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INDUSTRY BRIEFING: DIGITALIZATION IN FOOD & BEVERAGE

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Digitalization: The Future of Food & Beverage

By Chris McNamara, Smart Industry Content Director

□ Digitalization changes all areas of life: the way we stay informed, the way we travel, the way we buy things, and the way we manufacture products from cars to cookies to cream. The massive power of digitalization—the great opportunities and great risks—is changing business models daily. As such, the pace of an enterprise’s innovation and the willingness and ability to change are key success factors in global competition.

To capitalize on this revolutionary period in manufacturing, food & beverage companies must leverage digitalization advantages in everything from restructuring the value chain to embracing virtualization to capitalizing on the full breadth and power of the IoT. The Digital Twin must be employed by companies looking to make themselves smarter.

Likewise, companies must recognize the value in the mountains of new data they are producing and position themselves to properly analyze this data to drive faster, more-informed business decisions. Data analytics as a field is maturing—more decision-makers are aware of the value here and recognize the competitive advantage for their companies. But it is still hard. Companies are struggling with master data and data governance, trying to avoid garbage in/garbage out scenarios. The most advanced companies will drive competition with prescriptive analytics and Artificial Intelligence. They will use analytics to steer their business, rather than analyzing through the rearview mirror.

Tools employed for digitalization differ by business and vary from one type of manufacturer to another. This much is obvious. But another dif-

ferentiator is how well enterprises process the data about their operations. Data is only valuable when it is actionable, just as digital transformation is only realized by taking the first step into Industrie 4.0.

The key is taking that first step.

DO IT DIFFERENTLY, DO IT BETTER

Let’s begin by defining the term digitalization. In short, it means optimizing business processes through the adoption of a host of new digital technologies—big data analytics, IT/OT convergence, Digital Twin, Artificial Intelligence, even 3D printing and robotics. Elements of digitalization (or digital transformation or Industrie 4.0) are applicable across industry and manufacturing, including food & beverage.

Because the food & beverage industry faces unique challenges (seasonal demand changes, increasing demand for differentiated SKUs, increasing regulatory/quality restrictions, complicated production planning and the sheer scale of the industry production), it is uniquely situated to take full advantage of the benefits of digitalization.

THIS IS A GOOD THING

Consider these examples...Online grocery sales are booming in North America and western Europe; big data analytics affords the food industry deep insights into shopping trends and the ability to predict (rather than react to) customer needs. There’s an increased demand for variety in food & beverage products; smart factories enable greater, cheaper customization than has ever been possible. Seasonal

demands require food processors to pivot quickly; IT/OT convergence enables plant operators to fully understand how their facilities are responding to changes in production.

SO HOW DOES YOUR ENTERPRISE GET STARTED?

The concept of digitalization can seem daunting, but it needn't be, particularly in the world of food & beverage, which is accustomed to frequent change. Digital tools are at the ready for players in this space, with early adopters already reaping real rewards. But a mindset of change—a willingness to reimagine longstanding approaches to business—must be adopted across the enterprise, from

the decision-makers in the C-suite to the machine operators on the floor.

Specifically in the food & beverage field, approaches to adopting digitalization play particularly important roles in a program's success.

First, the digitalization program must be implemented in a strategic, holistic manner, supported by properly trained, fully engaged stakeholders with business-driven KPIs for success. All parties should recognize that in digitalization, process and organizational change are equal parts of the transformation. Recognizing this is critical for companies looking to drive best practices and minimize customization.

Next is prioritizing which parts of the enterprise to go after first. No one can do this all at once.



Enterprises must determine where value will be delivered first, which is dictated by clear business imperatives and KPIs that engage all stakeholders who drive this vision. Stages are prioritized and sequenced to build a foundation onto which additional capabilities can be layered. A time-to-value mindset should inform these strategic decisions.

Constant engagement with stakeholders must be maintained by frequent communication and collaboration. It is critical to partner and communicate with everyone throughout every step (though consensus, which can paralyze progress, isn't always the goal).

Digitalization offers a different, faster, better approach, but be mindful of the pitfall of trying to digitize or automate current work rather than creating new ways of business.

Consider developing a Digital Twin of the value chain, including MOM and Automation. This is a key part of the overall digital thread, and one that should be aligned with the broader master data-management scheme, which is critical in supporting the Digital Twin. Likewise, prioritizing the creation of data, and maintaining and making actionable all analytics is critical. The main focus of this effort is transparency and driving better decisions across the enterprise.

In order for digitalization to impart real change in an enterprise, it must be considered more than just another way to increase efficiency. Digitalization must be launched strategically, supported fully by all stakeholders and viewed as an upgrade to the entire business model. ▣

CELEBRATING THE GROWTH OF THE DIGITAL ENTERPRISE

Siemens' commitment to digitalization is on full display at the annual Hannover Messe conference, where representatives demonstrate the portfolio of solutions that enable companies of all sizes to optimize their efforts. Digital Enterprise, as the offering is labeled, connects the virtual and real production worlds through machine and plant simulations, Digital Twins and data analytics. These solutions are specifically geared toward the varying requirements of discrete and process industries. The seamless



interoperability of Siemens automation hardware and software enables companies to not only collect and process the data of machines and plants, but to turn data into competitive advantages. The motto "Discover the value of the Digital Enterprise" highlights the exciting new technologies that provide opportunities to reduce time-to-market, improve flexibility, expand individualization capabilities and increase efficiency and quality.

Digitalization trends in the food & beverage realm play an increasingly large role at this conference. High cost-sensitivity and mass production, as well as a growing variety of flavors and innovative packaging, are hot topics. Siemens frequently uses successes in the dairy and brewing sectors, for example, to demonstrate that both process and discrete workflows in the food & beverage industry can benefit from digitalization.

