FROST & SULLIVAN

Integrated Control and Software Solutions

Integrated Automation for Enhanced Return on Asset Investment

A Frost & Sullivan White Paper
in Partnership with Schneider Electric

Life Is On Schneider Electric

Contents

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Summary

In operational environments, intuitive, secure and seamless integration is not simply a glue that can link software to control and field devices. It is an enabler of higher quality, greater agility and flexibility, improved asset utilisation, reduced energy consumption, enhanced traceability with reduced compliance costs, as well as reduced risk.

In step with this thinking, Schneider Electric's **Integrated Control and Software Solutions** – that integrate PLC with SCADA system – simplifies the engineering of automation systems, ensures data quality and integrity, raises system consistency throughout the lifecycle of the plant and empowers the workforce to enhance productivity and maintain flexibility. As a result, this innovation helps users and integrators address capex, opex and continuous improvement priorities in an efficient, sustainable and holistic approach.

Critical Challenges Impacting Business Value

[1] *Rare and unpredictable events with severe and far-reaching consequences*

At a time when uncertainty has become the new normal (driven by changing market demand, competitive intensity, input costs, compliance obligations, safety risks, workforce issues and technology applications), operations and control professionals face many challenges in relation to capex, opex and continuous improvement priorities.

Capex: One of the most significant challenges in deploying and leveraging automation and control solutions is that of design and capex efficiency. Reducing overall project risk, whilst delivering quicker start-up, is challenging for owners/operators, especially as system complexity increases. **Time, effort and design cost** estimations for projects tend to be inaccurate in real world implementation scenarios. Also **errors** during the design phase increase debug time required and can be costly to rectify in the operational phase as they have a cascading effect on operations and maintenance.

How can we reduce design and commissioning time and cost?

Opex: To protect and grow profitability, owners/operators are focused on achieving operational goals in relation to **quality, productivity, energy consumption** and **maintenance efficiency**. Inconsistent quality not only impacts customer retention and market share, but also weakens operational efficiency. Ageing demographics, volatile funding levels, uneven progress on digital transformation and risk-averse policy-setting have hurt productivity levels across the board. In addition, industrial operations cannot simply pass on rising energy costs to their customers; competitive pressures prevent them from doing so. Finally, maintenance inefficiencies jeopardise operational excellence and asset reliability, as well as asset life optimisation. All of these impact opex levels and efficiency which require fully consistent operational data and control, as well as effective extension to life of equipment.

How can we deliver smart operations in terms of quality, energy, productivity and asset reliability?

Continuous Improvement: Agility to respond to **market shifts** (based on demand changes, increasing compliance obligations, fluctuations in input costs, new business models, as well as black swan events[1]) requires flexibility in operations. Changes in customer preferences not only impact current product/service mix, but also increase pressure on owners/operators to come up with new products/services to address changing needs. If they do not respond quickly, competitors will. Regulatory changes force owner/operators to adapt their processes quickly and effectively. New business models will not only call for radical changes to factory floor activity, but also new ways of analysing such activity and measuring outcomes. Black swan events such as disease outbreaks, extreme weather events, wars, geo-political stalemates and financial market crashes also present shocks to supply chains and process environments. Major disruptions in supply-demand over extended periods can prove catastrophic to operations that are not agile. That is why **retaining competitiveness** calls for continuous improvement in processes.

How can we stay nimble?

