FOOD ENGINEERING
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Engineering *Change:*

Discovering the Impact of Women Engineers in Food Manufacturing



Track and Trace Product Temperature on the Road

Contextual Data and Advanced Analytics Support OEE

How Digitalization Supports Pasteurization Recordkeeping

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JUNE 2026
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FEATURES



Track and Trace Product Temperature on the Road

Manufacturers know the origins of all their ingredients and everything that happened during the processing, cooling and freezing of their products, but what can they know about their product once it leaves their premises? This is the job of the track part of track-and-trace.

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Are Women Engineers Paid the Same as Men?

While researching our annual Women in Engineering piece, EIC Alyse-Thompson Richards also looked at median annual earnings.

WHEN I JOINED FOOD ENGINEERING IN 2024, I had the honor and pleasure of inaugurating our annual Women in Engineering feature.

Since then, I've spoken to several brilliant, talented and ambitious women engineers who have pioneered critical projects, including greenfield facilities and process optimizations. They've also shared their unique perspectives and experiences in and out of the industry. This year, I interviewed Halak Mehta, reliability engineer for Sapporo-Stone Brewing, and Dharma Prime, senior controls engineer for Concept Systems.

While researching this piece, I turned to the Department of Labor's Women's Bureau, which presents data on women in the workforce and offers insights on how best to support them. (Interestingly, the Women's Bureau was founded on June 5, 1920 — exactly one year after the U.S. Congress passed the 19th Constitutional Amendment and two months before it was ratified, giving women the right to vote.)

I included Women's Bureau data, as well as estimates from the U.S. Census Bureau's American Community Survey, in last year's feature, and this year, I've done the same. But this time, I stumbled upon data that offers another angle to the story: median annual earnings.

It's no secret that a pay gap exists in many industries, and engineering is no different. The U.S. Census Bureau provided a breakdown by engineering discipline:

None of these estimates show the pay gap has completely closed, but in several subcategories, it's very close. Additionally, nearly all these percentages exceed 85% — the overall national average gap in 2024, according to the Pew Research Center.

Of course, experience and education are major factors in determining income, but as these estimates indicate, there's still work to do to ensure men and women are paid equally for commensurate work, credentials and capabilities. This is especially true in historically male-dominated industries like engineering.

Hopefully by highlighting the work, stories and passion of women engineers, we'll work toward closing the gap once and for all. **FE**

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WEBINAR

JUNE 18, 2026 AT 2:00 PM EDT

STEP-CHANGE SOLUTIONS:

WHAT'S NEXT FOR AUTOMATION IN FOOD & BEVERAGE MANUFACTURING?

WITH FOOD SAFETY REGULATIONS TIGHTENING and operational costs continuing to rise, food and beverage manufacturers are under increasing pressure to improve efficiency, maintain compliance, and stay competitive. In this webinar, industry experts will explore how manufacturers can successfully automate for both today's challenges and tomorrow's opportunities. Attendees will gain insight into common barriers to automation adoption and practical strategies for overcoming them, while also learning how to evaluate automation suppliers and develop effective integration plans.

The session will also examine emerging applications for artificial intelligence (AI) in food manufacturing, including how agentic AI could reshape operations, decision-making, and production workflows in the years ahead. Additionally, experts will discuss best practices for successful robot and cobot implementation, helping manufacturers identify scalable automation solutions that support long-term operational goals.

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How Digitalization Supports Pasteurization Recordkeeping

Digital recorders and data management software ease recordkeeping and regulatory compliance —compared to traditional paper-based methods — increasing consumer safety and enhancing operational efficiency for processors.

Photo courtesy of passorn santiwiriyanon / Getty Images

BY OLA WESSTROM

THE FOOD AND BEVERAGE INDUSTRY REQUIRES THE HIGHEST DEGREE of process safety and quality assurance to protect consumers and comply with regulatory requirements. For decades, proving compliance has required meticulous and often cumbersome paper-based recordkeeping, but those practices are giving way to modern industrial data collection and management methods.

This pivotal shift is being fueled by a combination of innovative technological developments and regulatory bodies' growing acceptance of digital recordkeeping, most recently the American Food and Drug Administration (FDA) for dairy records.

This transition is more than replacing paper with electronically-generated reports — it represents a foundational change in how process data is captured, managed and used to drive safety and efficiency. Digital systems provide a new level of reliability and accessibility to this critical process data. The evolution is characterized by a combination of hardware and software tools, providing solutions that improve recordkeeping integrity, enhance reporting and simplify the complex landscape of regulatory compliance.

This article explores the implications of these advancements, culminating in a dairy sector pasteurization use case, where precise control and verifiable records are not just best practices, but legal mandates essential for public health.