A Half-Century of Success, A Revolutionary Approach to the Future—Siemens Case Study: AMWAY

□ Digitalization creates myriad benefits for a range of industries, and nowhere is this truer than in the food & beverage space, which has its own unique set of challenges and opportunities. Each player in food & beverage is different, naturally, but lessons learned from enterprises that are successfully adopting elements of Industrie 4.0 can be widely applied.

With that in mind, consider the case of AMWAY, a global leader in the health, nutrition and home-care markets. While AMWAY boasts a half-century of success with its direct-selling business model, it recently implemented Siemens' Teamcenter digital thread as a transformation to revolutionize—and optimize—its approach.



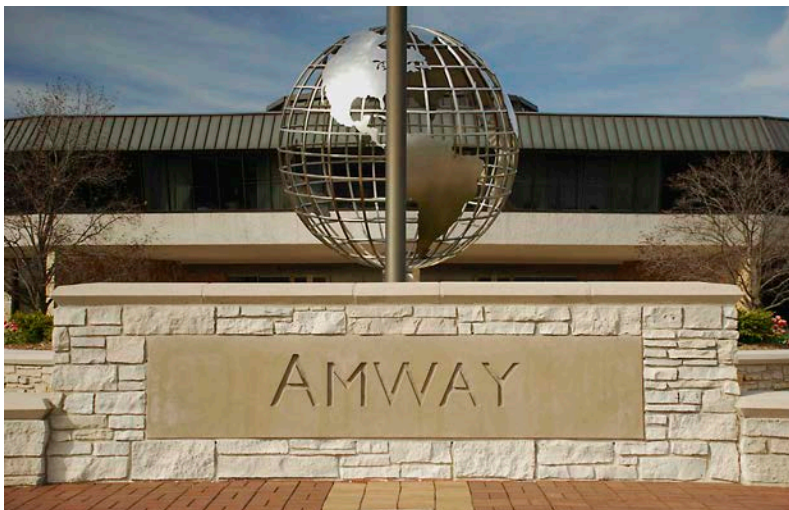
Left: Patrice Gausselein, AMWAY director of R&D strategy and business operations. Right: Catherine Ehrenberger, AMWAY vice president of R&D



“Our focus on time-to-market and responsiveness has challenged us to identify areas to eliminate low value-add activities,” explains Patrice Gausselein, AMWAY Director of R&D Strategy and Business Operations. “Our specifications were managed in a document structure, which is very manual and time-intensive. Siemens' Teamcenter

platform provides us a common tool for various functions to use for product content. It replaces many standalone systems, which had created silos of inefficiency. And the platform improves accuracy, reliability and introduces a field-based data structure for analytics.”

Analytics at AMWAY (like many food & beverage companies) is complicated. In addition to a host of other products, from cookware to cosmetics, AMWAY produces and sells vitamins, energy drinks and protein bars. In fall of 2016, the company began rolling out this digitalization process for its five major business lines—Durables, Home Care, Personal Care, Beauty, and Nutrition, which was selected for the most aggressive digitalization strategy. “Nutrition is a very regulatory-





“Nutrition is a very regulatory-driven industry and the ongoing need for updates to label, ingredient disclosures and global registrations pose reoccurring challenges.”

Todd Slater, AMWAY manager R&D global systems

driven industry and the ongoing need for updates to label, ingredient disclosures and global registrations pose reoccurring challenges,” explains Todd Slater, AMWAY manager R&D global systems. “Having our product content in a single software solution has many merits, which we hope to realize quickly after implementing this software. Our shift from a siloed, document-based to field-based structure should provide huge foundational benefits we’re eager to realize.”

The AMWAY business case is built around the efficiency gains and reduced cycle-time for managing product content in a field-based structure with assigned field owners. This digitalization effort with Siemens creates a solution with integrations to other supply chain solutions to eliminate the need to rekey, which can result in inaccurate data. Likewise, Teamcenter enables AMWAY to identify previously hidden opportunities to boost efficiencies, expose new synergies, and increase overall effectiveness in how product content is defined and flows from early product development through end of product life.

It’s no small feat. Guiding enterprises through the adoption of the PLM portfolio is the job of Siemens client executives like Rick Davies. “As with many companies I work with, AMWAY was coming from a world where each business line and functional area had its own set of tools. Everything was document-based.

AMWAY executives realized that this setup wasn’t agile. There was wasteful churn. But they had a vision for where they wanted to be.”

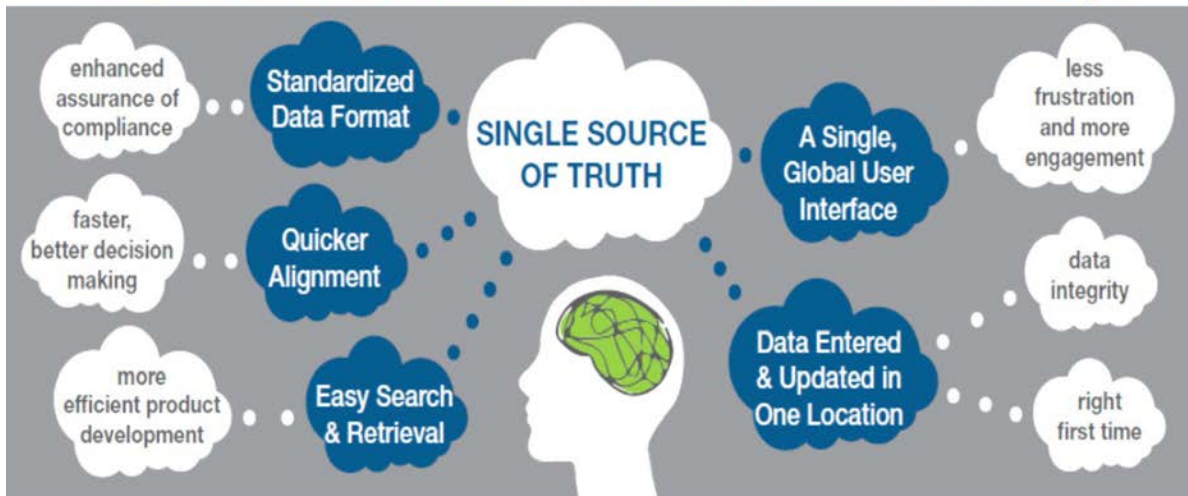
That vision included organizing all master data and taking a data-driven, strategic approach to product information. All functions of R&D and manufacturing are included in this digital transformation, from the development labs to the manufacturing floor. Regulatory teams and their counterparts in labeling now work on the same (digital) page. The supply chain operates with an efficiency that was



