



# INDUSTRY 4.0

## and the **FOOD PROCESSING INDUSTRY**



## **PART 2:** CONSIDERATIONS ON THE JOURNEY



The Association for Packaging  
and Processing Technologies



# About this e-book series

This e-book series was created with information from PMMI's "2017 Evolution of Automation: Industry Research Report." The report collected details from interviews with more than 58 CPG professionals (manufacturers, OEMs and technology suppliers) at Pack Expo Las Vegas 2017.

It also leverages the industry expertise of Adem Kulauzovic, Director of Coding Automation at Domino Printing, and the "Industry 4.0 Maximum Efficiency" presentation he gave at the 2018 Industry 4.0 ThinkTank conference in Chicago. Adem brings a wealth of experience in control engineering, IIoT and automation. In his 10+ years at Domino, he's helped customers in a wide range of industries integrate processing and packaging equipment to achieve greater productivity and leverage data to drive better-informed decisions.



The Association for Packaging and Processing Technologies



# Who should read this?

This is the second e-book in a two-part series, so we hope you've read Part 1 already. If not, you can [download it here](#).

This e-book series was developed for plant managers and engineers in the food processing industry who are looking into learning more about the potential of Industry 4.0 technology for their production and packaging lines.

In Part 2, we'll examine the steps you can take to begin or further your efforts toward integrating coding solutions in your lines and realizing the benefits of Industry 4.0 technology. We'll also look at some real-world examples where Domino has helped customers realize productivity benefits along the way.



# Where do I begin?



Change in general is never easy, and the road to Industry 4.0 isn't a particularly smooth one. Among the manufacturing personnel interviewed by PMMI, the most common challenges cited were:

- Justifying capital expenses to advance automation
- Developing the technical skills to implement and support automated machinery and software
- Partnering with the right suppliers

Beyond the physical requirements of connecting disparate machines, there's IT infrastructure to consider and a whole new flow of information to contend with. Some of the challenges ahead in acting on the vast amounts of data available include:

- Lack of skilled resources
- Out-of-date software models
- Inadequate IT infrastructure
- Absence of data standards
- Obsolete data management systems

The important thing to remember is that it doesn't have to be an all-or-nothing proposition. You can take small steps toward an ultimate goal of Industry 4.0 integration and start seeing incremental value right away.



**“Don't tackle the whole line or the whole plant — pick one area that's an easy win to learn from.”**

Let's take barcode management as an example. Many manufacturers have both generic labels and their own branded products. The data is essentially the same, but different labels are required. Why use thousands of different labels? Instead, reduce the codes to several 'templates' with in-house software (for example, Domino's QuickDesign) that can all be managed by a central database.”

Adem Kulauzovic,  
Director of Coding Automation at Domino Printing

## End user operational improvements driving automation



Cost reduction



Faster commissioning, startups and recovery



Automating labor tasks



Making products consistent in quality



Faster changeover



Increasing output



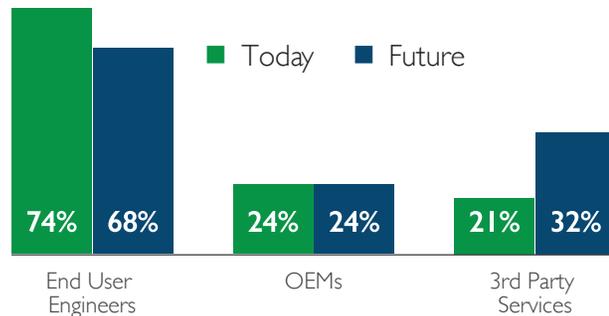
Predictive maintenance

# Who's going to actually make this happen?

Depending on the IT acumen of your internal team, Industry 4.0 technology could be an entirely do-it-yourself implementation, or you might look to OEMs or third-party services for support.

Today, most manufacturers rely primarily on internal engineers to support remote diagnostics and data management, but they envision an increase in third-party services in the future.

