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#### How Connectivity Enhances Machine Builder Digitalization-Driven Business Growth

The World Economic Forum predicts that the number of connected devices will grow from 22.9 billion to 50.1 billion by 2020. *Business Insider* estimates that the Internet of Things (a subset of which is IIoT) alone will add \$1.7 trillion in value to the global economy by 2019. For modern machine builders, these changes indicate evolving customer needs and the advent of new data-driven, digital business models.

Innovative software products such as Schneider Electric's <u>EcoStruxure Augmented Operator Advisor</u> now open the door to new machine builder service-oriented offerings that leverage the cloud to provide end user customers with superior machine maintenance support. The combination of better access to data, inexpensive smart phone and tablet interfaces, cloud connectivity and well-designed software tools can help machine builders reduce the time for corrective actions by up to 50%. Thus, machine builders, in order to remain competitive, will need to embrace this high connectivity environment and roll out new ways to enhance customer support and drive internal business growth. This enhanced connectivity is what

will enable machine builders to build deeper and more prosperous end user relationships.

In fact, for many machine builder businesses, there is little choice. The marketplace need for "smart" machines has rendered the traditional machine design process inefficient and design time and costs have increased as a result. For the end users that machine builders support, maintenance costs are too high and machine downtime needs to be reduced. Ironically, in the newly digitized and connected world these problems represent opportunities for machine builders in the form of new sources of revenue.

The new, data-driven business model enables machine builders to benefit from faster time to market, and from safe, more innovative, better connected, more flexible, and more efficient industrial machines. This new business model is defined by some of the following elements:

 A focus on cloud-based services – Schneider Electric's <u>EcoStruxure Machine Advisor</u> tool





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enables sophisticated services to help track machines in operation worldwide, remotely monitor performance data and apply fixes to exceptional events. Augmented reality tools like <u>EcoStruxure</u> <u>Augmented Operator Advisor</u> allow local on-site end user technicians to be remotely guided by machine builder experts. This advanced human-to-machineto-plant interconnectivity, if properly deployed, now allows both machine builders and their industrial end users to significantly enhance their marketplace competitiveness. Each are part of a greater <u>EcoStruxure Machine architecture</u> that connects the worlds of smart products, edge control, and software apps and analytics.

• An open, flexible architecture – The connected products, software and apps that are the core elements of the EcoStruxure Machine architecture enable the machine builder to manufacture better connected industrial and commercial machines through advanced digital technologies and open standards. This advanced connectivity opens the door





\*The Schneider Electric industrial software business and AVEVA have merged to trade as AVEVA Group plc, a UK listed company. The Schneider Electric and Life is On trademarks are owned by Schneider Electric and are being licensed to AVEVA by Schneider Electric. <a href="https://ecostruxure.schneider-electric.com/machine/architecture">https://ecostruxure.schneider-electric.com/machine/architecture</a>





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## How Connectivity Enhances Machine Builder Digitalization-Driven Business Growth

to enhanced customer support and digitization-driven business growth.

#### Advanced machine builder to end user

**connectivity** – Critical machine performance/behavior information will be accessible anytime and from any location on the globe. Machine builder end user support costs will be drastically reduced. Remote diagnostics will be enabled and, as a result, uptime for machines in the field will be maximized. In addition, advanced monitoring of customer machine assets will enable predictive maintenance, and other new services like asset monitoring, and asset performance and operations management that machine builders will now be able to offer to their end users.

#### The building blocks for enabling new outcomes

EcoStruxure Machine enables machine builders and their end users to enjoy faster diagnosis and resolution of problems and lower downtime of their machines. Such improvements are made possible because the new digitized hardware, software and services offerings are built upon open communication standards that allow for seamless integration. Machine builders can also connect remotely and securely to operators in the field from virtually anywhere and at any time. These types of capabilities result in higher availability, performance and quality and thereby help to ensure that Overall Equipment Effectiveness (OEE) metrics can be maximized. In addition to superior service, the advanced connectivity now opens the door to new business opportunities and revenue streams in the form of digital services that machines builders can now offer to their end users.



The benefits that accrue from implementing a new business model that leverages the strengths of the <u>EcoStruxure</u> <u>Machine</u> architecture include the following:

• Enriched product offerings – New technologies enhance machine connectivity and on-premises edge control and use cloud technologies to provide analytics and digital services.