PAPER IMPERFECTIONS

Traditional paper chart recorders have long been a staple for creating temperature and flow audit records. However, these tools possess several drawbacks that can negatively impact reporting accuracy, along with operational efficiency.

Bulky chart recorders take up considerable space, and their resulting paper charts present storage challenges. These records, often kept for years, are susceptible to damage from moisture, along with degradation over time, jeopardizing long-term process compliance verification.

Operationally, recorders also present ongoing challenges because they rely on mechanical parts that are prone to failure, consumable paper charts and ink pen supplies, which create recurring cost and upkeep needs. Maintaining these devices is labor-intensive, requiring personnel to manually change charts, review data by hand and physically archive the records.

Furthermore, paper chart recorders are susceptible to physical errors — such as pen skips and ink smears — which can obscure or invalidate critical data, and they offer limited data resolution, making it difficult to pinpoint precise measurements. For example, a line's interpretation on a chart can be subjective, and correlating multiple parameters such as temperature, pressure and flow across different charts is a complex and frequently imprecise task. Manual annotations on these charts often lack robust and verifiable audit trails, and they can become increasingly difficult to read months or years later, causing issues during regulatory audits.

NAVIGATING THE REGULATORY LANDSCAPE

Adopting digital records requires a mindset shift in an industry that has relied on paper for generations. However, the transition from clunky physical evidence to secure digital files represents a major step in operational evolution.

Recognizing the growing options for digitalization throughout industry, the FDA and other regulatory bodies are increasingly embracing and encouraging digital recordkeeping to supersede paper-based methods. This evolution is guided by standards, such as 21 CFR Part 11, which establishes the criteria under which electronic records and electronic signatures are considered trustworthy, reliable and equivalent to or better than paper records.

In the dairy sector, statutes like the Pasteurized Milk Ordinance (PMO) provide the legal framework for ensuring the safety of dairy products, and its requirements are now achievable using digital solutions. This provides a level of data integrity, transparency and accountability that cannot be achieved using paper methods.

Digital systems are being increasingly adopted throughout industry, supported by the advanced capabilities of modern instrumentation and data management software designed to adeptly meet stringent regulatory demands.

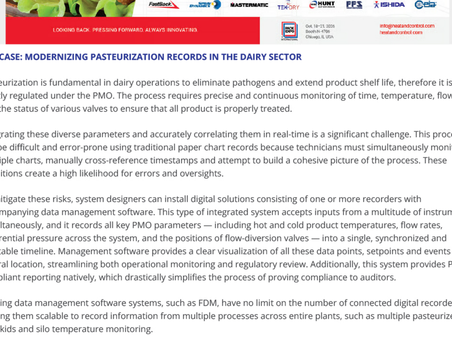
DIGITAL AUDIT ENHANCEMENT

Digital data acquisition, consisting of management devices and software, directly addresses the inherent limitations of paper-based systems by securely capturing and recording multiple critical control points (CCPs) simultaneously. Parameters such as temperature, flow, valve status and pressure can be monitored in a single, unified system. A range of other enhancements move beyond recording for compliance, bolstering user abilities to obtain the operational insights necessary for performance improvements.

Data is typically managed through a user-friendly human-machine interface (HMI), which provides local visualization, interaction and annotation capabilities right on the plant floor or in any other control room or workspace. As a result, operators can monitor processes in real-time, as well as enter comments and clearly flag events with much greater ease and detail than manual annotations allow.

Centralized control and reporting are cornerstones of digital enhancement, and specialized data management software deployed on premises provides fast and easy access to process data and annotations. While cloud solutions are also feasible for this purpose, most organizations prefer on-premises installations because they ensure that critical information is accessible on the production floor without relying on external network connectivity. This type of software enables automated reporting, which can be configured to meet specific regulatory requirements, such as those outlined in the PMO.

These systems are designed with 21 CFR Part 11 compliance out-of-the-box, offering features like secure electronic records, electronic signatures and robust audit trails that track all process and user-initiated activities. These tools help manufacturers improve operational efficiency by automating recording tasks, streamlining compliance using audit-ready reports, and increasing process insights with comprehensive and clear datasets for analysis. This versatility makes them suitable for a multitude of applications beyond pasteurization, including clean-in-place (CIP) systems and other processes where records are required.



USE CASE: MODERNIZING PASTEURIZATION RECORDS IN THE DAIRY SECTOR

Pasteurization is fundamental in dairy operations to eliminate pathogens and extend product shelf life, therefore it is strictly regulated under the PMO. The process requires precise and continuous monitoring of time, temperature, flow rate and the status of various valves to ensure that all product is properly treated.

Integrating these diverse parameters and accurately correlating them in real-time is a significant challenge. This process can be difficult and error-prone using traditional paper chart records because technicians must simultaneously monitor multiple charts, manually cross-reference timestamps and attempt to build a cohesive picture of the process. These conditions create a high likelihood for errors and oversights.