## Remote Diagnostics and Data Management

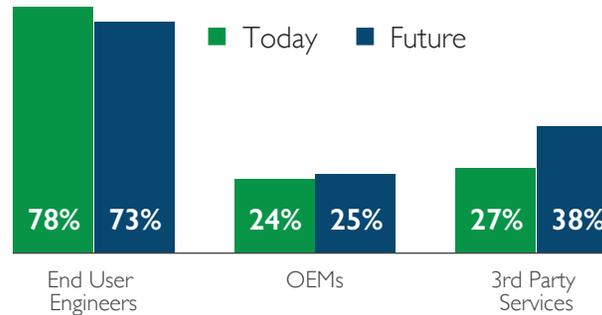


Exceeds 100% due to multiple answers.

Source: PMMI-pmmi.org/research

When it comes to integrating automated machinery, most manufacturers still rely on their internal engineers, but they again predict an increase in third-party services in the future.

## Advancements in Machine Automation and Integration



Exceeds 100% due to multiple answers.

Source: PMMI-pmmi.org/research

The important thing to consider when looking for outside support, whether it's through an OEM or a third-party integrator, is finding someone who truly understands your business, your goals and your needs. No two production or packaging lines are exactly alike, and each industry has its own intricacies that can impact the success of an Industry 4.0 initiative.

## Don't forget about internal training

Lack of skills or competencies will be one of the biggest challenges, particularly for managing and assessing the analytics that come from coding automation.

The National Association of Manufacturers (NAM) Manufacturing Institute Skills Gap study states that **82% of manufacturers have a moderate or serious shortage of skilled production workers**, [TWEET THIS!](#) and 5% of all manufacturing jobs — or 600,000 jobs — are open because there is no qualified talent. In addition, 2.7 million manufacturing employees are 55 years of age or older and likely to leave the labor force over the next 10 years.

As Adem Kulauzovic puts it, **“Creating a culture of employees with manufacturing skills — engineering, skilled trades and production — will be critical. Also, be aware that with the new innovations and processes that Industry 4.0 brings, new job titles and qualifications will most likely need to be created. Positions like line automation manager or automation specialist may be needed to ensure your systems stay running and up to date.”**



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# The importance of remote access

The ability for a machine or device to communicate with the world around it is one of the foundational pieces of Industry 4.0. And having that remote connectivity allows for some immediate benefits with regard to equipment maintenance and management.

Remote connectivity's main advantages focus on faster downtime recovery, cost reductions in on-site services and a diminishing end-user engineering staff.

## Main Drivers of Allowing Remote Connectivity

56% **Faster Downtime Recovery**

46% **Reduced Cost of Travel**

24% **Diminishing Engineering Staff**

9% **Lack of Labor**

Exceeds 100% due to multiple answers

Source: PMMI-pmmi.org/research

While the percentages of machines with remote connectivity are relatively low today, experts predict that 62% of manufacturers will have between 50% and 100% of their machines connected within the next decade.

Percentage of Machines That Utilize Remote Connectivity	Today	In the Next Decade
No remote access	22%	5%
5%-10% of machines	30%	5%
15%-30% of machines	26%	28%
50%-100% of machines	22%	62%

Source: PMMI-pmmi.org/research

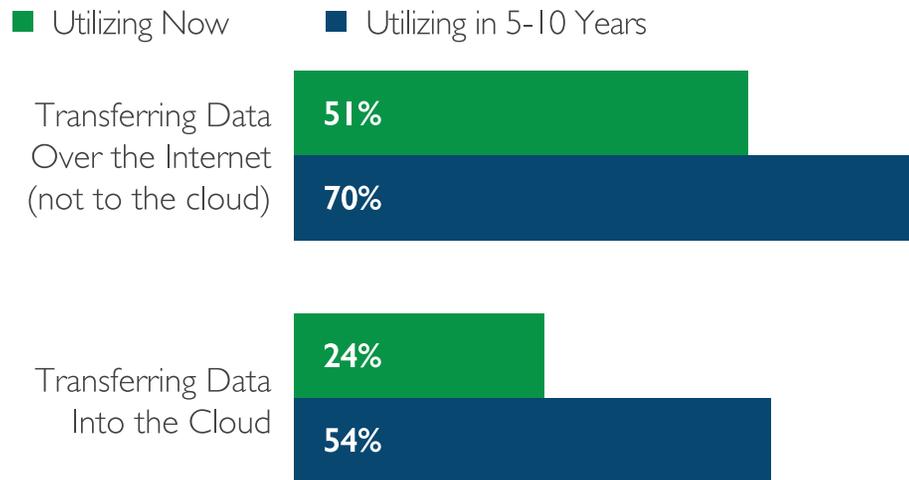
**96% of end users predict that the integration of remote connectivity into new machinery will steadily increase over the next five years.**

Source: 2017 Automation World Survey

# Keeping your connected data secure

Two out of three manufacturers are transferring data over the internet, but most are only thinking about cloud storage and computing; security is the fundamental issue.

