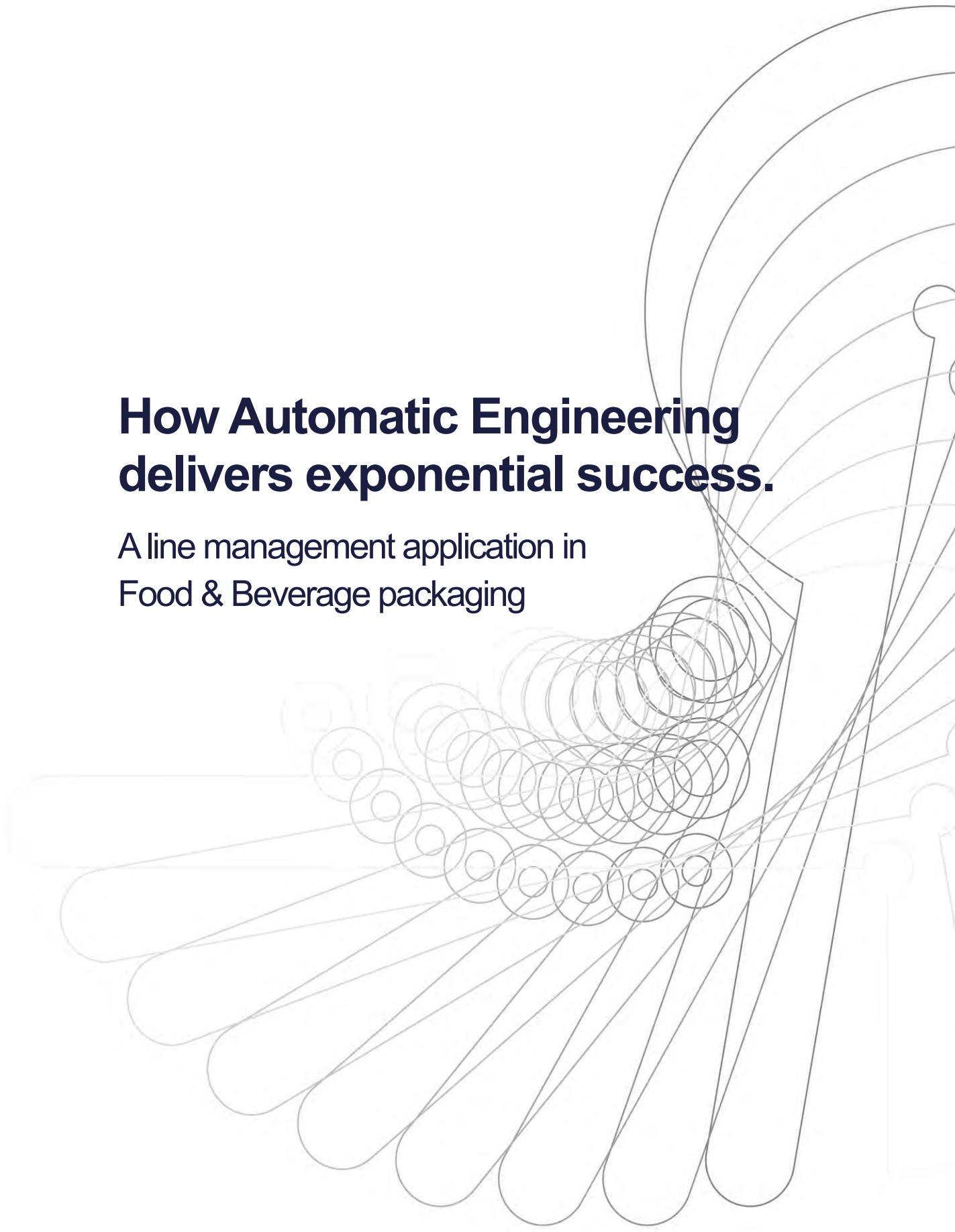
How Automatic Engineering delivers exponential success.

A line management application in Food & Beverage packaging



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Executive summary

This paper has been written to assist everyone involved in a Line Management System rollout - and is facing all the corresponding challenges that accompany a system rollout.

In this paper, we will explain the concept of a Line Management System in the context of Packaging lines (including filling processes). We will discuss the importance of standardization and flexibility in the Engineering & Design stages of a successful rollout process. And we will look at how to leverage the approach of “Automatic Engineering” to ensure success increases exponentially when the Line Management system is rolled out across multiple production sites.