only a dream as recently as a year ago. “There are challenges in cleaning up data,” admits Davies, who notes that a history of maintaining multiple sources of siloed data (managed by multiple functioning areas) was particularly challenging. “This was one of the primary drivers of AMWAY’s PLM business case and helped justify their investment.”

The client executive knows his Siemens software and its capability to transform enterprise operations. What most impresses Davies in this case is the willingness of AMWAY associates to adapt their operations. “They recognize that digitalization requires change and they’ve done a terrific job with that throughout the organization. Training and early Change Management was considered critical to success and has gone smoothly. Communications throughout this process have been clear. There is terrific support from leadership.”

Today's Global Needs and Wants: We listened and common themes emerged



Catherine Ehrenberger, AMWAY VP of R&D, earns particular praise from Davies. “She got the whole company to stand behind this initiative and move forward,” he says. “Catherine and her fellow executives studied this process from a personnel perspective, from a financial perspective and from an overall business-performance perspective. They understood that this would increase productivity, attract good talent, realize more agility and help accelerate AMWAY’s go-to-market timing across their wide, varied product portfolio.”

The digital thread running through the entire enterprise ensures that data is accurate and entered just once, rather than being transferred from document to document. “We are striving for greater management of IP, from initial R&D development through the Supply Chain lifecycle,” says Ehrenberger. “This accuracy of information will enable us to make better decisions with simple things, which is critical to support both new product development, ongoing production and to be responsive to marketplace impacts like new regulations. We are encouraging re-use of information, such as test methods, as a means to eliminate wastefulness.”

Like other food & beverage enterprises, AMWAY is particularly suited to digitalization because the

company operates in a continuously changing market. Consumers wield tremendous power; when they demand change, companies must respond quickly. “As such,” says Davies, “food & beverage companies must transform themselves from the town-store model to one that is more agile, and nimble. This can be a tricky process, but implementing a digital thread enables you to get it right the first time, every time, while reusing (rather than recreating) knowledge. When AMWAY is producing, say, a protein bar, they can now access all existing assets related to that product.”

Davies cites the Siemens concept of the “single source of truth”—making sure there is a trusted, shared repository of information throughout the digital thread, always accurate and available to stakeholders, which eliminates redundant efforts and boosts efficiency. This is at the core of the Teamcenter platform and at the center of AMWAY’s digitalization transformation.

“It’s about bringing together all of the information,” says Ehrenberger. “It closes the loop from ingredients to quality control to formula to supplier to transportation. The goal of the digital thread is end-to-end traceability. This is central to our master data strategy.” □

Digitalization—Unlocking Unlimited Potential for Consumer-Products Companies

By Suzanne Kopcha, Vice President, Consumer Products and Retail at Siemens PLM Software

Increased challenges in the consumer products industry are creating dramatic shifts in what companies need to do to stay competitive in the marketplace. The growing demands of globalization are adding complexity to all parts of the supply chain, including ensuring a product's quality and timely delivery. Increased demands of consumers for personalization and one-day delivery are requiring companies to operate in new and innovative ways, and at warp speed. Consumer products companies must work on a global scale, while maintaining flexibility, speed, quality and innovation within their businesses. The most innovative of these companies are using the power of digitalization—i.e. the integration and information sharing among multiple digital technologies—to transform their businesses and better connect to consumers to drive innovation. Leveraging IT software technologies that have been boosting productivity for discrete manufacturers for years—such as product lifecycle management (PLM), advanced simulation and big-data analytics—these companies are beginning to reap the same benefits. Digitalization can unlock unlimited potential for consumer products companies by enabling them to deliver consumer preferred innovation, at a speed they never thought possible, with productivity and profit that deliver top and bottom line results.

EXTERNAL FORCES CREATE CHALLENGES AND OPPORTUNITIES

The consumer products industry is going through more change than it has seen in the last 50 years. From food to cosmetics to household cleaners, there are 30

times as many new product lines launched each year as there were in the 1960s, with the numbers rising sharply since 2000. Whether these new companies are growing to support Asia's increasing population or introducing new products to satisfy the personalized demands of consumers and retailers, there are more consumer packaged goods than ever before. As an example, Mintel adds 33,000 new products each month to its global database. Companies must manufacture billions of each new product, in hundreds of different manufacturing environments around the world, and for thousands of global customers. This level of scale and complexity is exacting a toll. Many consumer products companies are seeing the complex needs for supporting current business drain the innovation capacity of research and development organizations, just at the time when consumer demand for innovation is increasing.

