FROST & SULLIVAN

Data-driven Asset Performance Management

Data-driven asset performance management can help food & beverage manufacturers leverage tools such as EcoStruxure Equipment Efficiency Solution, EcoStruxure Plant Augmented Reality Solution, EcoStruxure Plant Secure Asset Connection Solution, and EcoStruxure Asset Advisor Digital Service to transition from a reactive to a prescriptive approach. This will not only help reduce capex and opex, but also empower the workforce, whilst meeting manufacturing KPIs.

A Frost & Sullivan Whitepaper

Schneider Electric

Contents

The Imperatives for Change

The global food & beverage (F&B) industry faces significant transformation as a result of the direct impact of key mega trends, including socioeconomic shifts that are changing the way consumers engage with industry and consume products, widespread digital disruption, as well as the emergence of new business models changing the nature of marketplaces and competition.

As the exhibit below highlights, this transformation presents the F&B industry with a complex range of challenges:

Challenges Impacting the F&B Industry

Customer

- Megatrends: Population growth, urbanisation, rising disposable incomes, online shopping, increased consumer preference for healthier / safer F&B choices
- Increased demand for personalisation of F&B
- Increased demand for 'origin story' of F&B products and traceability
- Rise of omnichannel (wholesale, retail, online sites,mobile apps, etc.)
- Challenge of ensuring that consumer trust does not decline
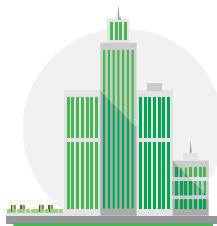
Company

- Flat growth in developed markets, slowing growth in some developing markets
- Retailer price pressure impacting margins
- Higher operating costs (energy, labour, material, etc.)
- Increased compliance obligations and costs
- Natural calamities and economic and socio-political volatility disrupting trade, supply chains and raw material availability
- Workforce attrition
- Ageing manufacturing assets
- New F&B processing approaches

Competition

- Start-ups and disruptors a growing threat to tier 1 F&B manufacturers
- Price based competition from private label
- Competition (and customer) driven increase in new product development frequency
- Vertical integration by e-commerce companies

Source: Frost & Sullivan

[1]Allianz Global Corporate & Specialty, 2017

[2]According to the USDA's Economic Research Service, in the US, annual food recalls more than doubled between 2004 and 2013; The Food Institute, 2018

[3]Also referred to as the free-from category, freedom foods are foods that are free of unwanted/undesired attributes. Based on health drivers, this could mean minimising unhealthy additives. Based on safety drivers, it means disease-free, hazard-free, solvent-free. Based on ethical drivers, it means kosher, halal, free range, fair trade, etc. Based on environmental drivers, it means biodegradable, renewable feedstock, energy efficient, free from environmentally-damaging pollutants, etc.; Frost & Sullivan

[4]Grattan Institute, 2018

Take the issue of safety in the F&B industry as an example. Large F&B product recalls cost on average US$9.42 million each.[1] The frequency of recalls is also increasing (as regulation becomes more stringent and as technology becomes more accurate and protocols become more effective).[2] Globalisation is also translating into larger scale recalls when they do occur. In many instances mislabelling, incorrect packaging or a manufacturing error contribute significantly to undeclared allergen recalls. Given the scale and frequency of food-borne illnesses and product recalls, the F&B industry has to contend with low levels of consumer trust. Another related area of growing concern is environmental contamination of F&B products (such as plastics or chemicals in food).

An example that highlights the rapidly changing landscape for F&B manufacturers is the continued growth of 'freedom foods'.[3] However, producing freedom foods increases the likelihood of supply chain bottlenecks and subsequently can drive increased production costs. As a result, upward pressure on food prices and the demand for newer, more efficient equipment is expected over the long term.

Increases in operating costs are another pressure impacting the industry. For example, the wholesale component of electricity prices for commercial and industrial customers in Australia rose by 50% between 2015-16 and 2016-17.[4]

Finally, the shift to **new processing approaches** is proving pivotal in the discussion of the F&B industry's future. Consumer demand for personalisation and competition-driven pressure to release new products is driving up the numbers of products manufactured and the frequency of recipe changes. This translates into an increased need for flexible operations with smaller batch volumes in some instances.

