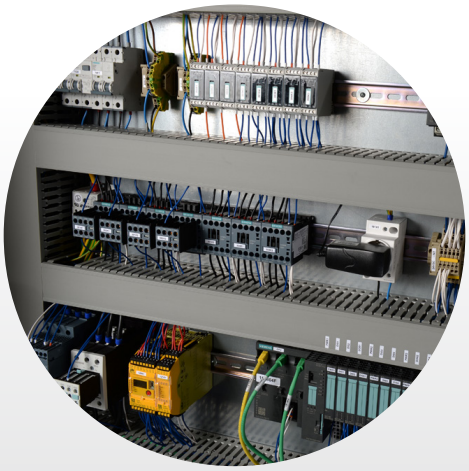
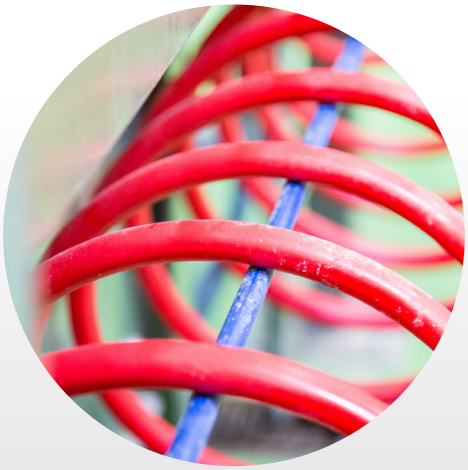
tna
packaging &
processing solutions

exposing inefficiencies in processing

rethinking control systems to maximise your productivity





a tna white paper

About the author:

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With over 20 years of sales, marketing and business management experience within the food industry, Michael is responsible for further developing **tna**'s systems and processes in order to meet the global needs of **tna**'s expanding customer base. Much of this rests with supporting and encouraging global and local collaboration aimed at helping food manufacturers improve productivity and performance.

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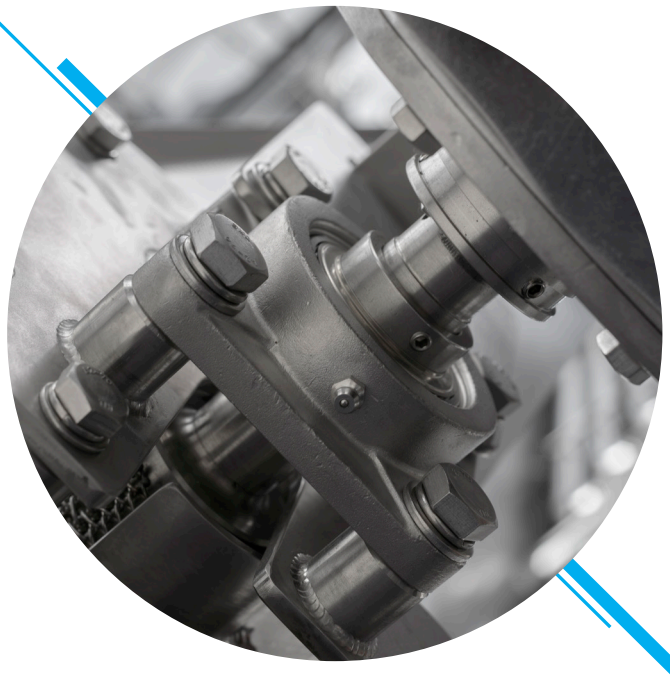
introduction

The fast pace of most processing industries means it is becoming more and more automated, to both ensure output targets can be met and production line efficiencies are maximised. Challenging economic conditions and an increased level of competition within the industry have further highlighted the need for process efficiency and have encouraged plant managers to review their existing systems to maintain future profitability. Automation is instrumental in consolidating costs from the high rates of labour, expensive raw materials and in ensuring safe and legitimate operations. However, integrating new technology into existing production lines can be challenging at times, while existing technology requires careful configuration in order to optimise the production process.



the concept of inefficiency

Working efficiently is a key ambition for any business as it significantly impacts on its profitability and competiveness within the market. After all, only an efficient business is operating at maximum output while spending the minimum cost per unit. Nevertheless, a lot of processing companies struggle to maintain efficient operations. Often caused by badly specified, outdated, poorly configured or inaccurately tuned control systems, inefficiency can apply to all areas of the process system and can have a damaging effect on profitability. Low product quality, lack of sustainability, excessive labour costs, material wastage, process inefficiency and poor environmental control are just a few of the many examples of how inefficient operations can affect different parts of a business. Whatever the area of concern or the root cause, inefficiency is always expensive.

targeting inefficiencies

To reduce inefficiencies within a business, it is necessary to identify the source of it. Only once the causes have been established can service providers, such as **tna**, start recommending improvements to the relevant control system and specify exactly what and where changes or updates are needed.