Today's consumers demand more of brands, including integrity and authenticity. The rapidly growing millennial generation looks beyond obvious features and benefits of a product, and is now looking for ethically sourced ingredients, formulas that aren't tested on animals, sustainable manufacturing that doesn't involve child labor, and recycled or recyclable materials. To get a product into consumers' shopping baskets, companies must pay strict attention to everything from the recipes for their products and where materials are sourced, to working conditions and purpose-driven marketing, all while introducing new consumer-preferred products to the market faster than ever before.

And it's not only consumers who are paying atten-

Increased demands of consumers for personalization and one-day delivery are requiring companies to operate in new and innovative ways.

tion to ingredients. Over the last five years, regulatory agencies have been demanding more and more product documentation. Companies must ensure they meet the ever-increasing regulatory demands, such as the new Food Safety Modernization Act. Companies must be responsive enough to quickly bring new products to market to win consumers, but precise enough and with the high quality necessary to satisfy regulators.

And they must do this on a global scale. Global multi-location operations mean original product formulas and their manufacturing processes must be adapted for the materials and equipment available, in compliance with local regulations, all while maintaining the consistent product quality consumers demand. Controlling product quality is essential to maintaining brand integrity, which is more and more important to today's buyers.

Finally, the massive scale of production presents a unique challenge for consumer products companies. When you make billions of units of a product, it's the efficiency of development, manufacturing and distribution that dictates whether you make a profit on your innovation. That's a very different problem from what is seen within discrete industrial manufacturing companies, where a bill of materials may contain millions of items, but products are made in only a few facilities. Consumer Packaged Goods is truly an industry of a different scale and complexity.

Yet, just as the industrial manufacturing industry segments have turned to digitalization as a solution to many of the complexities faced in their businesses, consumer product industries now have the opportunity to embrace these same solutions to meet changing needs within their business. The business is very dif-

ferent, but many of the tools and process changes that have reaped rewards for more mature users of PLM systems are relevant to solve the challenges consumer products companies face today.

HIDDEN DATA LIMITS PRODUCTIVITY AND INNOVATION

External market forces aren't the only challenges facing many consumer products companies. Today, few consumer products companies have a common data structure or a shared information platform for information used in the different phases of design and manufacturing. This means that there's no single source of truth even for a single product. Often the most valuable information and insights are difficult to share within a project or transfer to other projects, limiting re-use of critical information and causing non-value-added replication of work already done. Single data items can be re-entered more than 10 times across different systems in the value chain, creating dozens of opportunities for mistakes, not to mention the wasted productivity.

A compelling example: individual ingredients are often used in multiple different products; changing just one ingredient used in 20 products manufactured across the globe can easily mean updating 2,000 different specifications and more than 100,000 data items. Far too much non-value-added work at a time when 'speed to market' is essential for survival.

FROM DIGITAL TO DIGITALIZATION—UNLOCK YOUR DATA AND UNLEASH YOUR PRODUCTIVITY

The good news is that all the data you need to supercharge productivity, enhance customer value and

unleash innovation is probably already available inside your company, and already digital. What's needed is a common software platform that turns all that data into useful information that is not only secure, but also easy to find, understand, act on and re-use. And that is the essence of digitalization. Discrete manufacturers have been using PLM software systems for years to establish a digital enterprise backbone that serves as the single source of truth for all product information. And now more and more consumer product companies are starting to do the same thing.

An advanced PLM system creates a broad, transparent view across all the stages of a product lifecycle, making business planning much easier. It can help consumer products companies make smart decisions and respond to change more quickly. Having transparency of data allows for both descriptive and prescriptive analytics, bringing insight to issues, and helping determine what the impact of a decision can be and how to optimize the solution. Over time, PLM systems that are initially adopted for efficiency can

generate new levels of insight, helping turn existing assets, processes and products into an effective innovation portfolio driving growth.

Digitalization can create the 'agility with precision' needed to win market share in this dynamic and demanding environment. Consumer products companies can digitalize their entire product line and processes into a single collaborative environment. Instead of relying upon data silos or employees' hard drives, companies can now connect their systems via a single platform. This 'digital thread' can run from the consumer trend that sparks an idea, through recipe formulation, batch and filling instructions, lab tests and results, supplier networking, quality control inspections and even the labeling, packaging and artwork design used to launch the product. Modern PLM software solutions allow companies to optimize their innovation process, entering information once and enabling it to automatically flow throughout the entire company, the supply chain, and distribution facilities.

Using a digital thread of information enables com-



panies to track projects from research and development to production, optimize the process and design of products and improve the re-use of knowledge and assets far more efficiently. Take the overall packaging process as an example; if a department wants to utilize the same artwork in multiple markets, the marketing team in each country can leverage the original artwork design file and the data from the formulation and product definition. Instead of needing to design and approve new artwork, they can access the original art file and begin adapting it to the needs of their specific market. More than 75% of transactional work can be eliminated by re-using data, automating tasks and maintaining the relationships of the data across the portfolio of relevant products.

More advanced consumer products companies are moving on to building digital models in their PLM system, which encapsulate the global knowledge of the company for each and every product. These 'Digital Twins' represent everything about each product and its lifecycle, such as the definition, composition and design,

as well as information on market requirements, manufacturability, performance, suppliers, retailers, sustainability and more. When companies combine these Digital Twin models with advanced simulation capabilities, they have the ability to virtually model and simulate what used to require physical models. This means more analysis can be performed in a shorter period, helping companies to learn more quickly. These digital models can help reduce the cost of commissioning manufacturing facilities for new products by bringing together all the information to qualify them effectively. A plant manager or technician is able to predict crucial maintenance needs and plan for them when they least disrupt production, maximizing line utilization and profitability. More broadly, they give companies more control over their product portfolios and the way they are introduced and retired from the market.