Introduction

How do we define and measure the “success” of a Packaging Line Management System? For Businesses operating in the Food & Beverage industry, the judgement about whether an investment in a Line Management System has been successful will be based on how quickly the system has paid for itself and how much it is now contributing to the bottom line.

Other factors will also play their part: was the project delivered quickly and to schedule? Does it support ongoing process improvement initiatives? Is the system tailored to meet the particular and individual requirements of the company? The ability to tailor the system to the business‟ specific requirements feeds back in to ROI because it improves internal acceptance and enhances the system benefits.

ROI = Return on investment

The bottom line is: has it paid for itself? Is it now helping us to reduce costs and maximize profit?

For international Food & Beverage Manufacturers, it is common for concepts and systems to be rolled out throughout multiple production lines and/or sites. Once a good practice or a tool has proved successful in a pilot project, it quickly becomes deployed as standard throughout the whole company. There are many possible reasons for this:

- Future projects will require relatively less investment as knowledge is transferred within the company, project management improves and systems and engineering are replicated.
- Those involved in the pilot project and early rollout sites act as advocates and are keen to push through the rollout because of their positive experiences - so the rest of the company can benefit and they gain personal and professional kudos.
- Management are keen to ensure universal compliance with corporate standards.
- Operational integration and flexible management of multiple production sites.
- Acceleration of continuous improvement processes.

Whatever the reason behind the rollout, the simple fact is, the more frequently you use something, the more cost effective it becomes - because the investment you have made in it has the opportunity to pay off that much faster. And if you are reusing it over multiple sites, the payback period is even shorter. This is what we mean when we talk about “exponential success”.

System Integrators and Machine Manufacturers can also leverage exponential success. Firstly, because suppliers of equipment or technology are often directly involved in rollout projects for their clients; their assistance is often sought by customers under time and cost pressures.

Secondly, System Integrators and Machine Manufacturers may achieve exponential success by reusing systems, engineering work or project components across their customer base. For machine producers or system integrators operating in the Food & Beverage industry, there is a clear need to continuously update their methods and approaches so that they offer the best in automation technology and best meet the needs of their customers.

The Machine Manufacturers and System Integrators must choose the right automation technology to support their favored approach, in order to satisfy customer and market demands to reduce engineering costs and accelerate time-to-market. One prevailing way of tackling this is to reuse as much as possible from work which has already proved its value in practice. But the benefits of reusing proven systems must be weighed against the need to adapt to the individual peculiarities of each project, since customers will more readily accept - and more quickly benefit from - a flexible and tailored application.

Clearly, the Automation software selected for the Packaging Line Management System will play a decisive role. This holds true for System Integrators and Machine Manufacturers as much as it does for their End Users, the Food and Beverage Manufacturers.

For any software to unlock the potential for decisive improvements in the speed and cost of implementation, and any subsequent performance improvements, it must offer the capacity for both standardization and customization. Standardization ensures:

- Reduced likelihood of errors
- Lower cost of engineering
- Faster deployment
- Faster ROI

Customization ensures:

- Better user acceptance
- Enhanced process improvements
- Faster ROI

So, the main questions are: is the automation software currently deployed able to deliver these decisive improvements? And, if not, how do you select an appropriate system that can deliver these decisive improvements?

It is also important to consider: how can you leverage these improvements during a system rollout process? In other words, how can you also achieve exponential success?

“Exponential Success” in the context of a Packaging Line Management System

What is a PLMS?

PLMS = Packaging Line Management System

A Packaging Line Management System (PLMS) is a system for managing the operation of filling and packaging lines, whether those lines are packaging solid or liquid food or bottling beverages.

A PLMS incorporates automation and management information in a single system that is designed to support the operational management of the packaging line and be a key tool in the delivery of continuous improvement. A basic but important requirement of the PLMS is connectivity with all the machines and auxiliary equipment that make up the packaging line, in order to acquire production data and to centrally manage production parameters. That is why, for a PLMS implementation to be successful, the software solution at its core must have the capability to communicate easily and rapidly with all the diverse devices in the line.

What is the typical functionality of a PLMS?

The system should offer process management information online. For example:

- process visualization
- alarm and event management
- real-time calculated performance indicators
- performance trends etc.