Overall **pressure on revenues, profits or both** is a result of a number of factors, including relatively flat or slow-growth in major developed economies, slowing rates of growth in some developing markets, the increased challenge from smaller brands and private label brands from major retailers.

Against this backdrop, F&B manufacturers are also being disrupted by the increased uptake of mobile and wireless technologies, cloud computing, sensing technologies, data analytics, artificial intelligence, augmented reality and virtual reality, social media and the Internet of Things (IoT).[5]

[5]IoT is when objects are connected, virtualised and imbued with data measurement capabilities (giving physical and virtual objects an identity, interconnecting the objects that can monitor and interact with each other and having the ability to generate real-time insights from data that can be incorporated into existing business processes; Frost & Sullivan

Digital Transformation as Initiator and Enabler of Change

Whilst sensing and automation technologies have been used by manufacturers for a long time, the recent past has seen acceleration in the uptake of a diverse range of digital technologies.

This is happening across every domain within the manufacturer's ecosystem - demand prediction, raw material procurement, product design and new product development, production, packaging, storage, logistics, as well as quality control, product and people safety, waste management and recall management.

However, unlike other industries such as automotive manufacturing, aerospace or oil & gas, the F&B industry is still only an emerging user of digitalisation. One of the reasons why the F&B industry is still behind in its digitalisation journey is the fact that the industry is highly fragmented, making it difficult to achieve scale.

Despite the enormous benefits of digitalisation that can give manufacturers the power to collaborate and connect across different stakeholders involved in various stages of the value chain, the digital transformation journey is hampered by a number of factors, as highlighted in the exhibit below:

**Barriers to Digital Transformation in the F&B Industry**

Resource and Infrastructure Constraints	Lack of Digital Maturity / Variability in Digital Maturity	IT-OT divide
— Lack of capex — Ageing equipment — Skills shortage — Varying levels of skills and experiences amongst operators	— Continued use of paper-based manual approaches in many instances — Lack of awareness and appreciation of the benefits of digital transformation — Variability in digital maturity based on sub-segment with F&B, scale of operation and location	— Difficulty in finding common ground between IT and OT departments

Source: Frost & Sullivan

Consider the challenge of skills and experience. With a high proportion of the manufacturing workforce reaching retirement age, a number of studies warn that a range of new manufacturing jobs created in various countries will remain unfilled.[6] In addition, as manufacturing equipment becomes more advanced, the future workforce will be challenged by the increased level of complexity in production processes. To facilitate a successful transition to a digitalised manufacturing environment, the key barriers can be addressed through a strategic and data-driven approach to asset management.

[6]For example, in the US, the manufacturing skills gap is expected to grow from around 488,000 jobs unfilled in 2018 to around 2.4 million jobs unfilled between 2018 and 2028; Deloitte and The Manufacturing Institute, 2018
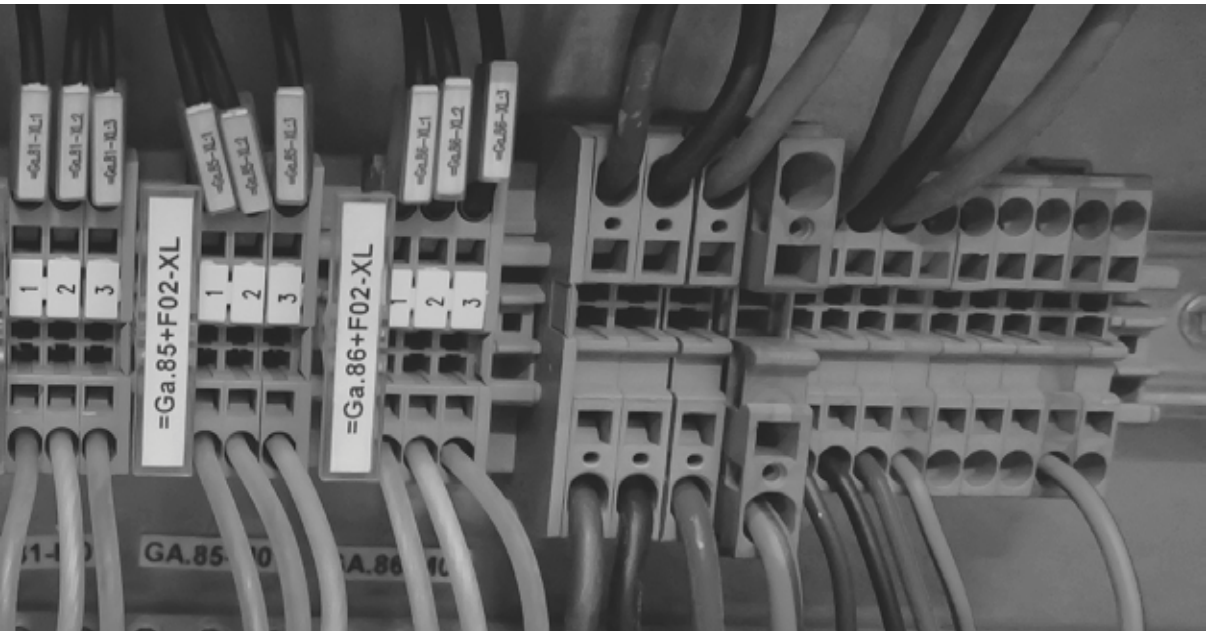
Data-driven Asset Performance Management

