



INDUSTRY 4.0

and the **FOOD PROCESSING INDUSTRY**



PART I: BUILDING THE CASE FOR CODING INTEGRATION

Who should read this?

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.

If you're already running digital twin simulations to prototype and fine-tune performance tweaks prior to implementing them in real time on your fully integrated and automated lines, these e-books might be a little basic for you.

But if you're curious about how getting the various components on your line (for example, your coding and marking equipment) to talk to you, and to all the other equipment, could help you get a better view of what's going on — day to day, or even minute to minute — we've got some answers for you.

If you're wondering how coding automation could help you improve productivity, reduce errors, streamline maintenance and avoid unplanned downtime, you've come to the right place.

Part I of this e-book series was created to provide you with an overview of automation/integration/Industry 4.0 as it pertains to the processing and packaging of food.



What exactly are we talking about here?

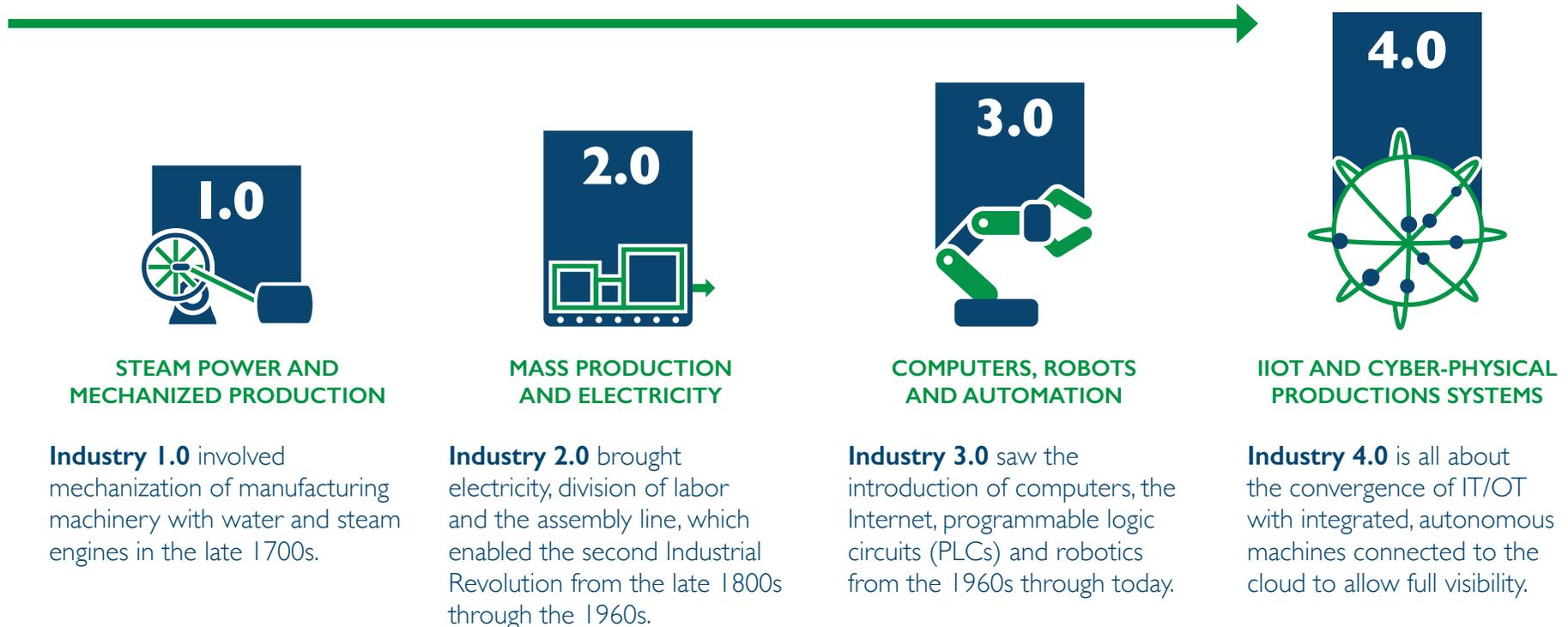
Do a Google search for “Industry 4.0” and you’ll get several million results that talk about cyber-physical systems, IoT, cloud computing, big data, artificial intelligence, virtual reality, machine learning, “cobots” and a dozen other high-tech buzzwords.

In simpler terms, Industry 4.0 is about smart manufacturing systems.

On the plant floor, machines and sensors on the line are able to share operational data with each other and with a central system located on-site or in the cloud. Just as smart thermostats, appliances and wearable devices are bringing the Internet of Things (IoT) to homes around the globe, the Industrial Internet of Things (IIoT) is connecting previously disparate machines and systems on the manufacturing floor.

This unprecedented level of connectivity allows information to be captured at every point on the production process and throughout the supply chain. The resulting data can then be analyzed and managed to make every manufacturing sequence as fast and accurate as possible — from highlighting bottlenecks to indicating the need for maintenance before a failure occurs.