To mitigate these risks, system designers can install digital solutions consisting of one or more recorders with accompanying data management software. This type of integrated system accepts inputs from a multitude of instruments simultaneously, and it records all key PMO parameters — including hot and cold product temperatures, flow rates, differential pressure across the system, and the positions of flow-diversion valves — into a single, synchronized and auditable timeline. Management software provides a clear visualization of all these data points, setpoints and events in a central location, streamlining both operational monitoring and regulatory review. Additionally, this system provides PMO-compliant reporting natively, which drastically simplifies the process of proving compliance to auditors.

Leading data management software systems, such as FDM, have no limit on the number of connected digital recorders, making them scalable to record information from multiple processes across entire plants, such as multiple pasteurizers, CIP skids and silo temperature monitoring.

EMBRACE A SAFER AND SMARTER FUTURE

The food and beverage industry's adoption of and transition to digital data management methods is characteristic of the sector's eagerness to increase safety and efficiency. By moving away from paper and its limitations, processors are improving product traceability from pasture to supermarket shelf, thereby enhancing consumer safety.

Digital systems provide an unparalleled level of data integrity and accessibility, ensuring that critical process information is accurate, secure and ready for review. This transformation simultaneously eases operational and regulatory bottlenecks, while freeing up valuable resources and reducing the risk of non-compliance. As technology continues to advance and adoption proliferates, digital data collection and management will quickly become the new standard for quality and safety in the food and beverage industry.

ABOUT THE AUTHOR

Ola Wesstrom is senior industry manager of food and beverage for Endress+Hauser USA. He is responsible for the development and implementation of best practice measurement solutions, supporting customers throughout the industry segment. Wesstrom has a Bachelor of Science degree in instrumentation and automation from National Pulp & Paper College in Sweden. Since joining Endress+Hauser in 1992, he has held various positions, focusing on food and beverage since 2001. **FE**

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UVC Disinfection Best Practices

For Food, Packaging And Logistics Applications

The companies that treat UVC as a flexible, application-specific toolkit — rather than a single technology solution — will be best positioned to meet the microbial and operational challenges of the next decade.

Photo courtesy of Group4 Studio / Getty Images

BY JAMES CLEMENTS

JUST A FEW YEARS AGO, THE FOOD INDUSTRY DIALOGUE AROUND UVC disinfection centered on a single narrative: the rapid rise and anticipated dominance of UVC LEDs.

Their promise of compact form factors, mercury-free operation and seamless integration into industrial equipment led many to expect a swift transition away from legacy UVC sources. Early analyses, including Jason Dubose's 2023 commentary in FOOD ENGINEERING, reflected this optimism and outlined a roadmap in which LEDs would eventually displace traditional lamps across food processing, packaging and logistics.

Three years later, the landscape looks very different. The most significant shifts have been both technological and strategic. Industries now recognize that UVC disinfection is not defined by one technology but by a broad, diversified portfolio of tools — each suited to specific microbial challenges and operating environments. Today's UVC ecosystem is a multi-technology environment in which LEDs play an important role, but no longer the dominant one. Pulsed UVC xenon (PUV) systems and 222 nm excimer lamps have surged in adoption, while medium- and low-pressure mercury lamps continue to serve legacy and cost-sensitive installations.

This expanded landscape reflects a deeper reality: there is no single "best" UVC technology — only the best technology for a given application.

What follows is an update on the state of UVC disinfection technologies, their performance characteristics and their evolving roles across critical sectors.

PULSED XENON (PUV): HIGH-INTENSITY DISINFECTION FOR HIGH-THROUGHPUT ENVIRONMENTS

Among all UVC platforms, PUV systems have experienced the most dramatic growth since 2023. Once considered niche due to size and cost, PUV has become indispensable in environments requiring speed, intensity and broad-spectrum germicidal action. Modern systems are modular, compact and available with cartridge-style lamp cassettes that simplify maintenance. IP69 enclosures and quartz breakage sensors support safe operation in washdown environments, making PUV a strong fit for food and packaging lines.

PUV's surge is driven by its unique performance profile. These systems deliver millisecond bursts of broadband UV with peak intensities far exceeding continuous-wave sources. Many achieve 4–6 log reductions in seconds, enabling processors to meet rising throughput demands without sacrificing microbial control.

PUV is effective for complex packaging geometries — bottle caps, yogurt cups, lids, molded plastics and other shapes that are difficult to treat with chemicals or heat. PUV's ability to uniformly disinfect irregular surfaces without deformation is a key advantage as packaging materials become lighter and more intricate.