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### How Connectivity Enhances Machine Builder Digitalization-Driven Business Growth

- New revenue streams Machine builders can now begin to realize the business benefits of the Industrial Internet of Things. The new smart (connected) products, software and apps serve as a foundation for building new machine builder services revenue streams.
- Easy integration Hardware and software from both Schneider Electric and non-Schneider Electric third parties, can now link under the open EcoStruxure Machine architecture to make integration a much easier task. Schneider Electric's intelligent PLCs (devices like the Modicon M251, M241 and LMC, for







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example), connect to databases via tools like SQL connector and provide the appropriate interfaces to other systems that are capable of storing data and that are OPC Unified Architecture (UA) and Ethernet IP compatible.

The specific hardware, software and services products that fall under the umbrella of EcoStruxure Machine also serve to simplify the way machine builders interact with Schneider Electric. Cloud- based tools help to support machine builders and their customers throughout the machine life cycle process. New customized portals

> Better connected machines provide machine builders with the agility needed to make smarter and faster decisions.

like Schneider Electric's <u>OEM Partner Portal</u> allow for streamlined selection, ordering and delivery of machine parts.

This digital transformation guidebook will analyze the key steps of the machine life cycle and illustrate how a new generation of products will help machine builders achieve new sources of business growth through advanced connectivity. Examples will be presented of how machine builders are finding new opportunities for service-driven business and for shortening their own machine design and development cycles.







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### **Design and Engineering:** How to Shorten the Machine Development Cycle

To most stakeholders, the value of data seems to be clear, and this value is often interpreted as additional revenue. However, in the new digital world, the definition of value extends beyond improvements in short-term revenue. The main benefit to machine builders will likely be a higher level of customer loyalty and/or a new business model based on much lower costs.

For machine builders, the road to the digitalization promised land begins in design and engineering. Problems in the design stage typically require reworking machine parts. This can lead to long delays and increased expenses and can mean the difference between profit and loss.



EcoStruxure Machine Expert - for developing, configuring, and commissioning the entire machine in a single software environment.



PacDrive 3 LMC Eco / Pro / Pro 2 - for automating machines/lines with 0 - 130 servo or robot axes.

New smart tools are helping engineers coordinate the various hardware and software components that make up the smart machine. Since clear and strict interfaces with well-defined behaviors are inherent to smart machines, they can be quickly and accurately tested. This helps to shorten time to market. The modularity of smart machines also enables hardware and software reuse. Smart machine templates of proven and validated designs enable machine builders to simplify design and engineering tasks. The software within the smart devices also allows more precise quality control through simulation. Such prototyping software is capable of creating a virtual model. This makes it easier to capture numerous control system requirements, which speeds up the implementation of a design project. This is especially true during the programming phase.







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## Design and Engineering: How to Shorten the Machine Development Cycle

Inaccurate specifications can waste many hours of precious (and costly) time. Software simulation tools allow both machine builders and operators to familiarize themselves with a new system before it is installed. This enhances both efficiency and safety.

New collaborative engineering software tools (like EcoStruxure Machine Expert) can interact with standard 3D simulation environments and cloud-based analytics to enable simulation of how parts will work in the machine prior to assembly of that machine. On the hardware side, intelligent devices such as PacDrive and Modicon M251, M241 controllers can be connected to 3D realtime simulation models for machines through a standard OPC Unified Architecture (UA). Robotics tools such as

Schneider Electric Cartesian, Delta and new SCARA offers can also be fully simulated. Such automated engineering and simulation capabilities can reduce time-to-market by up to 30%.

> For many machine builder businesses, there is little choice. The marketplace need for "smart" machines has rendered the traditional machine design process inefficient.



Modicon M241 and M251 logic controllers. For performancedemanding applications and modular / distributed architectures.







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## Machine Commissioning and Operation: How to Optimize

During the commissioning phase of a machine building project, machine builders face many challenges in achieving rapid speed to operation. For example, assorted communication interfaces for different devices, and separate supporting software unique to particular devices all complicate testing and configuration. Time consuming preparation of detailed project reports, and documented proof of properly configured system-wide settings make it a tedious process for gaining final sign-off from the customer.

Digitization helps the machine builder to simplify device commissioning through automatic discovery of devices in a digitized switchboard. Once discovered, the device settings can be downloaded and uploaded as required. Communication tests are then initiated and automatic communication reports are quickly generated. Automation solutions such as <u>PacDrive</u> with its <u>Sercos</u>-based system communication embed functions such as device discovery and "hot swappable" fast device replacement to help expedite the commissioning process.