[8]Frost & Sullivan, 2018

Moving from a reactive approach to a preventive, predictive and eventually a prescriptive approach to maintenance has significant benefits for manufacturers. This is because unplanned downtime and maintenance make inroads into productivity and profitability. For example, maintenance and downtime account for 25-30% of the total lifecycle cost of a pump.[8]

Transition from Reactive to Predictive/Prescriptive Maintenance Strategies

Reactive

Maintenance on failure

High risk of unplanned downtime

High pressure environment in case of asset breakdown

Production losses and high lifecycle cost

Preventive

Planned maintenance as per schedule

Savings of 12-18% over reactive methods

Prevents major asset failure

Improves asset performance

Predictive and eventually Prescriptive

Maintenance based on actual health and condition of the asset

Savings of 30-40% over reactive

Avoidance of unecessary maintenance

Prescriptive maintenance will ensure optimisation
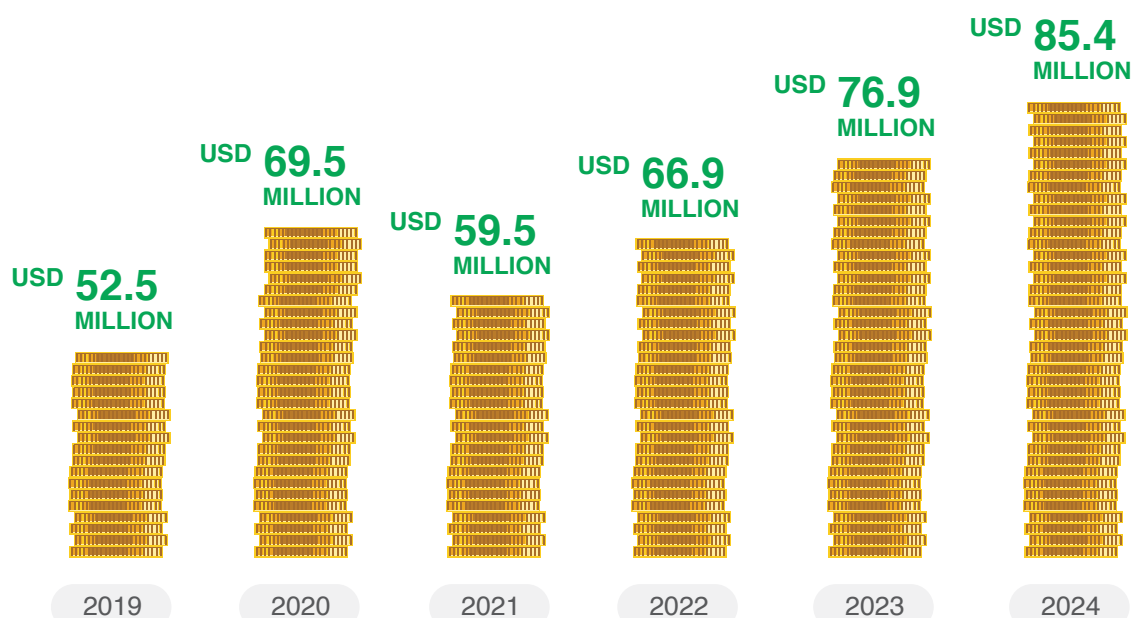
Source: Frost & Sullivan

The trend among asset-intensive companies to view maintenance as a potential area of profit rather than expenditure has driven investments in asset performance management solutions. The promise of predictive maintenance, which is more cost-effective than routine maintenance, and extends the life of assets, has popularised such solutions, especially with manufacturers burdened with ageing infrastructure.