The biggest shift is that PUV is no longer limited to batch systems. Compact, shielded modules can now be mounted directly over conveyors, enabling real-time, in-line microbial control at line speeds up to 500 m^2 per hour. This integration has transformed PUV from a specialty tool into a mainstream industrial solution.

EXCIMER LAMPS (222 NM FAR UVC): PRECISION DISINFECTION WITH SAFETY ADVANTAGES

Where PUV may represent brute force, excimer lamps embody tight precision.

The rapid rise of 222 nm krypton chloride (KrCl) excimer lamps has been one of the most notable developments in UVC technology. These lamps emit a narrow band of far-UVC light with strong germicidal efficacy but limited penetration into human skin and eyes. While safety research continues, the technology has gained traction for continuous, occupied-space disinfection, airborne pathogen control and personnel hygiene systems.

Excimer sources are available as stand-alone lamps, multi-unit cassettes and pre-configured modules. Their narrow emission spectrum, instant-on behavior and compatibility with open configurations make them ideal for conveyor-adjacent surface treatment, environmental disinfection and hand/footwear sanitation. Their growing adoption reflects a broader industry shift toward cleaner, safer and more sustainable UVC technologies.

MEDIUM- AND LOW-PRESSURE MERCURY LAMPS: THE LEGACY WORKHORSES

Although their market share is declining, medium- and low-pressure mercury lamps remain relevant in industrial UVC disinfection. Their combination of high efficiency, long life and low cost keeps them competitive in large-scale applications where LEDs and excimers still struggle to match output per dollar.

Medium-pressure (MP) mercury lamps still occupy a meaningful niche in food and packaging disinfection, especially where speed, intensity and broad-spectrum UV are required. Low-pressure (LP) mercury lamps excel in applications that require high germicidal efficiency, low energy consumption and stable 254nm UV-C output.

However, regulatory pressure continues to grow due to the Minamata Convention's global mercury phase-down. While industrial exemptions remain, the long-term trend favors mercury-free alternatives. Improved recycling and containment systems have mitigated some environmental concerns, but the shift toward excimer, PUV and LED technologies is accelerating.

UVC LEDS: STILL ADVANCING, STILL SPECIALIZED

UVC LEDs continue to improve in wall-plug efficiency, cost and reliability. Yet the early optimism surrounding their rapid takeover has evolved into a more realistic understanding of their strengths and limitations. LEDs excel in compact, point-of-use systems, integrated equipment designs and applications requiring precise control or miniaturization. They are ideal for small-scale, on-demand disinfection in tight geometries.

However, LEDs are not yet well-suited for high-power industrial disinfection or large-area, high-throughput applications. Their role is important but specialized. As efficiencies rise and costs fall, LEDs will increasingly fill niche applications where size and control matter more than raw power.



CROSS-INDUSTRY ADOPTION: FOOD, PHARMA, PACKAGING AND LOGISTICS

The most important recent shifts have been both technological and increasingly strategic. End-users understand that UVC is not a single technology but a broad portfolio of versatile tools, each particularly well-suited to a different microbial challenge.

One major trend is the engineering of UVC-optimized packaging materials. Films, caps and containers are increasingly designed to transmit or withstand higher UVC doses without degradation. Advances in polymer formulations, surface treatments and optical clarity enable faster cycle times, more reliable microbial reduction and longer material life. As PUV, excimer and LED systems gain traction, UVC-compatible materials have become a strategic differentiator for producers seeking higher throughput and improved sustainability.

Industries that once deployed UVC as a one-size-fits-all solution now apply it with surgical precision.

2026 AND BEYOND: A MATURE, MULTI-TECHNOLOGY UVC ECOSYSTEM

The UVC landscape in 2026 is defined by diversity, specialization and strategic deployment. LEDs remain important, but they no longer dominate the debate. PUV and excimer lamps have emerged as powerful alternatives, each with unique advantages. Medium- and low-pressure mercury lamps continue to anchor large-scale systems, even as their long-term future narrows.

This multi-technology ecosystem is more capable, adaptable and resilient than the LED-centric vision of a few years ago. It supports the increasingly complex demands of food safety, packaging hygiene and global logistics.

Looking ahead, regulatory shifts, sustainability goals and rising throughput demands will continue to shape adoption patterns. The companies that treat UVC as a flexible, application-specific toolkit — rather than a single-technology solution — will be best positioned to meet the microbial and operational challenges of the next decade.