The road to 4.0



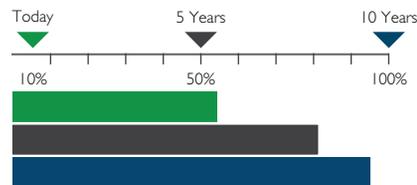
The competitive demand to adopt technology



Keeping pace today means staying one step ahead of the competition. Every opportunity to improve performance or reduce costs is adding up more quickly than ever, and companies are looking to automation on the plant floor to help improve flexibility and efficiency in operations.

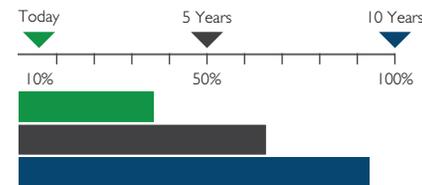
The chart below shows a forecast of how automation will advance at packaging and processing companies from today to five or 10 years from now.

Machine automation



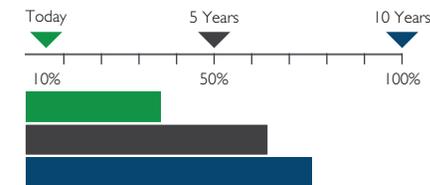
Machine automation controls a process with electronic devices, minimizing or replacing human intervention. Nearly every company that was surveyed operates automated machinery at some level. There is an extreme range of technology in use, with the vast majority of lines still relying on a human component.

Data acquisition



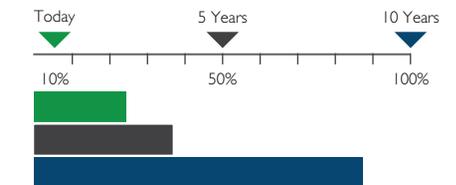
Data acquisition measures real-world physical conditions and records them for historical reference. Four of five plants are collecting machine data at some level, both manually and automatically, but most plants today are not effectively using data. Easier-to-implement solutions will encourage more companies to collect and upload data to a central system, to the edge or to the cloud.

Overall Equipment Effectiveness (OEE)



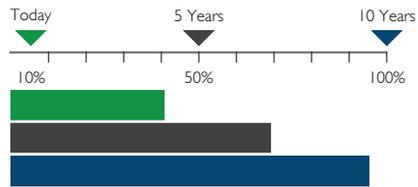
Overall Equipment Effectiveness (OEE) calculations are based on a system of automated processes and motion that can increase productivity. Larger companies are working with OEE more, but it needs uniform calculations and has to become a standard HMI function. Interest in OEE is increasing, along with expanded data acquisition.

Process optimization



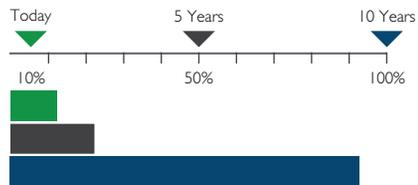
Process optimization is already ingrained at most companies. Advancement correlates to the IIoT and Industry 4.0 and supports a holistic plant floor view. Artificial intelligence, digital twins and augmented reality will optimize machine design, development, operations and maintenance within the next 10 years. Data will help optimize the manufacturing process as more data analysis experts enter the field.

Machine automation



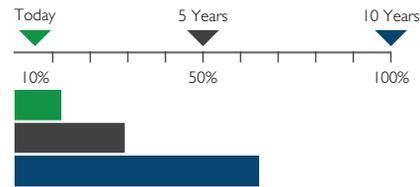
Line integration provides real-time insights to prevent and diagnose issues. Most of the respondent companies' lines are greater than 50% integrated, with a handful of companies reporting 100% synchronization. Many lines remain loosely integrated due to existing assets; new lines are designed to be connected. Manufacturing lines in Europe generally operate at a greater level of integration.

Predictive maintenance



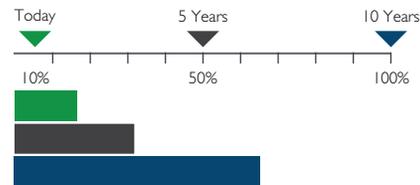
Predictive maintenance (PdM) helps determine the condition of the machine to predict when to perform maintenance. Current automated maintenance is primarily reactive, but in some cases is scheduled. The future of sensors and warnings will allow equipment to do its own condition monitoring. It will take a decade to be able to utilize big data properly on a large scale.

Total productive maintenance



Total productive maintenance (TPM) or autonomous maintenance plans provide operators with more responsibility and allow them to carry out preventive maintenance or autonomous maintenance. The operational possibilities of analyzing maintenance information are just emerging.

Full IIoT/Industry 4.0



Full IIoT/Industry 4.0 is a continuous-flow application that requires an integrated control platform with data collection and management systems — as well as software — to collect, monitor, store, mine and report on the data for use in real-time decision making on the plant floor. The industry is actively discussing continuous flow and is just starting to adopt it. Cybersecurity needs to be improved at all levels.