As a result of these drivers, expenditure by the global F&B industry on Asset Performance Management (APM) software and services[9] is expected to grow 44% from 2021 to 2024, to reach over US$85.4 million.[10]

[9]Asset performance management (APM) software focuses on plant assets and their operations and includes asset risk management, reliability-centred maintenance (RCM), predictive asset maintenance, and condition- based management; Frost & Sullivan, 2020

[10]Frost & Sullivan, 2020

**Global Asset Performance Management (APM) Software and Services Market in the Food & Beverage Industry, 2019 to 2024**

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| USD 52.5 MILLION | USD 69.5 MILLION | USD 59.5 MILLION | USD 66.9 MILLION | USD 76.9 MILLION | USD 85.4 MILLION |

Source: Frost & Sullivan

However, asset performance management solutions are not only about the physical assets, but also about human capital. As the profile of the manufacturing workforce changes, companies are under pressure to provide enabling solutions to support and empower them.

The Changing Profile of the Manufacturing Workforce
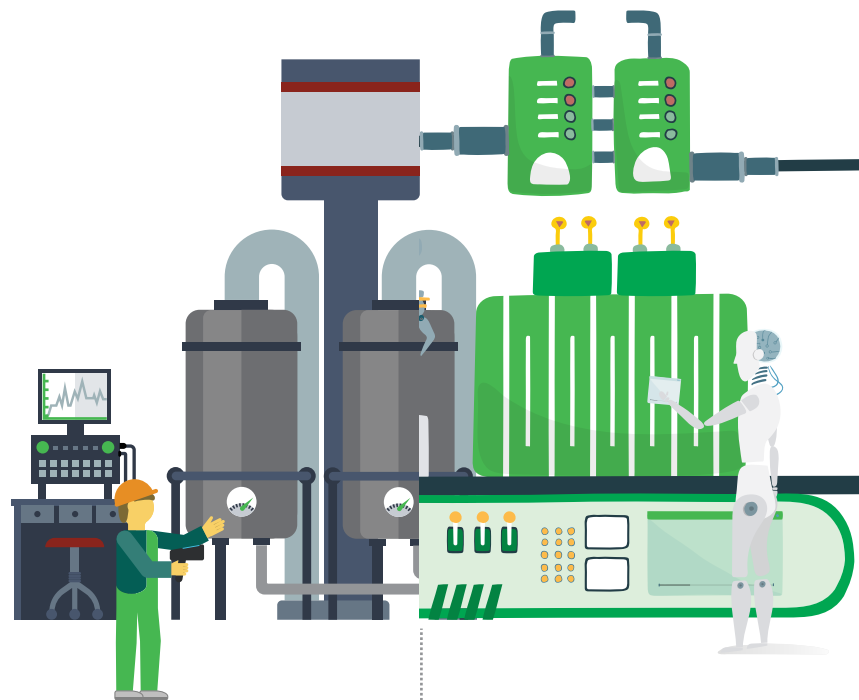
Production worker who carries out manual production tasks	Operator capable of working in an automated environment
Trouble shooter or exception handler	Maintenance expert capable of performing predictive maintenance based on data analytics
Inspector and controller of quality / safety / waste standards	Smart process engineer capable of controlling quality / safety / waste online
Production planner capable of planning processes in a top-down or linear fashion	Supply chain planner capable of developing a flexible, self-steering value stream

Source: Frost & Sullivan

Leading solution providers such as Schneider Electric are able to help F&B manufacturers in this process of empowering their workforce.

To help manufacturers take that first step in modernising their asset management and maintenance practices, Schneider Electric offers a comprehensive suite of software solutions and services to empower the manufacturer to collect information on assets, analyse asset condition and predict future failure before it happens.