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ABOUT THE AUTHOR

James Clements is a University of California - Irvine graduate whose career spans from emerging technologies in healthcare and life sciences to rapid commercialization strategies and advanced manufacturing. He began his career at ALCOA, where he contributed to materials science and process innovation. Clements now works at Excelitas, supporting solutions in photonics and engineered systems within the life sciences and medical markets. **FE**

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FOOD ENGINEERING

— WEBINAR —

JUNE 10, 2026 AT 2:00 PM EDT

DUST, DAMAGE, AND DOWNTIME: DESIGNING BULK SOLIDS SYSTEMS THAT PROTECT PRODUCT AND PEOPLE



Bulk solids systems can introduce more than just flow challenges. Inadequate design inputs and poor equipment selection often lead to dust exposure, product degradation, segregation, reliability issues, and increased safety risk—impacting both plant performance and product quality.

This session provides a practical framework for evaluating system design through the lens of material properties, airflow, transfer point design, and equipment selection. Attendees will learn how these factors interact to influence product integrity, system reliability, and overall operational efficiency. The discussion will highlight common design oversights that contribute to dust generation, over-processing, and downtime, along with strategies to address them early in the design or retrofit process.

By focusing on real-world applications, this webinar equips engineers and operations professionals with the tools to design bulk solids systems that are safer, cleaner, and more dependable from the start.

SPEAKER:



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Engineering Change:

Discovering the Impact of Women Engineers in Food Manufacturing

Women are increasingly pursuing careers in the STEM fields, and to celebrate this growth, the UK-based Women's Engineering Society is marking the 13th International Women in Engineering Day on June 23.

BY ALYSE THOMPSON-RICHARDS

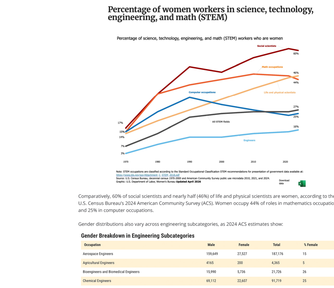
DHARMA PRIME AND HALAK MEHTA WERE CALLED TO SCIENCE AND ENGINEERING FROM THE BEGINNING.

Prime, senior controls engineer for Concept Systems, was drawn to mathematics, troubleshooting and problem-solving as early as middle school. Meanwhile, Halak Mehta, reliability engineer for Sapporo Stone Brewing, had a love for chemistry and a strong example in her electronics engineer parents, but when she realized sensory scientists could spend the day sampling ice cream, she realized food science could be in her future.

"With food, you can really impact people's lives directly — a process or a product that you contribute to can directly go to people's plates," Mehta says. "But it's also engineering, risk assessment and maintenance plans. It's this amalgamation of engineering, science and fun."

Prime and Mehta are among the growing league of women choosing to pursue careers in the fields of science, technology, engineering and mathematics (STEM). In celebration of this growth, the UK-based Women's Engineering Society is marking the 13th International Women in Engineering Day on June 23.

To help FOOD ENGINEERING honor the work of talented women engineers across the food industry, Prime and Mehta recently discussed their educational backgrounds, pivotal projects in their careers and advice for new and future professionals.



WORKFORCE DATA

Women have increasingly pursued careers in STEM fields over the last half century, according to data from the U.S. Department of Labor's Women's Bureau, but the growth has been slower in the engineering category — particularly compared to other disciplines.

As of 2024, women represent 27% of the STEM workforce, but only 16% of engineering roles are occupied by women. That's after a steady climb from 3% in 1970.

Percentage of women workers in science, technology, engineering, and math (STEM)

Note: STEM occupations are classified according to the Standard Occupational Classification (SOC) system used in the Current Population Survey. For more information, see the 2018 SOC User Guide and Standard Occupational Classification publications and publications from the Office of Management and Budget. Source: U.S. Department of Labor, Women's Bureau, **Updated April 2024**

Comparatively, 60% of social scientists and nearly half (46%) of life and physical scientists are women, according to the U.S. Census Bureau's 2024 American Community Survey (ACS). Women occupy 44% of roles in mathematics occupations and 25% in computer occupations.

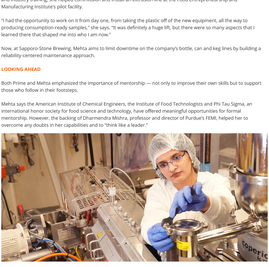
Gender distributions also vary across engineering subcategories, as 2024 ACS estimates show:

Gender Breakdown in Engineering Subcategories

Occupation	Male	Female	Total	% Female
Aerospace Engineers	159,649	27,327	187,176	15
Agricultural Engineers	4165	330	4,365	5
Bioengineers and Biomedical Engineers	19,998	5,756	25,756	26
Chemical Engineers	69,112	22,667	91,779	25
Civil Engineers	450,394	100,458	550,852	18
Computer Hardware Engineers	92,295	6,435	98,730	11
Electrical and Electronics Engineers	264,667	34,188	300,847	11
Environmental Engineers	27,845	13,896	41,756	33
Industrial Engineers	244,200	75,988	319,193	23
Marine Engineers and Naval Architects	14,458	1,928	16,386	12
Materials Engineers	40,930	10,015	50,943	17
Mechanical Engineers	341,180	35,270	376,450	9
Mining and Geological Engineers	7,457	794	8,251	10
Nuclear Engineers	6,772	1,339	8,111	17
Petroleum Engineers	19,236	2,063	20,299	10
Engineers, all other	603,241	110,842	714,083	16

Source: U.S. Census Bureau American Community Survey 2024, 1-Year Estimates, Tables B24121 and B24126. Margins of error not included.