PMMI estimates that **\$28.9 billion** will be invested on new equipment in 2018 with a key focus on IIoT and remote connectivity. [TWEET THIS!](#)

Why Industry 4.0 matters for manufacturing

As automation technology continues to advance, manufacturers are faced with an expansive array of choices. From something as basic as upgrading an individual machine component to more complex solutions centered on automated data collection and a robust cybersecurity package, manufacturers have many innovative solutions that can be integrated for a full view of the plant floor.

Across all manufacturing industries, six major trends are driving plant floor automation:

1. Lack of skilled labor/labor shortages
2. Global increase in product demand
3. Rising demand for flexible manufacturing
4. Producing products with consistent quality
5. Overall operating cost reductions
6. Smart machine technology

Why Industry 4.0 matters for food production

For food manufacturers, rising consumer demand for variety in flavors and styles has led to SKU proliferation, which results in fewer long, dedicated runs of one product and more frequent line changeovers.

Automation can help reduce the time needed for line changeovers overall, and it can help reduce the potential for errors when entering new coding data.

Even without integration into a larger manufacturing system, connected coding and marking equipment can alert operators when any parameters are approaching an out-of-spec condition or let them know ahead of time when consumables are running low or maintenance will be required.

Capital budgets are forecast to grow in food

45% of the food companies interviewed predict spending more on capital equipment in the next 24 months. Drivers included:

- Clean labeling
- Automation advancements
- Proliferating SKUs that are increasing changeover costs



Reducing coding errors is a key benefit

Coding and marking, which typically take place at several points along the manufacturing line, might seem like a relatively minor part of the whole process of turning ingredients into finished products. But when errors are introduced...



Production stops



Deadlines/quotas are missed



Waste/rework is created



Traceability is endangered



Corporate liability increases

Consider a typical food processing/packaging line:	
Average message length	6 characters
Number of coders	3
Packaging production line count	4
Production changes per day	2
Days in a year	365
52,560 characters entered per year	

Now consider that the average human makes one mistake for every 300 characters entered. [TWEET THIS!](#)

Integrating the coding equipment with an Manufacturing Execution System (MES) and automatically pulling codes from a central system can save a lot of headaches down the road.

SPEAK to the EXPERT



in

Connect with Adem on LinkedIn

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.

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So, where is the industry with regard to Industry 4.0?



Given the complexity of the technology — and the need to maintain a functional manufacturing line at the same time — adopting automation is, not surprisingly, a gradual process. Six key reasons for the gradual nature of the process:

1. Cost is always the bottom-line driver; automation is a large investment, which means slower adoption.
2. Lack of qualified labor is driving the need for more intuitive human machine interfaces (HMIs).
3. Barriers exist between IT and OT, and cybersecurity must be implemented.
4. Legacy equipment remains in use and manual operations are sometimes more efficient.
5. Disparate communications systems on the same line pose a challenge.
6. Footprint is always top of mind, with an emphasis on efficient use of space.

The number of integrated machines compared to stand-alone machines at a manufacturing site depends heavily on the age of the equipment and the product on the line.

From this table, we can see that the machinery on 18% of processing lines is fully integrated, but 27% of processing lines have more than 50% stand-alone machines.

On the packaging side, 21% of the lines are fully automated and 29% still have more than 50% of the machines operating in a stand-alone fashion.

“ One of the biggest pitfalls is not getting the right people involved.

“This can be the difference between having an integrated system working in three weeks or three years. With the uptick in network connectivity, higher bandwidth usage and remote and virtual access, it’s important to bring in representatives from across your business (IT, QC, operations, database) so they’re all on the same page. By doing this, you can ensure that your network will be secure and functional, and operate as expected.”

Adem Kulauzovic,
Director of Coding Automation, Domino Printing

	Percentage of Machines on the Line	Stand Alone	Some Integration	Fully Integrated
PROCESSING Lines 	<50%	36%	9%	21%
	>50%	27%	6%	39%
	100%	6%	3%	18%
PACKAGING Lines 	<50%	32%	9%	29%
	>50%	29%	3%	32%
	100%	6%	6%	21%

Source: PMMI-pmmi.org/research

Three packaging lines are integrated out of six, with stand alone equipment on some.

Why has food fallen behind?

Compared to other industries, food and beverage has been slow to adopt automation due to:

- Lower margins
- A high degree of material variability
- A long-standing, traditional method of manufacturing

There's a strong sentiment among plant managers of food production lines that, "If it's not broken, don't fix it." And that's understandable. A lot of time and effort goes into planning, implementing and maintaining a smoothly running line. But like everything else in the world, nothing is standing still. The retail market demands ever-greater customization, and faster line speeds are needed to meet increasing demand.





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.](#)

MORE THAN A MARK

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