When the various devices that enable the machine to work are linked together, they must work in a coordinated fashion very quickly. Smart machines all identify each other automatically. Operators don't need to prioritize and identify which drive provides which function, for instance. Instead, the parameters of the devices are uploaded in advance. In the smart machine world, communication protocols are standardized. This enables the smart machines not only to talk to each other on the floor of the factory, but also to





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## Machine Commissioning and Operation: How to Optimize

communicate to humans at the operation and management levels of the plant via dashboards. The machine also has knowledge about itself. It can answer questions like: Where is the machine located? What is the status of the machine? What is the status of its parts? Is a motor about to fail? This machine self-awareness is provided to the cloud and enables operational analytics so that the right decisions can be made.

Once the smart machines are delivered, they integrate with the IT environment. This provides the machine builder with a full overview of his field assets while he is connected at the same time with his internal production planning system. This type of capability expands to three distinct areas (tracking, monitoring and fixing) allowing machine builders to both enhance their own performance and to offer new support services to customers.

Tools such as Schneider Electric's <u>EcoStruxure Machine</u> <u>Advisor</u> enable this new business model by driving new service opportunities in the following ways:

• **Tracking** - An online repository service provides machine builders with easy access to documentation (from bill of materials, to localization and maintenance logs), and stores the full history of all their machines in the field. Such tracking abilities will help in quickly identifying the locations of machines, the tasks required to perform machine service, and the spare parts required. A log is also generated that documents all machine-related activities and events that have taken place.



• **Monitoring** - Cloud-enabled remote access allows machine builders to assess the performance data of machines. Intuitive and user-friendly dashboards display KPIs and track notifications. The monitoring tools are easy to configure as the user interface provides time-saving widgets (graphical user interfaces that display easy ways for a user to interact with the application).





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• **Fixing** - Any repairs to a machine are accelerated through mobile services that facilitate maintenance operations at end user sites through augmented reality applications. Graphical images of step-bystep procedures appear on the repair person's hand-held tablet device. Cloud-based Software as a Service (SaaS) tools feed the operator's tablet with graphical-based recommendations and advice for troubleshooting and fixing the machines in question.

These new ways of supporting machine commissioning and operation can help improve machine builder operational and support efficiency by up to 40%. You can get started with EcoStruxure Machine Advisor for FREE by clicking <u>here</u>.

#### The Entrade AG Story: Using Smart Machines to Sell New Services

Entrade AG, (click **here** to view the video) a Europeanbased OEM builds state-of-the-art micro power generation plants. These are modular scalable machines dispatched to remote areas in need of power that covert trash into usable fuel. The design and deployment of such machines are now made possible through new breakthroughs in digitalization and cloud- based technologies.

A key new critical success factor, the ability to remotely monitor, control and operate their machines from their small control center in Austria, at a very low cost, is what allowed Entrade to transform their business model from that of a pure machine builder to a mainstream service provider.

Schneider Electric introduced Entrade to a new set of integrated digitized tools that were easily and inexpensively connected to each other using EcoStruxure Machine architecture. The architecture enabled edge control with web server connectivity capability (for collecting data from\_ <u>Modicon M241</u> PLCs at the site of the machine), virtual private network (VPN) connectivity allowing access to the



cloud, and also mature software applications such as <u>Wonderware</u> and <u>EcoStruxure Resource</u> <u>Advisor</u> to allow for efficient management and analysis of remote operations.

These elements, combined within a cybersecure envelope, allowed for the development of a new services-based business model.





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### How to Lower Maintenance and Service Support Costs

As machine parts begin to wear out, instead of having to manage fixes in emergency situations, predictions of impending failures based on the early tracking and analysis of subtle performance anomalies will allow machine builders to provide better service to end users while minimizing the duration of any machine downtime.

This new forward-looking maintenance approach revolutionizes the way machine servicing is performed and new tools such as Schneider Electric's <u>EcoStruxure</u> <u>Augmented Operator Advisor</u> use augmented reality applications to greatly simplify the process.

When employing traditional approaches, maintenance personnel spend 50% of their time during a maintenance call researching information required to fix the issue. Consequently, they devote only 50% of their time actually working on the equipment.

EcoStruxure Augmented Operator Advisor allows an operator or maintenance technician to access any information related to a machine on the factory floor via a common iOS or android tablet or smart phone device. Information is captured from multiple sources and devices and is superimposed on the real-world environment (see illustration below). Any information regarding the particular machine—catalogs, wiring diagrams, manuals, troubleshooting steps and procedures—is made available to the operator.