Percentage of Women Occupying Engineering Roles



Source: U.S. Census Bureau American Community Survey 2024, 1-Year Estimates, Tables B24121 and B24126. Margins of error not included.

An uneven distribution also exists in management roles in the architecture and engineering sector. The U.S. Census Bureau estimates women hold 14% of leadership positions in these categories.

These differences don't just appear in the field — they often begin in college programs. Prime, who studied mechanical engineering and computer science at Oregon State University, says her computer science classes were fairly even, but in her mechanical engineering courses, the ratio of men to women was about 10 to 1.

"I just learned to form really good communities with the women who I did meet in those classes," Prime says. "A lot of them I'm still friends with today, and it's just really nice to have someone that you can talk to about your experiences. I think that made getting through the classes a lot easier."

Mehta studied chemical engineering at B.M.S. College of Engineering in Bangalore, India and earned a master's degree and a doctorate in food science from Purdue University. She says her undergraduate cohort was about 25% women, which was considered high.

"Chemical engineering remains a male-dominated field," Mehta says. "I do think that the ratio has improved in recent years. There's definitely some preconceived notions about women in engineering, and particularly in fields like mechanical and chemical engineering. I've had to become comfortable with being the only woman in the room, and I think that that's an experience that a lot of women in this industry can relate to."

INDUSTRY EXPERIENCE

Prime first discovered her love of controls engineering while working on Oregon State's Formula Racing team. Upon graduation, she took a job at a beverage OEM, but she realized it wasn't quite right.

"I was just doing mechanical work, and I liked it, but there was something missing," she says. "I always wanted to know, 'I'm building all of these things, but how do I control them? How do I take the next step?'"

Since joining Concept Systems in 2023, Prime has helped dairy and potato processors in the Pacific Northwest retrofit and update their systems. She served as lead controls integrator on a greenfield potato processing plant in Washington, where she learned about all processes, from raw product processing through packaging.

Image by georgerbirk / Getty Images Plus

"It was really fascinating to see them almost design the equipment as we went," Prime says about the project. "They had all of the mechanical designs laid out, and they had built similar factories before, but anytime you put two things together, they don't quite line up. Figuring out that kind of troubleshooting on the fly, and they're adding a new IO as we're realizing this process is a little more complicated than we thought, is always a really fun challenge to tackle."

While always interested in food, Mehta explored several areas of chemical engineering just to be certain. Petroleum, fertilizers, fragrance — she didn't like any of it. However, she found her niche while interning at a dairy manufacturer in India.

"I spent a large portion of my internship in the wastewater plant, and we were working on optimizing anaerobic digestion," Mehta says. "Some government regulations had recently changed, and they were trying to adapt to that change. I smelled like wastewater for nearly three months and worked in 110-degree heat, but I felt like it was the most wonderful time, so I thought I have enough data to conclude that I like food science."

Photos: Wirestock / Getty Images Plus

Mehta began her post-graduate studies in food science at Purdue University, where, in addition to conducting research and industry training, she helped commission and install an extrusion line at the Food Entrepreneurship and Manufacturing Institute's pilot facility.

"I had the opportunity to work on it from day one, from taking the plastic off of the new equipment, all the way to producing consumption-ready samples," she says. "It was definitely a huge lift, but there were so many aspects that I learned there that shaped me into who I am now."

Now, at Sapporo Stone Brewing, Mehta aims to limit downtime on the company's bottle, can and keg lines by building a reliability-centered maintenance approach.

LOOKING AHEAD

Both Prime and Mehta emphasized the importance of mentorship — not only to improve their own skills but to support those who follow in their footsteps.

Mehta says the American Institute of Chemical Engineers, the Institute of Food Technologists and Phi Tau Sigma, an international honor society for food science and technology, have offered meaningful opportunities for formal mentorship. However, the backing of Dharmendra Mishra, professor and director of Purdue's FEMI, helped her to overcome any doubts in her capabilities and to "think like a leader."

As part of her food science studies at Purdue University, Halak Mehta helped install and commission an extrusion line. Photo courtesy of Purdue University

"He always encouraged me," she says. "He always gave me some big decisions, threw me sometimes into the deep end of the pool but believed that I could swim. It helped me believe that I am entrusted with all of this decision-making, (and) I can do this."