This information must be presented in a clear and convenient way to the operators. The production team should receive the information they need to make the right decisions, act quickly and time appropriately and thus make sure that the processes are always in line with quality and efficiency objectives.

Figure 1: Packaging Line overview in zenon

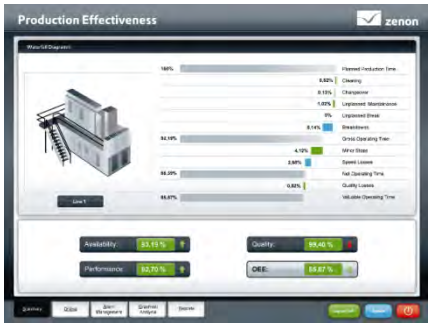


Figure 2: Analysis using an OEE Waterfall Diagram in zenon

Figure 3: Online indicators for consumption optimization with zenon

Functionality should also include the analysis and documentation of:

- historic process data (which it should be possible to filter according to equipment entities, time entities e.g. shifts etc), and
- production-relevant information (so detailed information about a particular packaging order or batch, for example, can be recorded, analyzed and archived, as required).

Access to this kind of information (correlated into reports and statistics) means that, with a PLMS implemented, the team has the opportunity to analyze and understand the process and, consequently, to identify the hidden potential for further optimization.

There are also considerations from an integration perspective which can significantly impact the value of the PLMS within the complete plant infrastructure. For example, does it provide:

- a flexible network infrastructure and open network technology, and
- standard but flexible communication interfaces for transferring data with other plant or business software, such as ERP systems.

ERP = Enterprise Resource Planning

Common reasons given for installing a PLMS

The implementation of a PLMS serves a variety of purposes including, but not limited to:

- keeping production processes under control
- increasing productivity
- optimizing consumption
- improving quality
- documenting processes
- better support for the implementation of industry standards
- regulatory compliance

We have looked at the immediate reasons an organization might install a PLMS. These present tangible benefits with an easy to measure Return on Investment (ROI) which can often be realized over a short period. In addition to these „hard" ROI factors, where payback can easily be measured, there may also be „softer" benefits which impact ROI but which are less easy to measure. Plus, of course, we recognize that the length of time in which ROI is achieved (the ROI period) will depend on the particular application requirements (and the subsequent cost of installation) and on how effectively the new PLMS is used.

Why roll out a PLMS?

Once the PLMS has proved successful (and ROI demonstrated and achieved), it makes sense for the organization to roll out the system to other appropriate packaging lines and locations throughout the business.

We have already discussed that the rollout of an existing, proven system can offer significant advantages in terms of knowledge transfer and economies of scale. This offers improved ROI because:

- costs are reduced as engineering work is reused
- success increases exponentially as the project engineers learn from their experiences elsewhere in the organization and they continue to optimize the deployment and subsequent use of the system

But, for many businesses, the most compelling reasons to roll out a PLMS are:

- regulatory compliance in the packaging area
- the integration of systems, so performance can be monitored and managed at corporate level

The rollout of the PLMS to various production sites is even more efficient when it is realized as part of a larger initiative aimed at enforcing corporate policies and procedures, local or international standards, good practices or other improvement-oriented concepts.

What to standardize in your system?

The decision to rollout a PLMS is based on the need to implement common concepts or functionalities across production sites or across different lines at one location. These common requirements translate into a list of all the components of a PLMS which must be standardized. Typically this list might include:

- Information for the integration into the PLMS level of the packaging/filling equipment (based on Weihenstephan and OMAC standards), e.g. standardized sets of data tags
- System functionalities: line overview, machine details, trend curves, alarms and events etc.

KPI = Key Performance Indicators

OEE = Overall Equipment Effectiveness

- KPIs such as OEE or relative consumption of materials
- Application design: symbols, color conventions
- Terminology and language: company terms, one-click language change of running application
- Measurement units: one-click change for supporting international teams
- User administration: access to system functionalities according to existing user management of the company's IT system

What to adapt to local peculiarities?

Although there are various components of a PLMS which need to be standardized, as outlined above, the packaging lines and the tasks they perform are not always exactly identical. It is important to consider and allow for these differences and any local peculiarities during the rollout process. Differences that need to be considered include:

- Packaging line layout
- Type (function and/or brand) of installed machines
- Specific monitoring equipment and measurement devices
- Certain standard functionalities selectable from a predefined list
- Functionalities required for just a single implementation

The decision to rollout a system will inevitably lead to a discussion about which elements of the system can be common throughout the organization and which can lend themselves to local adaptation – and, usually, much debate over whether this customization is desirable.