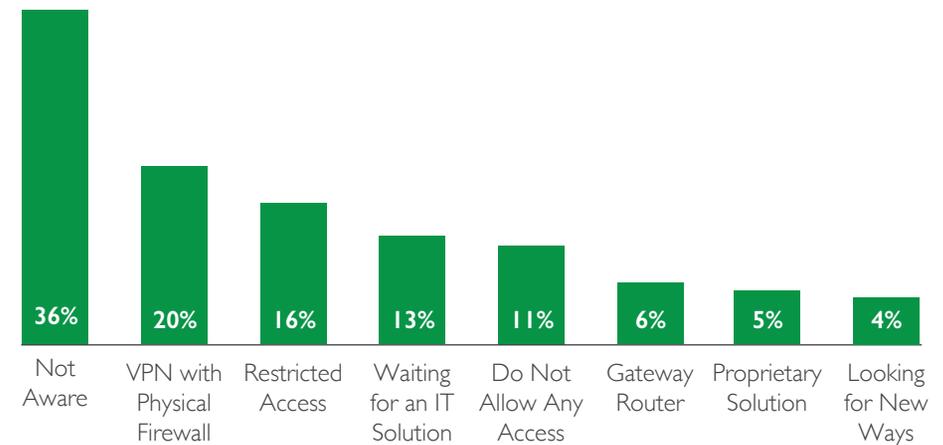
## End Users' Current Use and Future Use of Data Transfer and Cloud Storage



Source: PMMI-pmmi.org/research

Cybersecurity is an understandable concern and continued education is needed for end users and OEMs to become comfortable with continuous data exchange and analysis.

## 1 of 3 End Users are Not Aware of What Solutions Their Company is Implementing for Cybersecurity



Exceeds 100% due to multiple answers

Source: PMMI-pmmi.org/research

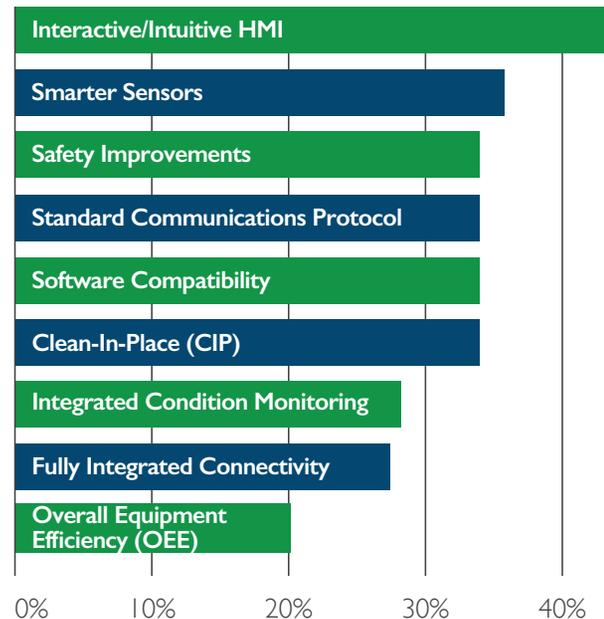
Continuous data exchange and analysis enables a holistic, historical, real-time, predictive view of a company's operations enterprise-wide, but it does present security challenges. Some baseline recommendations for securing this flow of data include:

- Assigning individual logins on a per-user basis
- Using software that stores and encrypts critical data with an audit trail
- Collecting and sending data to a remote storage location (internally or in the cloud)

# Advances in automation

As the equipment on production and packaging lines continues to evolve, manufacturers today are looking at interactive/intuitive human-machine interface (HMIs), smarter sensors and safety improvements as the next steps toward smarter machines.