Identifying the causes of inefficiencies is a complex task and requires an in-depth analysis of the production process. By logging the production data from the existing control system, it is possible to expose areas, in which inefficiency is being experienced. A standalone **tna** supervisory control and data acquisition system (SCADA) is well suited for this purpose as it can extract data from the existing programmable logic controller (PLC) system. Once collected, any relevant information is then logged in a central database to enable the creation of configurable reports that are specific to the plant in question. As this system is a standalone piece of equipment and does not form part of the actual control system of the plant, it does not disrupt or interfere with the existing production control and operation.

Once the results have been analysed with the help of the plant's operations and maintenance personnel, a plan of corrective action can be proposed and implemented. This may take the form of the installation of additional plant sensing devices, the replacement of inaccurate pieces of equipment, or tightening and interlocking the control parameters within the existing PLC application code. In fact, in many cases the results will indicate that the existing system is quite capable of meeting the improved criteria and that a simple alteration to the settings may be solution to the problem. The result will be a more efficient production process without any of the associated costs of a new control system.

inefficiency 1: product quality

Product quality issues can apply to both raw materials and the finished product and are often caused by badly specified, outdated or poorly configured control systems. The cost implications for such inefficiency can be significant. While the waste of raw materials is regrettable, real problems occur when the finished product does not fit the guidelines and is rejected due to poor quality or damage sustained during packaging. Besides incurring considerable costs due to increased wastage, potential customer complaints can be a real threat to the reputation of a business. With more and more regulations focusing on preventive control, such as the FDA's Food Modernization Act in the US, producers are increasingly under pressure to adopt mechanisms that prevent contamination and ensure that all their products are safe from the moment they leave the production line.

securing food safety assurance

Food safety can be assured by improving traceability and in-line checking throughout the entire production process. Data collection equipment, such as barcode scanning systems, can accurately verify that the correct batch is being processed by scanning the product barcode and cross-checking it with the available data, while data code assurance systems, ensure that the date code is printed, complete and legible. In-line monitoring systems, such as metal detection, will ensure the absence of foreign bodies within the product prior to packaging. Stale product monitoring will ensure the product is always within specification. These systems will ensure that the goal of total product safety will be achieved and provide a rigorous system of product traceability.

inefficiency 2: lack of sustainability

With the costs of energy rising, maintaining a sustainable production chain is one of the top priorities for the majority of plant managers. The amount of electricity, gas and water unnecessarily wasted each day may be huge and can be the result of a variety of different inefficiencies. For example, machinery running when not required, poor maintenance, fully-lit plants during production shut-downs, and leaking equipment can all contribute to large energy bills. With vast amounts of money wasted each year on unnecessary electricity, gas and water, plant managers are increasingly looking for effective ways to control their energy consumption and keep wastage to a minimum.

keeping control of energy costs

Sensing equipment such as flow meters, motion sensors and kWh meters can easily be integrated into any existing PLC-controlled systems, while outdated variable speed drives (VSDs) can be replaced with more energy efficient devices. Providing greater visibility into relevant plant data ensures that energy is used only when and where it's needed, plus machinery replacement costs can be kept to a minimum. With additional integration through control software and the option of gathering data to produce energy usage reports, any control system can enjoy a new lease of life. As sustainability efforts are often on-going projects, it needs to be remembered that, while large leaks often take priority, a high number of small leaks can equate to a similar amount of wastage and should not be ignored.

inefficiency 3: excessive labour

People are undeniably the most important part of any business, and in particular any production facility. Although, technological progress has certainly automated some of the plant processes, labour costs still account for the biggest share of any facility's budget. As a consequence, plant managers have started encouraging their employees to work more efficiently in order for the business to stay profitable in today's challenging economic and market environments. However, multi-tasking is not always easy when out-dated procedures prevail. It's not uncommon for maintenance staff to have to repeatedly trouble-shoot the same breakdown or work on the same piece of faulty equipment. While these procedures incur considerable maintenance costs, they also increase the amount of down-time. As a result, production grinds to a halt, labour costs are wasted and overall productivity, and profitability, slows down. While in some plants precious production uptime is wasted with maintenance and repair work, in others staff are often engaged in tasks that can be better and more accurately performed by a machine.

creating an efficient workforce

A number of processes within a production plant can be automated to remove repetitive functions and reduce the margin for human errors. With a PLC at the heart of the control system and a clear and concise HMI (Human Machine Interface) system providing machine status and production data, operators will be able to monitor any unusual activities and react quickly and efficiently, before any further processes are affected. Furthermore, a detailed review of all the activities within the plant can expose a number of tasks that would benefit from automation. Once this has been optimised, staff are able to perform other less repetitive duties and enjoy a broader range of plant activities. As a result, plant managers not only realise considerable cost savings, but also increased job satisfaction and retention levels amongst their employees.