To support the management of maintenance operations, Schneider Electric offers not only single stand-alone solutions, but a complete and integrated approach. An approach that comprises asset performance measurement and analysis tools (through EcoStruxure Equipment Efficiency Advisor), advanced and user-empowered tools for fast and easy digital management of the asset (through EcoStruxure Augmented Operator Advisor), and a secure link to partners who can contribute to maintenance tasks (through EcoStruxure Secure Advisor). Schneider Electric also proactively collaborates with customers through its cloud-based digital service that provides condition-based preventive and predictive monitoring of electrical distribution and rotating equipment (through EcoStruxure Asset Advisor Digital Service) with recommendations and support from experts at the 24x7 Connected Services Hub.

EcoStruxure Equipment Efficiency Solution:

For asset performance measurement and analysis, a simple, non-intrusive and easy to use tool is the EcoStruxure Equipment Efficiency Advisor which helps manufacturers to quickly identify bottlenecks and control them. This facilitates increased production, reduced downtime, minimised waste and lower production costs.

Challenge

- Need for smart preventive maintenance, minimised footprint, optimised operations

Solution

- EcoStruxure Augmented Operator Advisor, EcoStruxure Machine Expert, PacDrive, Magelis iPC

Impact

- 200% output with just 50% of the standard footprint
- 40% energy management savings

Site: SOMIC, Germany

EcoStruxure Plant Augmented Reality Solution:

AR technology simplifies complex processes by placing the right information (manuals, documents, experts) in the right place at the right time. It bridges the gap between the cyber-physical IoT and the real world, and creates a composite environment to engage operators in a dynamic and interactive way by offering step-by-step and intuitive task guidance. This ensures safety for inexperienced professionals on the shop floor. It also helps to standardise expertise (especially given the varying skill and experience levels in the workforce). AR facilitates model-specific instruction display to operators when they engage with complex machinery. For example, in the case of SOMIC's coffee capsule packaging machines, the use of EcoStruxure Augmented Operator Advisor facilitates instant access to context-sensitive equipment information, manuals and diagrams to improve operation and maintenance outcomes.

AR can also show various sensor readings such as in situ revolutions per minute (RPM), cutting force, position or environment data, alerting the user using sound and haptic feedback in case of deviation and thereby protecting them from accidents. By superimposing the infrastructure layout hidden within walls and structures, AR improves the operational speed of operators by aiding them in spotting the right location of issues without the worry of damaging assets. The recorded video view can be used in the future to identify possible failure symptoms, or to train new hires on operating procedures. AR can also provide expert assistance to lone workers at remote locations as they carry out maintenance. Using a live video feed, the expert at the control centre can guide the lone worker by interactive screen sharing and voice instructions. This enhances the problem-solving skills and efficacy of the lone worker.

Challenge
- Limited monitoring of assists due to manual operations negatively impacting operational efficiency
- Plant downtime due to extended time for resolution of faults
- No tracking of operational events
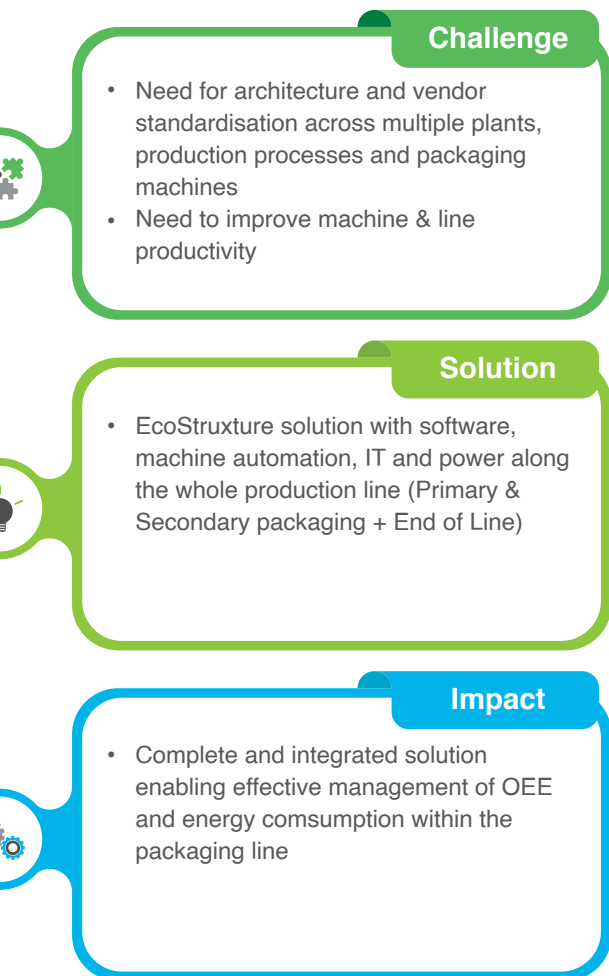- No life cycle support and maintenance