## Software and Machine Technologies End Users Are Looking For



Exceeds 100% due to multiple answers

Source: PMMI-pmmi.org/research

— **Future human-machine interface (HMI) displays** will combine numerous capabilities into a single integrated program that is governed by a set of recognized international standards.

— **An HMI** provides a visual representation of a control system and provides real-time data acquisition. An HMI can increase productivity via its extremely user-friendly, centralized control center with the power to connect and access processes, operations, training, recipes, videos and more.

— **Integrated condition monitoring** identifies machinery problems or developing faults (vibration, temperature, etc.) and schedules repairs to avoid costly machine downtime. It is a major component of predictive maintenance and automated parts ordering.

# To upgrade or replace?

New technology doesn't necessarily have to mean new machines; many legacy systems can be upgraded to work with an Industry 4.0 system. And some legacy systems can be upgraded with controls, connectivity and motion when it makes sense. Cost is the key determining factor to justify whether to retrofit or purchase new.

- **Program conversions** — The challenge is legacy software not connecting well. Programs have to be converted, and it's a daunting task. End users must determine which is best: to upgrade an existing system or buy new.
- **Upgrades to the interface system** — Legacy machines still have value. Retrofits are often performed to upgrade interface systems to allow bi-directional data exchange internally or with the cloud.
- **Equipment that is 15 to 20 years old or newer** — Data buses like Ethernet, Profibus, Modbus and Sercos can usually be upgraded on a machine, depending on the age of the components. Controls can be upgraded as well.

For older systems, it's possible to upgrade gateways to provide data collection, but there's more security on new machines today with limited user access for making changes.

## Considerations for coding

Manufacturers in the food and beverage industry continue to run older coding systems on their production lines for a number of reasons, including:

- A lack of capital budget to replace the old coders
- The coders are on the books and have not yet been fully depreciated (some coding depreciation schedules are as long as 15 years)
- Current coders work and are easy to fix (which begs the question: Do they work or do they require fixing?)

For those with much older assets in place, there's a tremendous opportunity to gain productivity improvement through the implementation of newer technology that delivers simplification, standardization and efficiency, resulting in dramatic improvements in total cost of operation (TCO).

Also, consider the long-term cost of trying to "make do" with aging technology or hardware. Printers that don't meet a production line's exact coding requirements are more likely to need additional maintenance and consume more ink or makeup than a printer with the correct specifications and setup. Additionally, relying on older coding and marking equipment often requires a backup machine for each printer. These redundant machines — plus service agreements, parts and downtime — further add to costs.

When considering an overall Industry 4.0 roadmap, coding is one instance where the benefits of new equipment can far outweigh those of upgrading older equipment for new connectivity.