Today's most sophisticated companies are adopting advanced analytics and automated data collection to present real-time dashboards to assist in responsiveness, agility and the ability to execute with precision.



The ability to automate insight from product and production data to create actionable plans closes the loop between design, production and actual product performance. As companies mature in their use of big data analytics, processes and insights gleaned will mature as well. Insights move from being descriptive, to diagnostic, to predictive, to prescriptive. Predictive analytics based on big data collected externally, from the market and social media, as well as internally, covering product performance from different teams and divisions, help identify which projects should be fast-tracked, which ones require more resources or testing, and when it is time to involve the senior management team to avoid missing the window of opportunity.

Prescriptive analytics are all about taking action. Companies are driving both top-line revenue growth and operational cost savings with analytics. Consumer products companies have leveraged analytics in the market measurement space for years. The difference now is the ability to search and analyze contextualized big data from multiple data sources, in seconds—from a cloud based, software-as-a-service solution.

If all this sounds a world away from the ad hoc systems and processes most businesses use now, remember that there's no need to change everything all at once. Digitalization through the use of a product lifecycle management system to deliver an integrated, single source of truth isn't reserved for large companies; it is something every business needs to consider and put in place. If you're already using PLM, it's crucial to connect the many different functions within the organization, from the executive suite to the planning and marketing teams, to manufacturing and the supply chain. Digitalization, supported by a digital thread, Digital Twins, simulation and analytics, can reinvigorate companies whose growth has been lagging. A seamless digital thread benefits every department, leading every part of the organization to the key information they need to bring the right products to the right market at the right time. Digitalization is not about technology, it is a strategy to grow your business. It can free up capacity to allow innovators to innovate again—leading to the next breakthrough product that the world is waiting for. □

SIEMENS SUCCESS STORY: COMPETITIVE ADVANTAGE VIA PLM

When Daesang, Korea's leading general-foods company, introduced PLM to drive its product-development innovation, it did so across business units so that all data generated from product development and mass production processes was integrated and easily shared across the enterprise. Daesang's highly transparent product-development environment has resulted in the company achieving a mastery over its data and a significant reduction in time required to develop products. Says Manager Ho-Jung Kim, "Our positive attitude was supported by a vision of 'what could be,' ultimately instilling confidence throughout the organization."



From the Cutting Edge of Digitalization: Q&A with Tyson Food's Jonathan Riechert

□ *As senior corporate engineer of innovation at Tyson Foods, Jonathan Riechert is among those leading the food & beverage industry into the digital transformation. As a member of Smart Industry's inaugural class of The Smart Industry 50, he is recognized among peers as a true thought-leader. Here Jonathan shares his thoughts on the latest developments of Industrie 4.0 as it pertains to the world of food-processing.*

HOW DOES DIGITALIZATION ADDRESS THE UNIQUE CHALLENGES AND OPPORTUNITIES IN FOOD & BEVERAGE?

Jonathan: I think the most unique thing about food & beverage is the track and trace requirements that are now coming to our field similar to what pharma has experienced for much longer. We are starting to see regulations drive this transformation, rather than the need for process or product improvements or cost savings. There is now a need to know where

all the inputs come from in a supply chain, how, where, and when that product is processed and packaged, and to which customer it was sent. The digital transformation is allowing us to more easily meet the new regulations and provide additional benefits to the business by automatically tracking process and packaging data, which can then be correlated to data in our ERP systems.

IS ADOPTING DIGITALIZATION CRITICAL TO COMPETE IN THE MODERN BUSINESS ENVIRONMENT?

Jonathan: Critical? Not in every case, but it depends on the business. I believe that as the level of automation goes up, the more critical the adoption of digitalization becomes. Increased automation attempts to drive human involvement out of a process, but as we do that we start losing the ability to ask questions of



the people involved in executing a process. Now, you have to ask questions of a machine or robot. How do we do that? We digitize the information so that we can present it in a way that allows us to understand what is happening inside a process.

WHAT HURDLES HAVE PROVIDED THE BEST LEARNINGS WITH THIS PROCESS?

Jonathan: Our biggest challenge has been making our plant-floor automation available for the digital transformation through equipment upgrades or connections to networks. The opportunities that are provided are seemingly endless. Our Continuous Improvement and Operations Departments have been seeing the data that can be collected, provided, and aggregated; they have been asking for more and more to continue driving improvements in their respective areas.

HOW WOULD YOU DEFINE YOUR MATURITY LEVEL WITH DIGITALIZATION?

Jonathan: We are seven years into our digitalization efforts from the time we put in our first (rather limited) system and I'd say that a good analogy would be

that we are like a pre-teen. We have gotten past some of the basics but are still learning every day, finding out new information, and exploring how we can use the new skills we are picking up. Much of that is we know how we can make things digital and get data while still trying to figure out how to best apply this knowledge to our business.

WHAT ARE YOUR GREATEST NEEDS/PLANS FOR DIGITALIZATION?

Jonathan: Our digitalization efforts will continue to grow as our operations look for further improvements and process understanding. I attempt to focus our resources on three questions:

1. What is the biggest pain point in the process?
2. What is the most important information needed to be seen?
3. What has the biggest impact?

Based on experience, the answers to those questions provide a great starting point and then can lead to more questions down the road, including questions you may not have thought of previously. □

SIEMENS SUCCESS STORY: DATA AMONG THE VINES

Quality grapes are critical to a winery's success. Increasingly, so is quality data. China's Great Wall Wine Company recently implemented Siemens' manufacturing execution system (MES) to digitally transform every part of its winemaking chain. The winery uses Siemens-built meteorological stations to gather data on soil. Field technicians also use Siemens applications to record pesticide levels. The MES enables standardized process management, while detecting process deviations and sending notifications to prevent damage. "Traditionally, the grape quality and vintner's skills were the deciding factors of the wine that goes to market," explains Great Wall Winery Chief Engineer Li Zefu. "With the help of Siemens' digital technologies, we have standardized the overall production process management."