Solution
- EcoStruxure Plant
- EcoStruxure Secure Connect Advisor
- EcoStruxure Mobile Operator Advisor

Impact
- Advanced diagnostics enabling minimised downtime and human error
- Future-proofed operations, with scalable and flexible system architecture
- Improved operational and production efficiency through total system integration

Site: Large packaged food manufacturer, India

Challenge

- Need for architecture and vendor standardisation across multiple plants, production processes and packaging machines
- Need to improve machine & line productivity

Solution

- EcoStruxture solution with software, machine automation, IT and power along the whole production line (Primary & Secondary packaging + End of Line)

Impact

- Complete and integrated solution enabling effective management of OEE and energy comsumption within the packaging line

Site: Pasta manufacturer, Italy

EcoStruxure Plant Secure Asset Connection Solution:

Given the heightened risk involved with operating complex equipment from different OEMs with differing asset conditions, a safe and secure remote link to a wider ecosystem of experts can help operators rely on skilled partners to solve operational issues.

It can facilitate the simultaneous monitoring of multiple assets, machines and plants across various geographical locations, with data amassed from any point in the value chain and analysed against key performance indicators (KPIs). For example, in the case of a premixing line for a large packaged food manufacturer, the use of EcoStruxure Secure Connect Advisor helps speed up fault resolution and consequently reduce downtime.

Apart from improving diagnostics and response times, this ensures that there is adequate compensation for skill shortages in-house, whilst reducing travel time and costs for configuring, calibrating, commissioning or troubleshooting. This not only improves the turnaround time for maintenance activities, but also provides a platform for a more proactive approach to future failure.

AUGMENTED REALITY

Apps, analytics, and services

EcoStruxture Augmented Operator Advisor

Edge Control

Local Servers (System Platform)

Process Control (MSSO)

Connected Products

Machinery and Equipment

EQUIPMENT EFFICIENCY MANAGEMENT

Apps, analytics, and services

EcoStruxure Equipment Efficiency Advisor

Edge Control

GTU/GTUX

M580

Connected Products

Connected Devices

SECURE ASSET CONNECTION

Apps, analytics, and services

EcoStruxure Secure Connect Advisor

Edge Control

EcoStruxure Machine SCADA Expert

EcoStruxure Control Expert

Modicon M340

Connected Products

Altivar Process

EcoStruxure Asset Advisor Digital Service

A global survey of business leaders of large companies suggests that equipment breakdown accounted for 28% of large risk losses across all industries; with 62% of these equipment breakdown losses due to lack of maintenance.

Significantly, 43% of business leaders surveyed indicated that equipment failure risks have increased over the past five years. That explains why the risk of critical equipment failure was a major concern for 94% of these business leaders.[11]

To address this challenge, EcoStruxure Asset Advisor collects data from devices, pushes that data to the cloud and presents it to both the customer's dashboard and to Schneider Electric's Connected Services Hub for further analysis of equipment health. This collaborative approach between customer and Schneider Electric helps customers tap into the knowledge and expertise of people who have dealt directly with the technology.

Customers benefit from timely support from the team of experts at the Connected Services Hub, who remotely monitor and analyse the connected assets of the customer to spot anomalies, facilitate prompt troubleshooting and accelerate resolution. This ability to rely on and engage with experienced professionals through phone calls, emails, texts and reports enables organisations to maximise the value of the analytics and fault detection capabilities of EcoStruxure Asset Advisor.

[11]FM Global survey results, 2019

"What was once 'dumb' equipment can now tell us its condition and whether or not it is approaching failure and needs service. This is incredibly valuable to us."

Customer Feedback on EcoStruxure Asset Advisor Digital Service

EcoStruxure Asset Advisor monitors critical equipment along the entire distribution system (transformers, LV switchboards, MV switchgear, variable speed drives, motors and their application) and IoT sensors via the cloud, to move from reactive to predicitive maintenance. The cloud-based platform turns data into actionable insights applying smart alarming, aging assessment, and advanced analytics like machine learning.