## The importance of industry communication standards

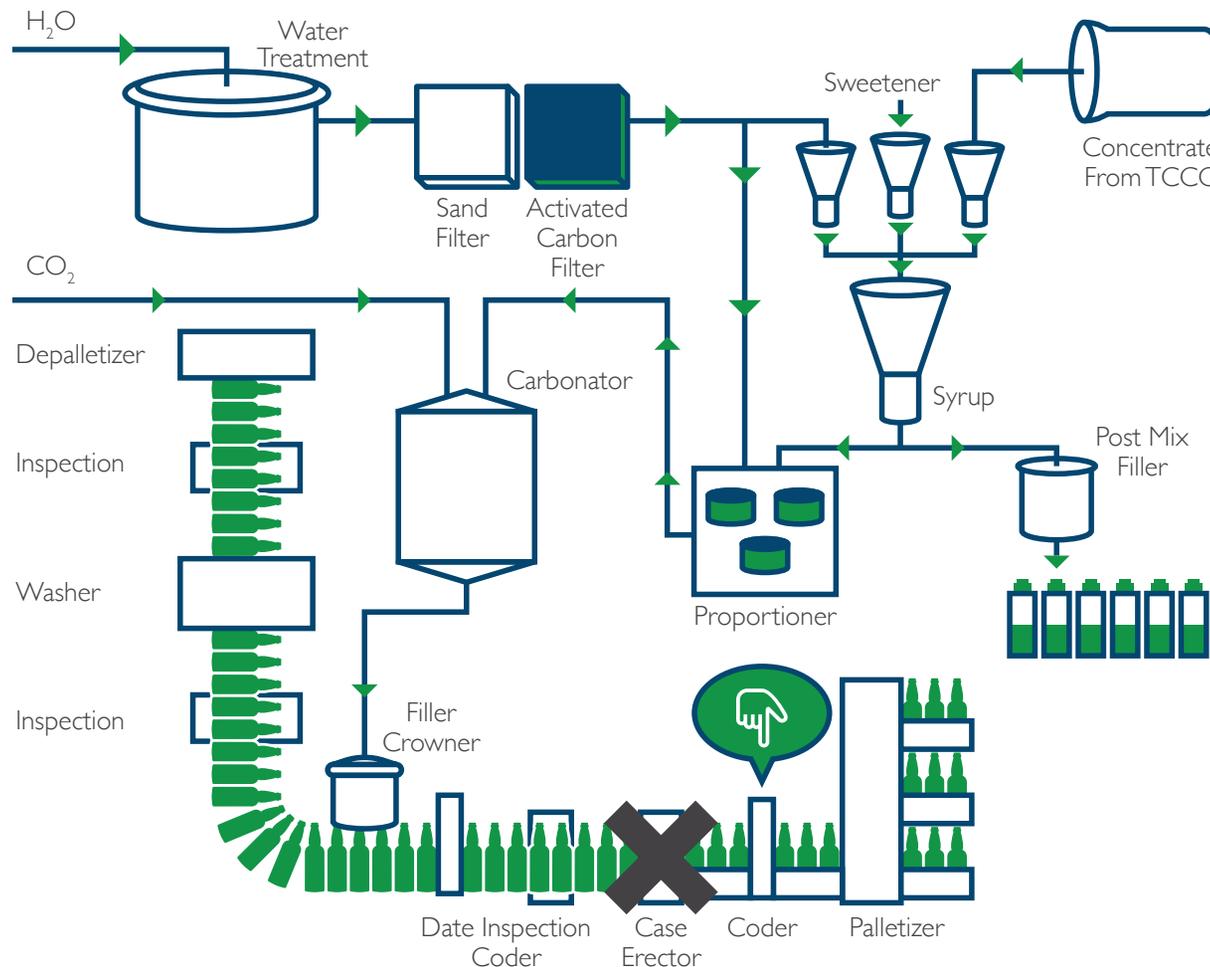
Another important consideration when integrating coding equipment is adhering to industry standard communication protocols. "You may already have an integrated OT network full of PLCs and HMIs, communicating to some larger SCADA or ERP solution," says Adem. "Make sure that your coding equipment can also communicate utilizing the same protocols. Otherwise, you may end up with multiple forms of proprietary hardware gateways and/or middleware that will, if you are lucky, give you limited connectivity and access to data."



# The opportunity of connectivity



Let's take a look at two real-world examples where coding equipment connectivity made (or could have made) a difference in a food and beverage production line.



This large beverage company lacked the capability to integrate its coder into its current system, so all issues were documented by the operator manually on a clipboard.

Based on the written logs, the coder was the bulk of the company's recorded unplanned downtime. The reason given was, "Printer down due to poor code." After numerous technician visits, the root cause was determined to be a malfunction in the case erector that caused it to improperly erect the cases, which in turn meant the coder was not printing in the right position. So the real issue was the erector, not the coder — but based off the reports, the printer was judged to be the issue.

Now, you may think, "Well, if the erector had been integrated, the operators would have seen the fault." This is true, and they did — but since the downtime report pointed to the printer, their assumption was that the case erector was down because it had been taken down to fix the printer.