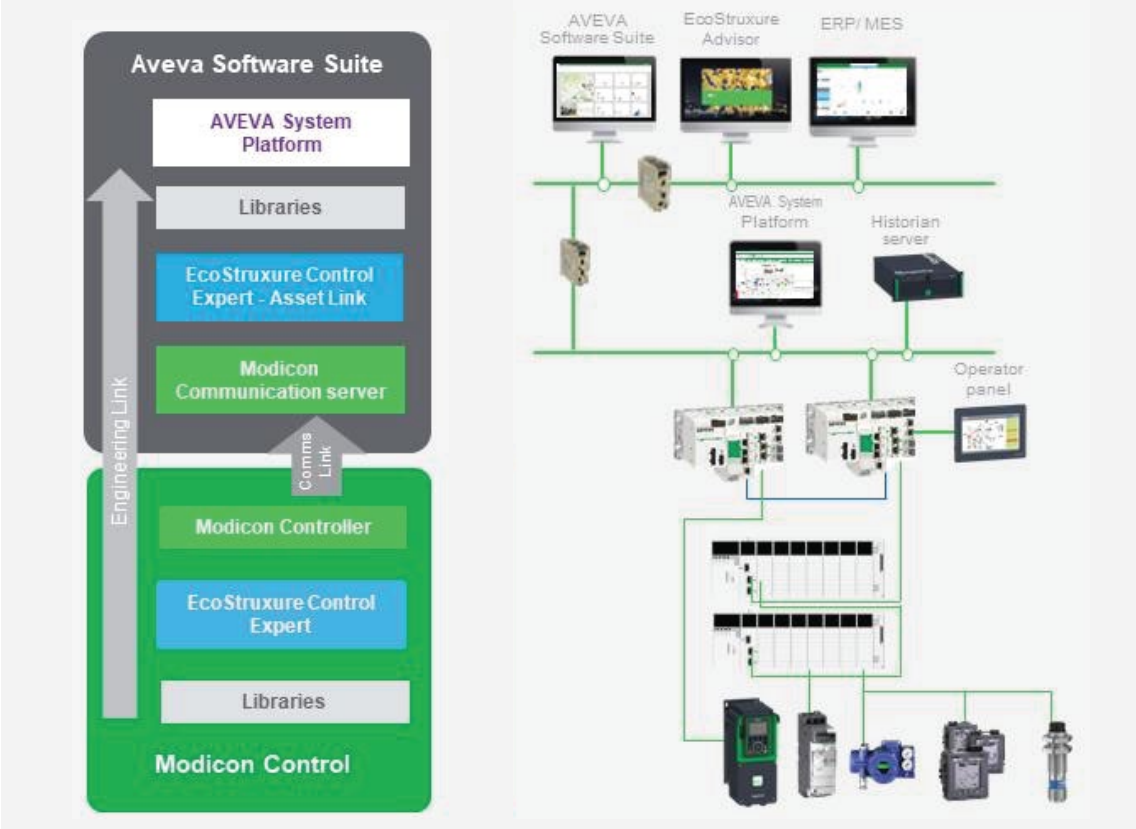
Integrated Control and Software Solutions

Whilst modernisation of operations, IT and OT convergence and enterprise-wide connectivity are being pursued vigorously, integration of the control layer with the supervisory system is not as seamless as it should be.

To address these capex, opex and continuous improvement challenges and achieve true integration across the operations, there is much work that needs to be done. However, actionable insight from integrated operations - that can potentially have a transformative impact on the business whilst reducing risk - is still elusive for most. This is because, whilst modernisation of operations, IT and OT convergence and enterprise-wide connectivity are being pursued vigorously, integration of the control layer with the supervisory system is not as seamless as it should be.

Responding to this challenge, Schneider Electric - in partnership with AVEVA – is launching Integrated Control and Software Solutions – that integrate control with supervision to facilitate seamless data flow between the control and software layers.

Integrated Control and Software Solutions



Source: Schneider Electric

To facilitate this, Schneider Electric's Integrated Control and Software Solution addresses the following key integration challenges:

- Communication - Modern control systems need high performance, cyber-secure links between many control assets and supervision systems
- Engineering - Duplication of engineering represents risk
- Standardisation - Standard blocks to connect to control assets (drives) and to interface to software applications (Batch, Recipe) provide rapid and reliable integration across the whole control system

Communications: (EcoStruxure Control Expert - Modicon Communication Server) is an approach focused on simplifying the connection of the control system with supervision; not simply a single controller with a HMI. The EcoStruxure Control Expert - Modicon Communication Server recognises and resolves the users' challenge in the Industrial IoT world to optimise and secure[2] communication. The optimisation of individual communication links based on the available hardware and ensuring cyber-secure links are enabled provides the user a high performance and secure control system without additional skills, knowledge and training.