This ability to achieve a system-wide view - across both power and performance parameters – is made possible through direct connection to the relevant assets (e.g. protection relays, thermal relays, control units, etc.) or by having sensors installed to monitor temperature on connections (TH110 and CL110), dissolved gas analysis, partial discharge, current waveforms and so on. As a result, operators can mitigate the risk of electrical failure whilst also understanding how electrical asset ageing impacts process performance.

"I like the fact that all your Service Matter Experts are in the background, running the analytics to help find hidden problems."

Customer Feedback on EcoStruxure Asset Advisor Digital Service

ASSET ADVISOR

Source: Frost & Sullivan

Critical Success Factors

To arrive at a customised, scalable and actionable solution, a few factors to consider are:

01 Focusing on new thinking:

Adoption of proactive asset management strategies involves changes in work processes, implementation of best practice and other cultural changes. However, bringing about change is often a very difficult process for manufacturing industries. An iterative approach that ensures that the manufacturer leverages the expertise of the right solutions partner can help to break down silos and resistance to change.

02 Incremental improvements:

Whilst step changes are impressive, in many F&B segments which are typically high-volume, low-margin sectors, solutions that offer small efficiency gains can make the difference between turning a profit or a loss. Often, ageing assets – once audited – can be made to show efficiency gains through the effective leverage of IoT sensors and software. This helps to augment the existing system without the need for significant capex.

03 Partnering with a complete solutions provider:

The right strategic partnerships, the acquisition of analytics platforms and enhancement of services through new business models are some of the ways that solutions providers are ensuring that they are able to address manufacturing sector customer requirements effectively. In the case of Schneider Electric, the added advantage of its strength in the industrial software portfolio, its industry-leading power products and process control solutions portfolio, and domain expertise across verticals is significant. This, combined with a truly consultative approach, can help make the journey to digital transformation a success.

04 Customised and robust cybersecurity:

Manufacturers not only need to assess their current security posture and keep pace with emerging compliance requirements in terms of industrial cybersecurity regulation, but they also need the architecture, platform and services that facilitate secure remote access, centralised monitoring and 24/7 access to cybersecurity experts.

Conclusion

F&B manufacturers are challenged to ensure a high level of profitability, whilst reducing time-to-market, improving product quality and addressing compliance-, customer- and competitor-driven pressures.

However, advances in technology have unlocked numerous opportunities for manufacturers, empowering both their people and ecosystems. The scope of implementing these technologies goes beyond merely improving efficiency. The use of these technologies helps manufacturers to not only differentiate their product offerings, but also to provide better end-to-end operations, which in turn can generate new streams of business revenue. Use of modern digital maintenance, with specific tools such as EcoStruxure Equipment Efficiency Solution, EcoStruxure Plant Augmented Reality Solution, and EcoStruxure Plant Secure Asset Connection Solution can help reduce capex and opex, whilst meeting growth objectives.

Leveraging EcoStruxture Asset Advisor Digital Service can help organisations tap into an experienced team of specialists delivering remote monitoring, troubleshooting and analysis of connected assets. Such services and solutions can help contextualise, customise, scale, secure, maintain and optimise the operations solutions environment in such a way as to make the digital transformation journey an effective enabler of growth.

R+

UDC-

U2

V2

W2

We Accelerate Growth

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Bengaluru	Iskandar, Johor Bahru	Milan	Sao Paulo	Tel Aviv
Bogota	Istanbul	Mumbai	Seoul	Tokyo
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ABOUT SCHNEIDER ELECTRIC

Schneider Electric is leading the Digital Transformation of Energy Management and Automation in Homes, Buildings, Data Centers, Infrastructure and Industries. With global presence in over 100 countries, Schneider is the undisputable leader in Power Management – Medium Voltage, Low Voltage and Secure Power, and in Automation Systems. We provide integrated efficiency solutions, combining energy, automation and software. In our global Ecosystem, we collaborate with the largest Partner, Integrator and Developer Community on our Open Platform to deliver real-time control and operational efficiency. We believe that great people and partners make Schneider a great company and that our commitment to Innovation, Diversity and Sustainability ensures that Life Is On everywhere, for everyone and at every moment.

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