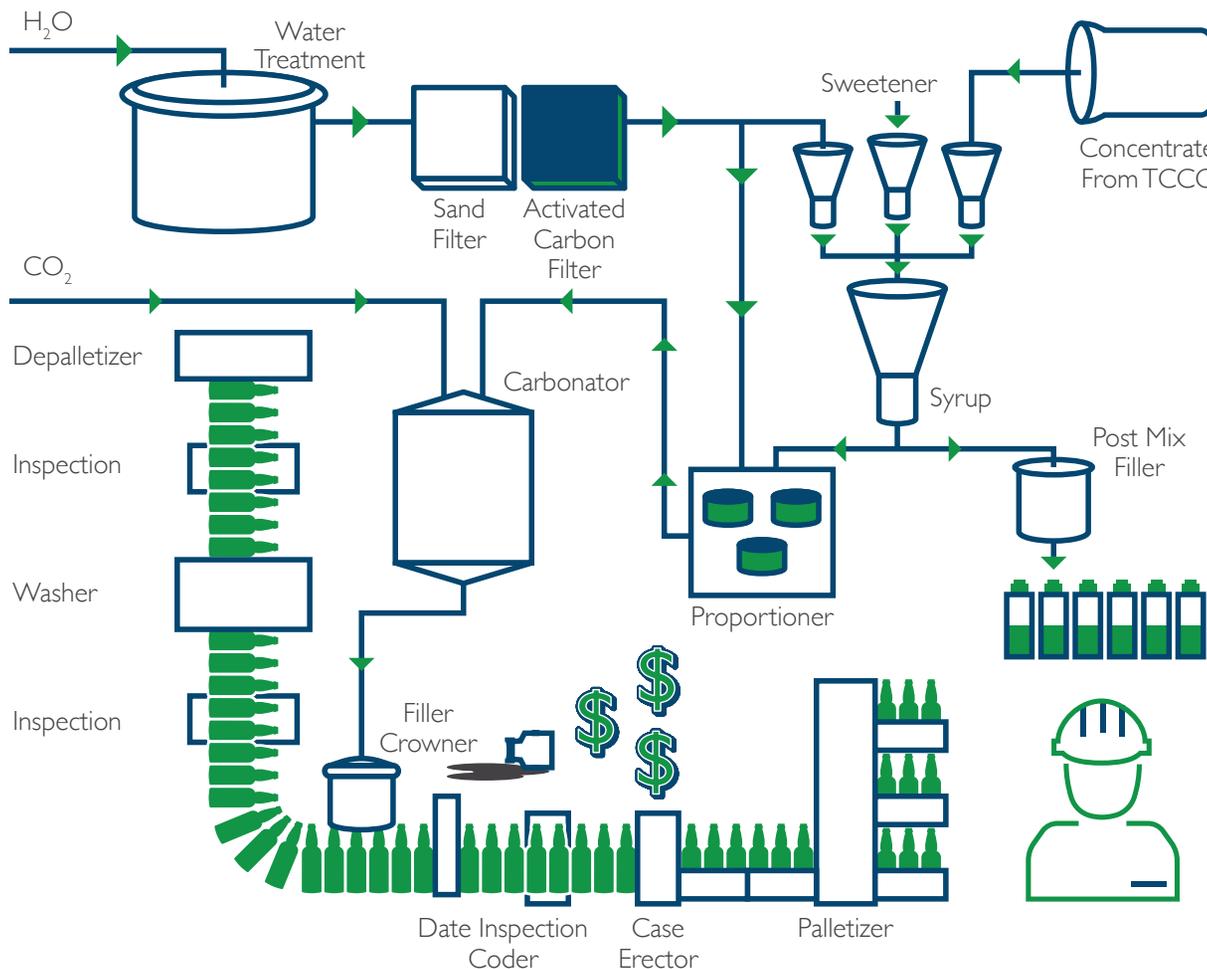
One can see in this example where time, money and resources were being put in the wrong places. While the issue was finally fixed, the lost production time and money could have been avoided if the system had both the printer and the erector integrated. The operators would have been able to see the whole picture and assign resources to the right issue.

## The opportunity of connectivity (continued)



In this example, another beverage company had limited data integrated into its SCADA system.

The company was looking at its running costs and found a major variance between the estimated and actual costs of its printer consumables. The company determined its costs per 1,000 codes by comparing the number of bottles printed (by counting the number of pallets produced) to the number of ink cartridges used. From these calculations, it appeared the company was using three times as much ink as previously assumed. This, of course, caused an issue, since the company's annual consumable budget had begun dwindling long before the end of the year.