Ideation, Realization, Utilization— Making the Digital Thread a Proactive Agent

■ In a world of smart, connected products, where entire markets can vanish with a single innovation, food & beverage manufacturers must take a new approach to business.

Some companies closely watch how products are being used, and feed data back from product utilization into product ideation and development in order to anticipate trends. But even if you know what to make, you still have to make it. That’s why manufacturing—the realization phase of innovation—is vital in this new era.

Food & beverage manufacturers must weave a digital thread through Ideation, Realization and Utilization. It’s not enough to digitize. That just mimics processes digitally for incremental improvement. You have to digitalize. Digitalization makes the digital thread of knowledge a proactive agent in driving your business. With a fully optimized “Digital Enterprise,” you are better equipped to initiate or respond to disruptive innovation.

To help you activate digitalization, Siemens offers a “Smart Innovation Portfolio” that delivers:

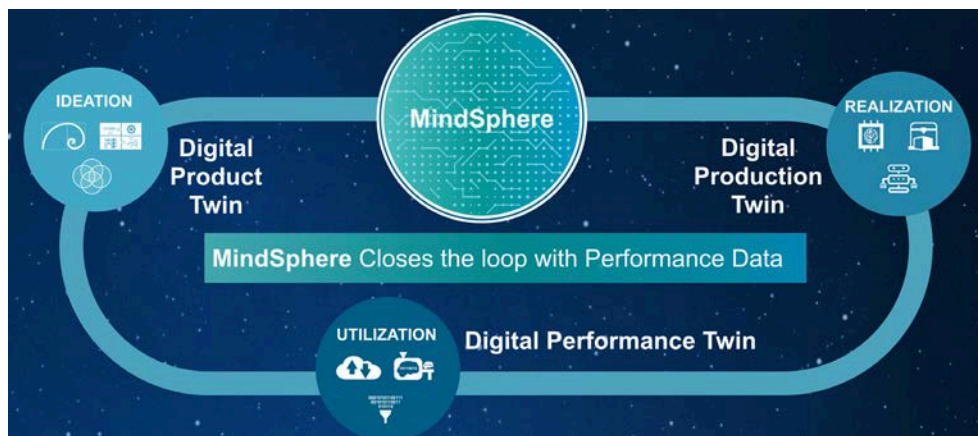
- **Engaged users** who receive the right information at

the right time—by transforming information so that only what’s relevant is delivered in a context suited to each person’s role

- **Intelligent models** that evolve throughout the process with the information necessary to optimize themselves for how they need to be built and how they should perform
- **Realized products** that achieve business goals through the integration of virtual-product definition and real production execution
- **An adaptive system** that helps you efficiently deploy solutions today, while maintaining future flexibility

Siemens AG, our parent company, shares our mission of helping food & beverage customers thrive in the era of smart innovation. The company’s “Digital Enterprise Software Suite” extends digitalization from development and operations through production—and works with the Smart Innovation Portfolio to help you realize innovation. The following graphic illustrates the Siemens concept of Ideation, Realization, Utilization. Take a look...

DIGITAL ENTERPRISE FOR FOOD & BEVERAGE



Change must invest every phase of the business process. Only Siemens has solutions across the entire value chain. Digitalization collapses the innovation cycle and enables continuous business transformation.

The Food & Beverage Industry in the Age of Digitalization—A Q&A with Siemens' PLM Experts

One of the most dramatic and encouraging features of digitalization in recent years is the expansion into new fields. No longer the sole property of, say, industrial manufacturing, hallmarks of digitalization such as big data analytics, Digital Twin and IT/OT convergence are now being applied in the food & beverage field, where early adopters are reaping tremendous results. Here we discuss the topic with Suzanne Kopcha, Siemens vice president of consumer products and retail, and Filip Schiettecat, Siemens senior director of industry management CPG/process.

CAN ELEMENTS OF DIGITAL TRANSFORMATION BE APPLIED TO ALL INDUSTRIES?

Suzanne: Yes. Most of the main concepts of digitalization can be applied across all manufacturing industries and a diverse range of industry/product types across consumer products, from food & beverage to personal care, home goods to footwear. Some elements have to be specialized for specific industries, or course. There are also many elements of digitalization that can be applied to services industries, such as financial institutions. Think iTunes, Uber, Amazon, Air BnB—those are service industries completely transformed by digitalization.

Filip: Those examples illustrate how digitalization can create entirely new business models that disrupt entire industries (or create new ones). This is the case even with technology that might seem simple at first sight. Consider Snapchat, Facebook, Uber, Amazon, Hammer, etc.

WHERE DOES THE FOOD & BEVERAGE INDUSTRY STAND IN RELATION TO DIGITAL TRANSFORMATION COMPARED TO OTHER FIELDS?

Suzanne: Food & beverage is an emerging industry in the world of digitalization. PLM has traditionally been driven by discrete industry, where engineering drives design. Opportunity in food & beverage is huge.

Applying these concepts and solutions to formulated industry has accelerated in the last five years, but we still have ways to go. One reason for slower adoption is that food & beverage companies tend to be fragmented across functions. These functions have very different skills. So digitalization can mean vastly different things to different commercial and R&D functions.

Filip: I agree—food & beverage is definitely an emerging industry in the adoption of digitalization. Compared to other industries like automotive or aerospace, where digital product design and manufacturing automation have been in play for years, the food & beverage field is just starting to adopt and standardize digitalization at a proper scale.