While in college, Prime participated in the MECOP internship program, and since joining Concept Systems, she has mentored two interns through the same initiative.

"That's a really fun experience to take someone who's in the first six months to year of their career," Prime says, "and help them figure out 'what is important for me to learn right now? How can I develop my skills and that problem-solving mindset as an engineer?'"

That also involves developing and learning to trust their "engineering gut," Prime adds.

"Even a new engineer can notice when something's wrong and when something feels off," she says. "Even if you don't have the knowledge, the background or the expertise to articulate it, I think (it's) being able to say, hey, I think we should have someone else take a look at this. I think something's going on here. I always try to encourage our interns when they speak up."

Dharma Prime, senior controls engineer, has worked on system retrofits and optimizations for food processors in the Pacific Northwest since joining Concept Systems in 2023. Photo courtesy of Concept Systems

Mehta also recommends burgeoning engineers to have a "growth mindset" while being adaptable, teachable and willing to deal with the discomfort of new experiences.

"Growth could look like different things at different stages in your career," she says. "Sometimes it's a graduate program. Sometimes it may be upskilling with a certification. Sometimes maybe it's picking up an AI tool or even picking up a new hobby. But just believing that you can learn quickly and add value to something completely new, I think that's really important."

While women pursue engineering — and build a community for each other — Mehta and Prime hope the gender gap in engineering and manufacturing continues to close.

"I do think that we are on a good trajectory," Mehta says. "We can definitely expect to see some improvements, but we need to do more. I would like to not see headlines anymore that say, 'first woman to do XYZ in organization's ABC years-long history.' No more glass ceilings." FE

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Contextual Data And Advanced Analytics Support OEE

Food and beverage management is sold on data standardization in plants to support AI-based strategies. This early wave of data standardization projects and solutions is delivering increased context on traditional metrics, such as OEE.

Photo courtesy of Chatchai Limjareon / Getty Images

BY GRANT GERKE

TWO YEARS AGO, THE RUIZ FOODS BOARD SAID THEY NEEDED AI. "The board couldn't actually define what AI was and needed me to explain the technology to them," said Michael Warter, SVP and CIO at Ruiz Foods Products, Inc., at the IFT FIRST event in 2024. Fast forward to Hannover Messe in 2026, and AI discussions are about actual applications and scalable data foundations, according to IT/OT Insider.

Management, plant managers and operations leaders are recognizing that context wrapped around data is the answer to scaling innovation and increasing margins. The first wave of context platform solutions is being applied to traditional data to produce advanced analytics, increased real-time visibility and to enhance overall equipment effectiveness (OEE) metrics.

The new technology solutions represent a step change in enabling real-time analytics for operators. "Data standardization is what allows OEE to shift from being a retrospective key performance indicator (KPI) to becoming a practical operating tool that teams actually use during the shift," says Shahzad Khan, Yokogawa Life Business Unit, global system consultant.

Incremental efficiency gains have management's attention.

"When you examine the opportunities in yield and think about improvement, it's in millions of dollars," says Oliver Ganschar, head of digital product management and innovation at Kraft Heinz. "When there's data in real time supporting a specific problem, it's not hard to realize the possible value."

MontBlanc AI, a supplier of production monitoring software, released a case study on cooking oil processing and demonstrated how its modeling solution generated contextual data and anomaly alerts, preventing the degradation of over 120 tons of product. Operators eliminated manual interpretation of dozens of signals by modeling and applying contextual data, according to MontBlanc AI.

"The reality in today's manufacturing world is that data doesn't have any context," says Aron Semle, chief technology officer at HighByte. "Changing the context of that data isn't that expensive, and companies need to start and iterate. The faster manufacturers contextualize data, expose it to AI and experiment with people on the factory floor, the better." HighByte's Intelligence Hub's industrial software directs modeled data to the cloud using a codeless interface.

An early adopter of HighByte's solution began modeling historical data and real-time information from its manufacturing execution system (MES) for a potato application. "They connected into our solution, added context to their historical data and fed it into the large language model (LLM) to create an internal chatbot," Semle says. "An operations expert began to chat with the chatbot, along with some guard rails, and it came back with interesting insights."

Food manufacturing leaders are seeking near-and-now solutions powered by data. "With existing and prospective clients, the mandate is to use AI, but it can't be a multi-year process of deploying new systems," says Virag Vora, technical sales engineer at TwinThread.

"If unstructured data exists on paper or in disparate systems, the technology available today has come such a long way to merge all of that into a single context," Vora adds. "Companies can now leverage that data to train models and see measurable value quickly."