Engineering: (EcoStruxure Control Expert – Asset Link) removes effort and inconsistency from the project configuration to create a higher quality control system. EcoStruxure Control Expert – Asset Link uses an example of best practice (a sample object) to generate a set of rules (patterns) which can be applied to any similar objects within the control system. The patterns recognise any duplication of effort (asset description, variable addresses, interlock comments and scaling variables) defined within the controller code and used within the supervision and synchronises this configuration. Doing this provides a higher quality of information to the supervision user and ensures the configuration within the controller is complete; thus improving the quality of configuration and the information available to the control system user. By letting users build lean PLC code – replicating the configuration up to the AVEVA System Platform – without being weighed down by excessive processing, EcoStruxure Control Expert – Asset Link ensures optimal results. By eliminating unnecessary tags, the PLC load is reduced and users can run the control system on minimal hardware.

Standardisation: (Ecostruxure Hybrid Libraries) provides standardised objects to facilitate the integration of connected devices. Having access to the detailed information available with assets for measurement, motor management and power control within the controller and supervision allows the user to leverage the thousands of additional measurements available within their control system. The libraries also provide interfaces into software applications (Batch, Historian, Recipe) which enable the detailed phase operations to be defined one within the controller and then programmed immediately within elements of the software suite.

[2] Cyber security through Achilles L2 on the M580 as well as SDLA design process for all products

Applying Integrated Control and Software Solutions in Operations

Use Case 1: Water Distribution Networks

Challenge: Utilities across the world are focused on reducing non-revenue water (NRW)[3] and addressing water loss in the system. Until NRW is minimised, a utility suffers from infrastructure damage, poor resource management and service, potential loss of pressure and higher energy bills. Climate change driven extreme weather events also pose a major threat to sustainability and safety of water supply. This risk and increased demand driven by population growth prompt increased recycling and re-use of treated waste-water. At the same time compliance obligations around operational safety and reporting, as well as the ageing of dispersed water distribution network assets present utilities with the challenge of improving process efficiency through enhanced visibility and control.

Unfortunately, operators only have partial visibility of their network based on sensors and measure points located in remote stations and at critical junctions of the network. This may help review some historical data, but does not help inform real-time decision making or scenario analysis for forecasts.

Global water demand 20 to 30% above current levels by 2050

Over 2 billion people in countries experiencing high water stress

Global volume of NRW - 126 billion cubic metres per year; amounting to USD 39 billion lost per year

UN World Water Development Report 2019: Leaving No One Behind; Liemberger, R.; Wyatt, A. Quantifying the global non-revenue water problem. Water Sci. Tech.: Water Supply 2018

Solution: Hydraulic simulation software (such as Schneider Electric's Integrated Water Network Management) can help deliver a digital twin[4] solution that gives water utilities real-time visibility of the network for enhanced operational efficiency, reduced NRW, the ability to plan maintenance more effectively, extended asset life, optimised water pressure (and thus reduced energy consumption) and more accurate forecasting using what-if scenarios.

For example, Italian utility, Acqua Novara leveraged Schneider Electric's Water Management Suite (WMS) Water Loss and Water Network Management integrated with edge control solutions such as EcoStruxure Geo SCADA Expert, SCADAPack Smart RTU and Modicon PAC and connected products such as Altivar Process, Trio Radio and Telemecanique Sensors to achieve 10% water loss reduction and 15% water supply energy consumption reduction. Similarly, UK utility, Anglian Water leveraged Schneider Electric's integrated solution of Water Management Suite, EcoStruxure Geo SCADA Expert (ClearSCADA), RTUs and Trio Radios to bring down leakage to amongst the lowest levels in the UK.

Leveraging Integrated Control and Software Solutions: To fully realise the value of the digital twin, it has to be natively embedded in the edge-control layer of a water network automation system. Such an integrated control and software solution provides information to the operators and goes far beyond traditional SCADA systems and which were the exclusive domain of hydraulic engineers in the past. In addition, the tight integration of the control layer can natively connect the hydraulic software application down to the field devices. This includes the actuators controlling the pumps of the networks and the sensors providing the necessary data to simulate the entire network in the most accurate way.