This instant and easy access to relevant information helps to reduce operator and/or technician error. When an operator is performing a specific task, a step-by-step set



EcoStruxure Augmented Operator Advisor captures relevant machine information - for instant and easy diagnosis and contactless maintenance.

of instructions (this feature will be available in near future), for example, appears on the screen, reducing, the time and cost of the maintenance activity.

EcoStruxure Augmented Operator Advisor, provides machine builders the capability of building augmented reality interfaces into the machines they build. This, once again, introduces a new business model that opens the door for providing modernized maintenance services to their end users using augmented reality tools.



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## How to Lower Maintenance and Service Support Costs

Schneider Electric offers OEM training and certification programs to help machine builders develop new digital-driven systems and services of their own. Both face-to-face and e-learning options are available to help increase knowledge and expertise in digitalization-related applications. Begin your knowledge transfer today by accessing information on our comprehensive industrial automation training courses and learning services here.

Within the EcoStruxure Augmented Operator Advisor tool, machine builders can create their own augmented reality projects including "points of interest" within their machines. By taking photographs inside of the machine of these points of interest, they begin to link these to the tablet portion of the application and, in essence, buildin an environment that allows for what is called "context sensitivity." When this picture-based information is linked to the machine builder's service bureau, a virtual "over

the shoulder" service can be provided for the person on the floor who is attempting to resolve the maintenance problem. The expert at the service bureau can walk the on-site end user through the process as they both refer to the same set of images. As a result, machines are up and running more quickly and









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the machine builder avoids having to bear the expense of dispatching an expert on-site to perform the fix (this feature will be available in near future).

Another tool, EcoStruxure Secure Connect Advisor, provides secure remote connection to equipment from outside the factory network in a simple and safe way. Deployment of such a tool saves machine builder staff considerable traveling time and expense, and, by allowing a faster reaction time to a crisis situation, also helps to reduce machine downtime. Together, these innovative offers cut down time for corrective actions by up to 50%.



EcoStruxure Secure Connect Advisor - allows operators to remotely access, program and monitor machines.

#### The Bühler Story: Machine Builder Taps the Efficiency Gains of Augmented Reality

The Bühler company (click **here** to view the video) holds leading global market positions in building machines and developing methods for processing grain into flour and feed, as well as for the production of pasta and chocolate, in die casting, wet grinding and surface coating. The company's core expertise addresses the areas of mechanical and thermal process engineering.

As early adopters of augmented reality tools, they are exploring what the technology can bring to both internal staff during production processes and to their end users useful targeted information to users where and when they need it and for visualization of production data on mobile devices. Each application they build is customized and adapted to the environments in the machine to suit the particular end user's needs.

Bühler uses EcoStruxure Augmented Reality Advisor Project for its production lines. They see a major benefit in the ability to provide customized information to every user. Individualized content can be entered into the system daily or for each order and be displayed on the user's terminal or mobile device. The speed of the resulting information displayed on the terminal is greater that what could be previously achieved using routing slips or other paper or

One completely new aspect of this technology is its interactivity. This enables users to access real-time system process data or documents such as material data safety on an as needed basis.





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Technology architectures like Schneider Electric's EcoStruxure Machine, are built around the concepts of advanced connectivity and digital augmentation. As an "open" architecture, EcoStruxure machine removes much of the cost and uncertainty surrounding hardware and software integration. Both Schneider Electric and non-Schneider Electric devices can connect. At the same time, connected data gathering technologies such as sensors and human interface devices such as mobile phones and tablets can "augment" the value of existing machine and equipment infrastructure. This is accomplished by leveraging internet/cloud connectivity and digitization to unlock a deeper and more precise analysis of smart machine performance.

EcoStruxure Machine accommodates new, emerging trends such as the Industrial Internet of Things (IIoT) and related "Big Data" management. Machine builders wishing to leverage such an architecture should pursue the following steps:

- Identify the layers required to accommodate both legacy and new machines – EcoStruxure Machine addresses three fundamental layers: a connected products layer that enhances connectivity, an edge control layer that exercises local on-premise control of these products, and an apps, analytics and services layer that applies new analytics and cloud services benefits to both new and existing core applications.
- Ensure end-to-end cybersecurity across all three layers – IIoT technologies that plug into the EcoStruxure Machine should comply with IEC 62443 Industrial Network and System Security cyber security standards. Manufacturers of machine components need to assure a Secure Development Lifecycle (SDL) for those new products destined to fit into the architecture.
- Embrace an open architecture that unlocks trapped business value – EcoStruxure Machine is an "open" architecture that derives more value from data. Consider





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the example of how augmented reality can empower a machine operator who points a tablet at an industrial machine and sees, on his tablet, a digital overlay of what is happening inside of that machine. An open architecture permits faster data collection, more precise analysis, and quicker identification of equipment behavioral trends.