Naturally, a balance needs to be struck between maximizing the benefits of a standard rollout (reusing technology, reducing costs, leveraging existing, proven engineering work) and meeting specific local needs. Any system that can combine the advantages of both a standardized rollout, with the capacity to tailor the system to local or individual requirements will offer significant advantages.

The zenon approach: faster ROI through “Automatic Engineering”

ROI is determined by a variety of factors which influence the payback period. The simplest way to reduce the payback period – the time in which it takes the system to pay for itself and begin contributing to profits – is to reduce the cost of the installation and rollout. Engineering is a large part of these costs, so it follows that any system that helps to drive down the time and cost of engineering will contribute to the success of the rollout.

Combine the capacity to drive down the time and cost of engineering, with a feature rich system that supports process improvements and compliance and ROI can be maximized.

What is “Automatic Engineering”?

Many of the available automation software products adopt a “classic” engineering approach, whereby the integrator has to write huge amount of programming code for each function. This requires a lot of specialist programming skills and makes the integration and later maintenance of every project more time-consuming and, thus, more expensive.

A more advanced engineering approach is based on the philosophy of “parameterizing instead of programming”. It enables users to deliver functions simply by configuring out-of-the-box modules. Thus, it makes the integration and maintenance easily achievable, even by people with little or no programming expertise. Such a software platform delivers important mechanisms to ensure reusability and standardization - and their associated benefits. In the context of a PLMS rollout, parameterizing turns out to be particularly promising during the development phase of the pilot project.

Automatic Engineering brings reported cost reductions of as much as 90 percent compared to classic technologies used previously.

When a company decides to rollout this pilot project, the engineers face the challenge of integrating all the standard components of the system whilst, simultaneously, maintaining the capacity to adapt to local peculiarities as flexibly and cheaply as possible. This is where “Automatic Engineering” comes into play. The core of the Automatic Engineering concept is an application creation wizard. This wizard can save weeks of engineering time by streamlining the design process.

The wizard goes beyond simply reusing project components or objects. The wizard guides users step-by-step through the creation of an entire project. Another wizard then enables users to document the entire project: with a

single click an entire project can be documented in portable and user friendly HTML.

The wizard enables users with little or no programming expertise to confidently create entire projects. But it also offers significant advantages for experienced developers:

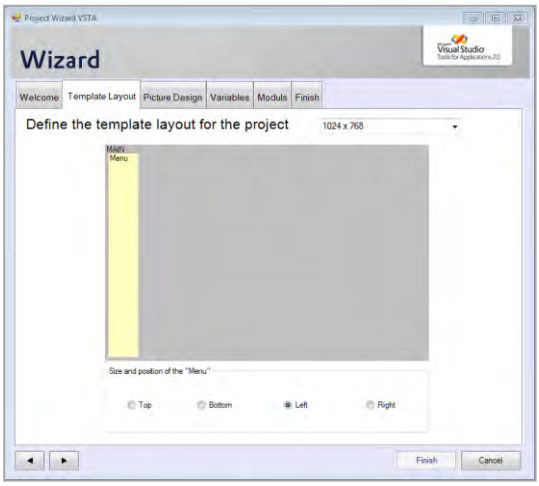
- Greater ease of replication and reuse of project parts
- Less scope for error
- Improved reliability
- Avoid laborious scripting or workarounds, or the need for them in the future
- Simple to adapt and „tweak" project components in each project

As the programming effort is reduced, so the ROI period will also reduce. Success increases exponentially during the rollout process: the more often the Wizard is used, the better the ROI is.

The Automatic Engineering Wizard is capable of realizing the same operations as the application developer - but extremely rapidly. By running the Wizard, the standard components of the system are automatically included in the final application. The wizard then allows the user to select a particular application parameter, in order that they will be easily adaptable to local requirements during each subsequent application deployment. This may include information such as: what types of machines are used in the packaging line? Which functionalities are required? The Wizard selects then the appropriate software modules and assembles them in order to obtain a reliable result pre-configured for use.

