

# How to Enable Smart Manufacturing with an Effective, Interconnected PAT System

Process Analytical Technology (PAT) can optimise production and form a gateway to futureproof, competitive Smart Manufacturing activities. By connecting analysers, automation devices and data processing software tools, information can be shared in a timely manner across entire organisations. This enables the creation of process knowledge that can be used for the real-time, quality-centric control of manufacturing.

*Martin Gadsby, Director at Optimal Industrial Technologies, looks at how to maximise the end benefits of a PAT setup by effectively managing connectivity.*

PAT-driven Smart Factories leverage accurate, actionable insight gained from manufacturing and processing activities to optimise productivity, efficiency and quality management. To achieve the required in-depth process understanding needed to deliver these benefits, the PAT framework relies on the continuous processing of large volumes of univariate and/or multivariate data from analytical instruments and analysers on the factory floor. These data are shared with software platforms, such as multivariate analysis (MVA) packages, prediction engines and management systems, to generate meaningful information and knowledge.

Therefore, a significant and challenging aspect of establishing a PAT framework is the creation of an integrated network of disparate hardware and software tools that speak different 'languages', where all data can be collected and processed in a shared, common platform. To ensure an effective implementation, the first action that businesses should take is to deploy an advanced knowledge management software solution within the overall framework.

## Keeping everything PAT under control

A PAT knowledge management platform helps develop and summarise the insight provided by the various components of a PAT system and supports the communication of key information. More precisely, a knowledge manager interprets all communication protocols, gathers all data and provides one or multiple automated quality predictions



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*Martin graduated from the University of Bath in the late 1970's, and after working through a few positions in industry, he became the new European R&D Process and Process Automation Group Leader for Kraft Foods. After a few years at Kraft, Martin decided to set up a process automation business with a colleague, Dave Richards, and Optimal was born.*

*Optimal Industrial Automation was formed over 33 years ago, with Martin now being the main owner and CEO. Optimal Industrial Technologies was formed more recently as the products division and is the market leader in the field of Process Analytical Technology (PAT) with its PAT Knowledge Management product – synTQ. Martin is intimately involved with progressing the evolution of synTQ and advising the Optimal development team on what he believes to be the optimum development direction. Over the last few years, he has taken on the overall responsibility not only for the company, but also for the sales and marketing of synTQ whilst remaining very active in ensuring that the development of synTQ continues unabated. On the personal front, Martin is a bit of a 'petrol head' and enjoys flying aerobatics and racing cars.*

in a timely way. It can also use process and control models, combined with factory automation solutions, to maintain the design space and desired state, ensuring optimum operating conditions. This delivers optimum product quality while minimising the cost and time of manufacturing.

An effective PAT knowledge management software can therefore connect different parts of an enterprise to maximise flexibility, productivity and quality. Thanks to this functionality, businesses can benefit from a holistic view of the PAT system and their operations, ultimately empowering them to have full real-time control over manufacturing activities, including real-time, automated quality predictions.

## Identifying the right PAT knowledge manager

Not all PAT knowledge management platforms offer a high level of interconnectivity. Hence, businesses should favour solutions that are open and flexible, i.e. those that can bi-directionally interface with hardware and software components from a wide range of vendors.

The first aspect to check is if the software can support multi-vendor PAT methods. This means making sure that the solution can communicate with analytical instruments from multiple providers and, in particular, from the solutions that most accurately suit the project. A vendor-agnostic knowledge manager enables businesses to select the components that are most applicable to their process, giving them freedom to build a PAT system using the most suited instrumentation and third-party packages from a variety of sources. Ultimately, the software should be able to control the analysers and their data acquisition functionalities without the need to significantly alter any existing infrastructure.

For example, Optimal's total quality management solution, synTQ, addresses this issue with adapters that ensure connectivity with a wide range of instruments from different vendors. More precisely, Optimal is committed to ensuring that synTQ is vendor neutral and the software has a constantly expanding catalogue of more than 100 instrument adapters. As a result, businesses are able to ensure that the critical quality attributes of a product and critical process parameters are included within the PAT framework.

When looking at compatibility with other key PAT software tools, the ideal solution should be able to interface with different platforms, such as MVA, LIMs (Laboratory Information Systems), Historians, MES (Manufacturing Execution System) and other similar third-party packages. In particular, it is critical

to be able to interact with a wide range of MVA modelling packages, e.g. via synTQ adapters, and to perform one or more fully traceable real-time quality predictions. In this way, businesses have immediate quality measurements on raw material, intermediate and finished goods without operator intervention. It is precisely this information that can drive significant quality and commercial gains.

Furthermore, full connectivity with all necessary control and monitoring equipment, such as programmable logic controllers (PLCs) and supervisory control and data acquisition systems (SCADA) needs to be assured. This is essential to setting up quality-driven automated processes on the shop floor.

Finally, it is essential to select a solution that can achieve these ends by using a methodology that is compliant with current Good Manufacturing Practices (cGMP) with full data integrity. This capability allows manufacturers to support quality audits and ensure regulatory compliance.

## Streamlining PAT connectivity

Interconnectivity enabled by an advanced knowledge management platform is at the core of a successful, futureproof PAT implementation strategy. Optimal's synTQ features key communication and functional elements to ensure that businesses can benefit from data availability, visibility and convergence. As a result, manufacturers can leverage the power of Big Data to create Smart Factories.

***To learn more about managing connectivity in a PAT setup, download the free eBook 'QbD & PAT for dummies' at <https://www.syntq.com/qbd-pat-dummies/>***