• Enable proactive maintenance so that asset uptime is optimized to improve profitability – The advanced connectivity facilitated by EcoStruxure Machine allows maintenance technicians to avoid performing maintenance too early (fixing a device before it needs fixing) or too late (fixing a system only after costly downtime has occurred), thereby significantly reducing operations costs.

Since connectivity is a key driver of such architectures, cybersecurity considerations are critical. Digitization and

cybersecurity are 100% linked, therefore one should not move forward without the other. Each organization along the industry value chain, including machine builders, has the responsibility to understand where vulnerabilities lie within their particular operations.

Schneider Electric applies a Secure Development Life Cycle (SDL) approach to all of their core products (an example being the new <u>Achilles Level 2 Certified M580</u> <u>PLCs</u>). Within the context of SDL, secure architecture reviews are performed, threat modeling of the conceptual security design takes place, secure coding rules are followed, specialized tools are utilized to analyze code, and security testing of the product is performed. These actions help to "harden" products, making them more resilient against cyberattacks. In this way, as new products replace old, entire systems evolve to become more cyber secure.







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In today's high-speed business environment, the time delays and complexities characteristic of the traditional pricing, ordering and configuration process is no longer a tenable business model. New machine and automation control solutions from Schneider Electric leverage breakthroughs in digitalization technologies to completely revamp how machine builders interface with the information, documentation and products they need to deliver. As a result, concept-to-commissioning time for such products will now be reduced from months to weeks, with reconfiguration times dropping from weeks to days. Schneider Electric provides Machine builders and other OEMs with online portals (like the <u>OEM Partner Program</u>) platform, and <u>Machine Integrator Partner Program</u>) that can be accessed to facilitate the selection and quoting of common product configurations on behalf of their end user customers. Available product offerings are automatically sorted and compared and the selected products are then easily submitted to a shopping cart from which a data sheet is automatically generated for the end user.

#### Explore portal benefits and register now!

#### Additional helpful tools:

Following is a list of resources to help interested machine builders get started in launching their digitalization-related product and services initiatives:

**Consolidated product catalog** – A license-free tool that provides machine builders with instant access to quick and easy detailed information that converges over 7,000 pages of automation and industrial control product catalog data.

**Spare parts distributor locator** – With a vast distribution network of more than 15,000 outlets across the globe, machine builders can quickly and easily identify the nearest distributor for needed spare parts. A "Distributor Locator" is available to find your closest distributors. These stock not only factory automation devices but also electrical, final distribution, and wiring devices.

<u>CAD System integration</u> – Machine builders can integrate Schneider Electric products in a few clicks into their own CAD system. The 2D or 3D files are downloadable from the Schneider Electric website in any mechanical CAD standards.





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#### Expand your knowledge base

Below is a list of key assets that will serve as a quick orientation for understanding how new digitalization-driven business models can drive growth:

<u>Augmented operator video</u> – EcoStruxure<sup>™</sup> Augmented Operator Advisor combines contextual and local dynamic information for mobile users, enabling them to experience a fusion of the physical, real-life environment with virtual objects.

**<u>EcoStruxure Machine Digital Demo</u>** – A roadmap that provides a general overview of the key products and tools that are enabling the machine builder drive to digitalization.

White paper – "Business Models for Smart Machines"

White paper - "Understanding Smart Machines: How They Will Shape the Future"

Blog – "How Machine Builders Apply Augmented Reality to Solve End User Business Problems"

Blog – "Machine Builders Take Initial Steps Towards Digitization-Driven Support Services"

Blog – "Digitization Helps Machine Builder Reinvent Their 'Business Model' to Bring Sustainable Energy to the World"

"Ask the Expert" article – "What the digitalization wave means to machine builders"

"Ask the Expert" article – "<u>Discover how new technologies are transforming the way traditional industries</u> operate and prosper"

**Customer Care Center** – At any time machine builders can turn to the local Schneider Electric <u>Customer Care</u> <u>Centers</u> (now accessible via "<u>mySchneider mobile apps</u>") and the Schneider Electric field service teams for technical or logistics support.

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