It is natural that an application developed using the Wizard may need some fine tuning in order to perfectly fit the particular application. For instance, the developer may wish to rearrange the components of the process visualization on the screen. The development environment based on “parameterizing instead of programming” makes such final customization accessible, convenient and cost-effective.

Figure 4: Automatic Engineering, supported by Wizards: Step by step, the Wizard leads the user through the configuration process.



The rollout of a Packaging Line Management System using "Automatic Engineering"

Engineers involved in any rollout process have clear expectations from the software technology they use: integrating the standardized parts of the application rapidly and reliably, whilst simultaneously maintaining the ability to adapt to specific local requirements. That is why the Wizard for "Automatic Engineering" is a vital element for ensuring the success of the rollout process.

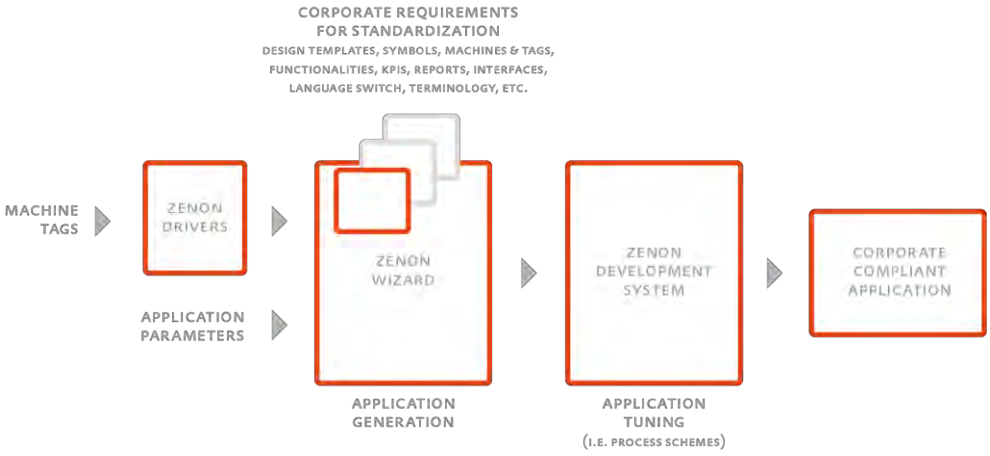


Figure 5: The flow of engineering information when using "Automatic Engineering".

The starting point of the engineering process will be the machine tags, which should themselves be subject to standardization. Then the drivers are chosen in order to ensure data communication with the appropriate production equipment. All this information, together with the PLMS application parameters is input for the application generation when prompted by the Wizard. From a design perspective, the Wizard already includes a representation for standardized components and the complete intelligence for “Automatic Engineering”. The Wizard produces a software application which follows the agreed standardization and is almost completely adapted to the particular application. For fine tuning, a supplementary editing process is accessible using the standard development system. The final result is a **PLMS application which complies with company standards and application requirements.**

A quick guide for efficient system rollouts

1. Define the requirements of your pilot PLMS.

2. Choose a software that meets your demands and offers easy and fast configuration (ideally using a “parameterizing instead of programming” approach) and enables reusability and standardization of certain components or complete applications (“Automatic Engineering” functionality).

3. Integrate a pilot PLMS and document your experience.

4. Analyze the pilot system and the results it has delivered. Measure these against your company goals (e.g. standardization). Use this analysis to help you define the standard functionalities and characteristics required.

5. Specify the variable elements (user options) which need to be adaptable when using Automatic Engineering.

6. With the support of a specialist in VBA, .NET or C# programming, develop the wizard toolbox and test it under real operation conditions.

7. Use the Wizard for the Automatic Engineering of new Packaging Line Management Systems.

8. If supplementary customization of the system, which is not covered by the Wizard, is needed, use the Development Environment (Editor) to adapt the application perfectly to the packaging line peculiarities or individual requirements.

Conclusion

The success of automation systems, such as a Packaging Line Management System, greatly depends on the underlying software technology selected. Sophisticated concepts such as “parameterizing instead of programming” and “Automatic Engineering” deliver significant advantages – for greater success. When adopting the approaches outlined in this paper, this success increases exponentially over a project rollout.

Have you had experience of using Automatic Engineering? What are your experiences when implementing Packaging Line Management Systems? How did you measure your success? What ROI period did you achieve? Emilian Axinia, Food & Beverage Industry Manager at COPA-DATA is keen to hear your thoughts. Please email him at EmilianA@copadata.com.