution for their Chiller Unit

Benefits:
• Customized applications for better efficiency
• Remote maintenance

EcoStruxure™ Machine - HVAC

Apps, Analytics & Services	EcoStruxure Secure Connect
Edge Control	ModiconM171/172 Industrial Edge Control for IIoT — EcoStruxure Machine Expert — EcoStruxure Machine SCADA Expert
Connected Products	Pressure sensors XML

Learn more

Life Is On | **Schneider Electric**

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Schneider Electric visit

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