inefficiency 4: material wastage

There is no worse sight in any production plant than seeing products being spilt onto the floor or transferred into waste bins. As production lines are becoming more and more automated, products are being processed at unprecedented speeds. Just one product breakage can affect the entire production cycle and easily damage a large number of goods before the fault is noticed, resulting in unnecessary downtime and excessive wastage. Often caused by inaccurate control equipment or badly tuned processes, material waste is a real problem for any plant manager and weakens the efficiency of any production line.

fds for a smooth product flow

Involving a controls systems provider, such as **tna**, from the start of a project can prevent such inefficiencies. By developing a detailed user requirement specification (URS), **tna** is able to help plant managers identify the expected key performance indicators (KPIs) that the process requires. This URS is then translated into a functional design specification (FDS), and once signed off by both parties the process will be set up according to the agreed specification. With a tight control specification in place a smooth and reliable product flow can then be achieved, reducing material wastage and downtime to a minimum.

inefficiency 5: process inefficiencies

Out of all the types of inefficiencies within a plant, process inefficiencies are the most invisible and hardest to detect. Control systems are rarely commissioned with a full set of finely tuned control loops as not all processes or recipe types can been tested during initial production trials. As a result, many variables are simply left to chance and will cause unexpected problems at later stages. Although, the system may be running the correct plant equipment at the correct time in the production sequence, fine tuning might not have been applied to some control loops to accurately tighten down these processes. Some processes can also be prone to frequent stoppages during a cycle, further reducing the overall production line efficiency and repeatability of product quality.

re-tuning for more accuracy

Revisiting the original PLC control code and fine-tuning the proportional integral derivative (PID) loops will greatly improve the control situation. This can be achieved in a number of ways:

- Manually watching and tuning the loop parameters and entering new values for P, I and D.
- Using a dedicated loop tuning package to provide guidance in the correction of the loop parameters for maximum efficiency. Control system specialists, such as **tna**, who are well experienced with the Rockwell Automation RSTune product can help plant operators with the setup of this software.
- For plants requiring more complex loop tuning, the use of a predictive and adaptive system can be considered. This is a model-based controller that sits above the PLC control loop on its own PC-based platform. Using these models, the system predicts the direction the process is taking and takes corrective actions before it can deviate from its set points. **tna** has in-depth experience of the Adaptive Resources QuickStudy product and can provide assistance when this process is carried out.

Implementing any of the above steps will result in a much tighter control of the process loops for more consistent product quality, greater process line efficiency, improved safety and reduced waste.

inefficiency 6: poor environmental control

Environmental control is a key priority for everyone in the process industry, particularly as industrial pollution poses a real threat to the future of our planet. When it comes to processing plants, drainage discharges (e.g. waste water) and atmospheric emissions (e.g. stack discharge) are the two critical problems that the industry is facing. Not only are these discharges causing substantial damage to our planet, but tighter Government regulations have also brought harsh penalties should any of these unwanted materials accidently escape from the plant. Without effective environmental control, plant manager are increasingly risking huge financial losses and in some cases even plant closures.

ensuring safe operations

Simply adding extra sensing equipment at selected points within the process will accurately monitor waste products prior to discharge. The information gathered is then fed into the PLC system via 4-20mA signals and compared with a set point of acceptability. Depending on the data, the process will either allow discharge or create an out of tolerance alarm, causing the process to stop before any harmful substances are introduced into the environment. The logged data will also provide a detailed record for submission to external monitoring bodies if required, eliminating the risk of large fines and ensuring a safe and efficient operation.

rethinking control systems

Inefficiencies within the process industry are numerous, and come at a considerable cost to plant managers, consumers and the environment. Collecting detailed and reliable data from as many parts of the production process as possible is vital to ensure a safe and efficient plant operation. Control systems play a crucial role in ensuring that only quality products leave the facility, waste is reduced to a minimum, labour and maintenance costs are under control and all regulations are adhered to. PLC and SCADA systems can easily be integrated into existing production lines to eliminate or reduce process inefficiencies, simplify operations and maximise productivity. Control systems providers such as **tna** can be involved from the outset of a project and offer complete engineering solutions from software and system design, control panel manufacture and installation, to maintenance and advice.

summary

Summary to come???

If you like to find out how **tna** can help your business to become more efficient then please contact us at www.**tna**solutions.com or email us at info@**tna**solutions.com

About **tna**

tna is a leading global supplier of integrated food packaging and processing solutions with over 14,000 systems installed across more than 120 countries. The company provides a comprehensive range of products including materials handling, processing, coating, distribution, seasoning, weighing, packaging, cooling, freezing, metal detection, verification and end of line solutions. **tna** also offers a variety of production line controls integration & SCADA reporting options, project management and training. **tna**'s unique combination of innovative technologies, extensive project management experience and 24/7 global support ensures customers achieve faster, more reliable and flexible food products at the lowest cost of ownership.

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