Upon closer inspection, we saw a discrepancy between the number of bottles the company said had been coded and the number the printer reported it had coded.

When we mentioned this, our customer quickly realized what was going on. The date coder was ahead of the inspection equipment on the line, which meant every bottle was being coded (good or bad). Our customer was only counting the bottles that were good and packed for shipment — there was no way of counting the number of bottles being rejected.

After management started paying attention to the large number of rejects, they found several issues — prior to coding — that were causing the problems. Once the print count was implemented, not only were they able to confirm that estimated ink usage was accurate, but they also found some additional undetected issues that were cutting into their operating costs.

After integrating the printer into its SCADA system, this company was able to get a better picture of what its real efficiency was and how much cost it was incurring due to scrappage.

# Fulfilling the promise of Industry 4.0

While the manufacturing industry might not be considered the most cutting-edge sector overall (especially food and beverage), plant managers and engineers are looking toward the future of integration and automation to deliver significant benefits.

## The top five operational improvements manufacturers want to achieve from automation:

- 41%** Run Multiple Sizes
- 33%** Reduce Labor
- 29%** Measure Line Efficiency to Maximize Uptime
- 24%** Shorter Runs
- 22%** Minimize Changeover Time

Source: PMMI-pmmi.org/research  
Exceeds 100% due to multiple answers

## Manufacturers expect automated machinery to reduce labor through:

- Run consistency
- Zero breakdowns
- No defects and less waste
- Maintenance performed while machines are running
- HMI dashboard interfaces
- Mass personalization with just-in-time (JIT) inventory

## And they expect software automation to improve data acquisition with:

- Measurement of machine performance
- Real-time data through MES
- Predictive maintenance
- Digital simulation
- Accurate TCO and OEE

Getting there takes a concerted and cooperative effort among manufacturers, OEMs and third-party service providers.

Domino can help. We have experts with years of control engineering and integration experience. But more than that, we'll take the time to listen and truly understand your goals and needs. We understand the manufacturing industry because we work with customers just like you, and we share the pride you take in a smoothly running and productive line.

Call us today at **800.444.4512** or visit **[www.domino-printing.com](http://www.domino-printing.com)** to learn more.

# SPEAK to the EXPERT



**Connect with Adem on LinkedIn**

In his 12+ years at Domino, he's helped customers in a wide range of industries integrate processing and packaging equipment to achieve greater productivity and leverage data to drive better-informed decisions.



Share this e-book!



## Where do we go from here?

We hope you enjoyed our e-book series, "Industry 4.0 and the Food Processing Industry." We'd also like to invite you to download our newest white paper — "Three ways coding and marking can make bakery operations sweeter." Download our white paper today to see how different coding technologies can address the challenges of today's baking industry.

[Download our white paper.](#)

## About Domino

Domino provides a broad portfolio of innovative industrial coding and marking solutions developed in collaboration with customers in food and beverage, life sciences, manufacturing and other industries. Beyond delivering the latest printing technologies and Industry 4.0 connectivity, Domino brings four decades of knowledge and expertise to help companies maximize productivity and OEE with agility to meet the changing needs of today's fast-paced world. Domino is more than a mark.

Domino printing technologies include thermal transfer overprinting, thermal ink jet, continuous ink jet, print-and-apply labeling, large character inkjet and laser.

[Learn more about Domino solutions here.](#)

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# Domino sponsors Industry 4.0 ThinkTank

On January 31 and February 1, 2018, Domino and Optel sponsored the Industry 4.0 ThinkTank event in Chicago. Billed as the largest Industry 4.0 event in North America, Industry 4.0 ThinkTank brought together experts from all over the world to discuss how the 4th Industrial Revolution and IIoT will change the face of business today and tomorrow.



“Think big, start small, go fast.”

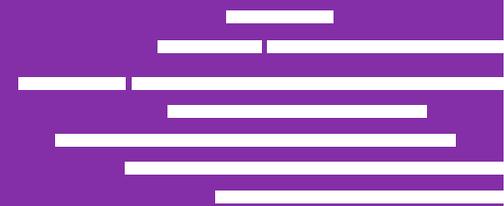
- Scott Christensen,  
Speaker, GrayMatter



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