[3] *NRW is any water pumped by the water utility that does not come back as revenue.*

[4] *A digital twin is a digital model or replica of a physical asset, process or system that allows users to proactively monitor their equipment or processes. In addition to leveraging sensor data, digital twin technology incorporates advanced technologies such as Big Data, artificial intelligence (AI), machine learning and Internet of Things (IoT).*

Use Case 2: Food & Beverage Processing

Challenge: Rising input costs such as raw material, electricity, gas and transport are pushing up operating costs for a range of food & beverage processors. Consumers are also becoming more health-conscious, opening up opportunities for manufacturers to diversify their products. There is also an increase in the market's competitive intensity that drives product variety and differentiation. Given downward price pressure from the large retailers, food processors are seeking to differentiate their offerings by increasing the range of products they can deliver to market. This necessitates more frequent changes in ingredients and processes on the factory floor. To facilitate increased flexibility on the factory floor, food processors are using digital solutions such as IoT or automation to increase operational efficiency, reduce labour costs and gather relevant data more accurately.

Consumers are also looking for transparency and traceability when they purchase their food. There are many reasons for this trend: safety concerns, compliance with ethical standards, reduction in food wastage, etc. Companies need to be able to efficiently gather, manage and analyse the necessary data needed to address this customer expectation. Aside from reassuring consumers that their food has been handled and processed correctly, traceability allows processors to put a price premium on their product. It is much easier to market luxury or organic food items or a 'clean-green' image if the processor can show consumers what makes that product unique, such as where it came from and how it was handled.

Overall food demand projected to increase by over 50% by 2050

Over 700 million people exposed to severe levels of food insecurity in 2018

14% of the world's food lost from post-harvest up to, but excluding, retail

World Resources Institute, Creating a Sustainable Food Future, July 2019; The State of Food Security and Nutrition in the World 2019 – FAO; The Food Loss Index (FLI), FAO

Solution: Recipe and Batch management solutions help processors to be more agile in terms of real-time decision making and responsiveness to changing market demand. This not only automates processes, but also enhances equipment utilisation, productivity, quality, traceability and reporting outcomes.

For example, a leading grain flour production facility in Argentina leveraged Schneider Electric's integrated solution comprising the System Platform (AVEVA) with Batch Management, Historian and SQL database, Modicon M580 and X80 I/O (with Scaime weighing module), Harmony HMI and iPMCC (Intelligent Power Motor Control Center) with Altivar ATV32 to achieve high availability and control, as well as improved traceability. Similarly, a leading beef producer in France leveraged Schneider Electric's Harmony IPC for HMI and EcoStruxure Machine SCADA Expert software (for Line management (Lite SCADA)) to link production and palletizing areas for enhanced productivity and flexibility.

Leveraging Integrated Control and Software Solutions: Integrated Control and Software Solutions provide tight integration with control systems so that manufacturers can undertake nimble reconfiguration in response to changing new product development (NPD) needs or inventory levels. Product quality and traceability is also ensured to meet compliance requirements as well as maintain preparedness in the case of food recalls.

Conclusion

The Integrated Control and Software Solution is expected to resonate well with operations across diverse sectors since it combines best-in-class automated menu-based software from a leading and trusted solutions partner with best-in-class cyber-secure controls to reduce project design and cost and improve operational flexibility and effectiveness. It is also supported by the full breadth of Schneider Electric's portfolio of solutions and service expertise. This enables a consistent approach in terms of data to ensure worker/operator and end-market safety and security, with the opportunity to improve performance.

Design and planning teams will be able to leverage already tested and validated reusable assets codes libraries to reduce project errors, as well as time- and cost-to-deploy. Operations teams will benefit from the seamless integration between PLC and SCADA with more efficient maintenance and the ability to deliver continuous improvement through greater agility and flexibility that comes from a more holistic and accurate view of data as it flows through operations.

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