There are advancements in digitalization technology for the food & beverage industry that should compel laggards to start (or ramp up) their journey. Intelligent formula workbench environments enable digital formulation. Production simulation and optimization software optimize flow analysis and simulation in pipes of process facilities. Consider also this motivation—some competitors are already further ahead on their journey to become digital enterprises.

WHAT AREAS WITHIN FOOD & BEVERAGE HAVE THE GREATEST UPSIDE WITH DIGITALIZATION?

Suzanne: The greatest potential is in the ability to digitally represent the product information and have it seamlessly flow to the manufacturing floor, at the executable level. We talk about Ideation, Realization and Utilization—it's a transformative concept. A digital backbone can transform how companies bring products to life. A digital thread of information enables modeling, analytics and the efficient manufacture of a diverse portfolio of products across the globe. With the complexity of consumer products—the wide variety of products and the distributed supply chain to support the world's consumer—a connected digital thread of information to the factory floor is an imperative to win in the marketplace.

Filip: The greatest opportunity is for food & beverage companies with broad product portfolios with high variance, high volume and complexity in product structure. Likewise, companies operating across differ-

ent countries, facing different regulations in each, can hugely benefit from digitalization.

HOW IS THE ROLE OF THE DIGITAL TWIN CHANGING IN THE CURRENT MANUFACTURING ENVIRONMENT?

Suzanne: Digital Twin is driving automation to new levels and bringing significantly more automation and efficiency to the manufacturing environment. Add IoT and analytics and the game is about to change again. Manufacturers can move to a more prescriptive approach than a reactive approach, which is possible with the Digital Twin. Those with a closer touch to manufacturing are most comfortable with the concepts of digitalization. There is more discomfort with this virtual world at the ideation/business-leadership levels of companies. To ease the process of adoption and accelerate digitalization, I think we have to come up with a journey map (a step approach) to change, which helps less-mature companies understand how they can



SIEMENS SUCCESS STORY: THE DIGITAL BREWHOUSE

Stiegl began using Siemens electric motors in the 70s. Today the Austrian brewery relies on a custom Siemens automation system as a key part of their success in efficiently producing their diverse line of beverages while maintaining strict quality standards. Stiegl's Salzburg headquarters are digitized throughout processes—the specialty cellars, fermenting facilities and brewhouse are flawlessly controlled and visualized. After



taking this leap in technological evolution, Stiegl master brewers have realized they now have more time for their true passion: creating new recipes.

'eat the elephant' and deliver value along the way.

Filip: A journey map is critical, particularly as the role of the Digital Twin in the manufacturing environment is changing. And it is changing in waves...

- First wave: Companies go digital by adopting an electronic/digital version of their paper-based information. Here you see the rise of a document-management system, or more advanced object-oriented product-specification-management systems, or the rise of the typical historian functionality in manufacturing.
- Second wave: Companies deploy additional capabilities that use available base data to create products or value-add concepts. The focus is on reusing componentry. Consider as examples basic formula-development environments that reuse existing material specifications to create new products. Or digital P&ID toolsets for plant design. Or real-time manufacturing dashboards that provide context and transparency on what's happening on the production line.
- Third wave: Here the focus shifts to optimization and simulation to efficiently speed up innovation

cycles. Advanced calculation and simulation technology is being embedded in the available function domain, which (combined with the available master and operational data) enables an enterprise to create advanced models for product/plant/production optimization and simulation. Cross-functional data links and operations are made to simulate, evaluate and validate the impact and synergies between different functional domains—for example, product/process/manufacturing. Once you're at this wave, you really start to speak about a viable Digital Twin.

- Fourth wave: Agent-based and collaborative intelligent systems become a priority. By adding IoT and forms of artificial intelligence to industry software capabilities, digitalization reaches the next level of performance, where the systems themselves are starting to make suggestions to the user based on data and patterns. Consider product-development environments starting to make suggestions about suitable ingredients or guiding the user to similar formulations or experiments in the same experimental design space. Consider manu-

Companies operating across different countries, facing different regulations in each, can hugely benefit from digitalization.

facturing systems suggesting to alter production routing based on anticipated material and energy consumption in combination with multiple production orders based on advanced scheduling routines. Consider maintenance activities proactively triggered by the system that are based on real data/pattern recognition.

From a pure technology and functional point of view, most of the professional end-users are comfortable operating in a virtual world. (In their private lives they already interact with advanced technologies like smart thermostats.) From a company and organizational point of view, typical food & beverage bottlenecks still fragment processes. There is organic split-up across business lines or product categories. There are hiccups on the global operations model, as with the traditional functional distribution of product design, manufacturing, engineering and quality.

Promoting a unified digitalization platform across siloed organizations can be a tedious task; leaders of the initiative may face resistance due to operational and political objections. And digitalization can deliver levels of transparency, efficiency and flexibility that are not always welcomed by everyone within an organization.

WHAT ELEMENTS OF DIGITAL TRANSFORMATION MOST EXCITE YOU?

Suzanne: Simulation and analytics. I think there is limitless opportunity to glean insights from years of information that was previously unusable. Data analytics can bring visibility, transparency and insights that level the playing field and drive action and effectiveness to those who take advantage. Analytics can

eliminate non-value-added work and cut waste in the system. Transparency derived from data is an amazing catalyst for change and increased competitiveness.

I am equally excited about the opportunities with Digital Twin—the notion of using a model of your product and production to simulate and optimize the future is exciting. Feed that model with real data from your operations and now you have a smart Digital Twin of your environment and can begin to use machine learning to prescribe and take action—now that’s cool!

Filip: I echo Suzanne’s comments. The combination of a Digital Twin, IoT, big data and Artificial intelligence is the future. And it’s an exciting future.

WHAT ARE THE GREATEST CHALLENGES FOOD & BEVERAGE INDUSTRY LEADERS FACE IN ADOPTING ELEMENTS OF DIGITALIZATION?

Suzanne: Lack of a sense of urgency—the “boiling frog syndrome.” Some executives think of digitalization as a technology project that is nice to have, all while small, agile companies are eating their market share and taking away longstanding loyal customers. There is also confusion about where to start. The task seems daunting—embarking on multi-year transformations that can be exhausting to the organization. Likewise, there is the issue of employees’ willingness to change how they work. Oftentimes when companies ask their employees to provide requirements, personnel can only provide requirements for how they work today. Many employees can’t envision a world that operates differently than how they’ve worked (and how they’ve been successful) for years.

It is critical to have strong, engaged stakeholders that have a digitalization-program vision they can communicate to the company.

Filip: Those are critical challenges we all face. Organizational inertia and an inability to think-out-of-the-box.

HOW DO WE OVERCOME THESE CHALLENGES?

Suzanne: I've experienced one company that did this very well. Their digitalization project was a business imperative with strong leadership and visibility and active engagement at the top. They took the time to map out their current processes and identify their points of failure—or at least where they were not delivering the results they needed—and the parts of their process that they wanted to keep. Then they started to design the future with domain experts and digitalization leaders. They educated their workforce that the world would change and got them into the mindset of solving problems, not providing requirements. This company was courageous enough to embark on transformation of technology, skill, and a fundamental shift in how they did work. The key points to overcome are: (1) make the change a business imperative (2) have engaged and active stakeholders (3) start small so that value and success can be the momentum for future change and (4) include the workforce in the right tasks, but be fully aware that some can't see past how it's always been done. They shouldn't be designing the future.

Filip: Bright and brave minds at the top, partnered with strong, visionary managers with a strategic understanding of what digital transformation means for their industry. Having a clear understanding of the potential benefits. People who can create a vision and advocate it clearly, defining a clear future goal to reach.

Rome was not built in a day—in this process we must be courageous but also pragmatic and realistic. Taking one bite at a time by defining and guarding short-term goals and wins. And finally, those reaping early success with digitalization can clearly communicate that this is a journey and part of a step-wise organizational/strategic change program.

HOW DOES DIGITAL TRANSFORMATION AFFECT THE RELATIONSHIP BETWEEN MANUFACTURERS AND MACHINE BUILDERS?

Suzanne: Digitalization offers a much tighter relationship for requirements and ETO equipment, for traceability, and for sharing designs to better enable predictive maintenance. Digital Twin and digital thread can provide seamless information exchange with these relationships.

Filip: Just as food & beverage products are becoming more individualized, so is the machinery. Digitalization enables us to create designs to support specific processes and applications in an ideal way for the desired manufacturing process (designed with flexibility in mind). Expect this to lead to more variability in production lines, optimized for the use-case at hand, using modular components with the flexibility to be changed quickly to support a number of production scenarios.

HOW DOES THE SIEMENS CONCEPT OF IDEATION/REALIZATION/UTILIZATION BENEFIT THE CUSTOMER?

Suzanne: Ideation, Realization, Utilization is a framework to understand the phases of digitaliza-

tion and the scope of Siemens Digitalization solutions. It helps customers by giving them a way to understand the intent of each part of the strategy and help define where to start—what part of the digitalization journey best matches the challenges they face in their company. The framework can be a roadmap to define the journey of change for a specific company.

Ideation, Realization and Utilization are not underlying technologies. The phases have technology solutions that are part of the phases. A nuance.

Filip: These are the three phases and underlying technologies that make up Siemens Digital Enterprise Software Suite, which enables companies to:

- Eliminate silos and drive a tighter intra-company/supplier collaboration
- Drive continuous improvement across all disciplines using existing data, enabling a true closed-loop concept
- Integrate machine builders' workflow and enable strong collaboration

- Digitalize the entire enterprise and use the Digital Twin to optimize products and processes

HOW DO YOU DESCRIBE THE OVERALL MATURITY LEVEL OF DIGITALIZATION AND WHERE DOES THE FOOD & BEVERAGE INDUSTRY STAND IN THIS RESPECT?

Suzanne: Many in food & beverage have moved past skepticism, but are still early adopters in the digitalization journey. The places to watch are new companies with progressive business models; they are developing their companies with much more advanced digitalization capabilities. Large enterprises will have to accelerate their journey of digitalization to compete.

Filip: I believe that the skeptics in food & beverage are regretting missing the first waves of digitalization adoption. The industry as a whole is moving quickly to the adopters level, while the frontrunners are reaching the next level of performance thanks to their true collaborative approach. Those who realized the potential of digitalization and acted quickly are breaking down traditional silos in their organizations and reaping the rewards. □

SIEMENS SUCCESS STORY: A MODERN APPROACH TO AN OLD ART

The workday at Switzerland's Altendorf cheese factory begins at 5 am, when local farmers deliver the day's milk. But since the facility was completely reconfigured with a new engineering framework and advanced hardware solutions, production time for the cheese has been cut in half, demands on personnel have lessened, energy savings have skyrocketed and communications across the enterprise have been streamlined. In short, the digitalization evolution at this Swiss cheese factory has eliminated longstanding efficiency holes.



Want to learn more?

Whether you're taking your first step in your digital transformation or looking to deepen your commitment to Industrie 4.0, Siemens is here to help. Below find the Siemens representative best suited to your field. And do reach out to us...we'd love to talk.



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