ADVANCED ANALYTICS AND OEE SOLUTIONS

The use of new digital tools to obtain accurate OEE metrics has been well-documented in recent years. Reported by FOOD ENGINEERING in February, Mark Bertrand, director, industry solutions at SmartSights, recently discussed how regression modeling and machine learning help find accurate "equipment culprits" for a specific packaging application.

For the last 30 years, the king of efficiency in manufacturing has been automation and control technology. Control Station developed the Overall Controller Effectiveness (OCE) metric for process automation. According to Control Station, "OCE is similar to OEE, but extends the concept to combine a PID controller's availability, performance and quality into one score that can be rolled up from loop to unit to plant," says Bob Rice, vice president of engineering at Control Station, Inc. "In practical terms, OCE is a standardized and streamlined way to highlight which PID loops are helping (or hurting) stability, variability and setpoint tracking."

Setpoint monitoring via modeling introduces a new wrinkle for OEE formulas, with huge implications. "A company wanting to maximize an OEE model will dissect all the individual components, not only from a formula perspective of what contributes to OEE but then from an instrumentation or property perspective," Semle says. "There will be temperatures, pressures, line speeds, defect rates and all of these combined attributes are going to be correlated to that OEE."

New metric examples based on more granular data include energy per good unit, water per batch or yield losses tied to specific operating states like startup, changeover or clean-in-place (CIP).

This points to increased data visibility and real-time data for operators. "Once a (data standardization) foundation is in place, operators will finally be looking at the same version of the truth," Khan says. "That's when OEE stops being reviewed at the end of the week and starts driving real-time decisions by operators, supervisors and engineers.

In the MontBlanc AI cooking oil application, early alerts enabled operators to intervene before degradation occurred, preventing oil from being downgraded to lower-value categories. "To no one's surprise, the shift to increased granularity was the logical next step in process manufacturing environments, just as it was in discrete manufacturing applications," Rice says.

The TwinThread platform optimizes a range of process applications, including what batches, changeovers and startups look like. "Once companies have examples of all of those and add in historical data, then food producers can start training models for different scenarios," Vora adds.

In addition, models identify how certain operators or process engineers run a batch. "If you can codify that knowledge into rules that a model can extract, companies have a higher chance of success in reproducing the ideal changeover or the vertical startup. Context is still important," Vora says.

MICRO-STOPS AND SUCCESS WITH AI

As context-aware data increases, operators will be able to leverage this information. Micro-stoppages are often missed in batch, filling and packaging applications. "Context-aware metrics quickly expose issues like micro-stoppages, recurring minor faults and gradual speed instability," Khan says. "Individually, these losses may not move availability much on paper, but collectively, they have a significant impact on throughput, waste and utility consumption."

Now, experienced operators – or humans-in-the-loop – can improve quality and reduce energy costs through context-aware data. "Operations in a real-time adjustment world can monitor ambient conditions and identify ways to improve the product, for instance, developing a new lot of flour with slightly more protein," Vora says. "This opens up an entire new world of micro-adjustments, but only if the data collection granularity supports it."

Food producers are aware of the success stories of machine learning applied to predictive maintenance. Mars recently piloted a predictive maintenance program for chocolate production across multiple plants using Datadog and Microsoft Azure's IoT Edge platform.

"Data standardization is increasingly viewed as an operational requirement, not an IT initiative," Khan says. The low-hanging fruit of predictive maintenance has proved successful, which may be leading more food leaders and management to be sold on the need for data foundations and tools in 2026. **FE**

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Track And Trace
Product Temperature on the Road

Once it leaves your frozen warehouse, do you know your product's condition at any given time?

BY WAYNE LABS

Photo courtesy Tricia(R) Getty Images

WHILE WE MAY THINK OF TRACK-AND-TRACE TO BE A SINGLE FUNCTION or capability in a software system, it actually comprises two: the literal part is used to find the source that created each load — lanted ingredient, allergen, foreign object, undercooking, improper ingredient/product storage conditions, etc. — and the track part can be used to locate product once in the supply chain.

For example, a railcar's or truck's time and location data (telematics) can be combined with temperature monitoring to ensure your product is traveling under the same safe conditions that existed in your refrigerated warehouse. But who is responsible for tracking temperature en route?

Once good product leaves your warehouse you no longer have control over it; instead, you place it in the hands of shipping companies (unless you have your own trucks). What happens en route can turn good product into bad before it arrives — or doesn't — at its destination. In 2014, a trailer load of fresh-frozen shrimp valued at $300,000 was [stolen in New Jersey](), but it just as well could have been damaged by a failure of the truck's temperature or temperature monitoring equipment.

The source of problems and precautions to make sure shipping companies carry out food safety requisites and fulfill track-and-trace requirements.

TEMPERATURE TRACKING IS A CONTRACTUAL AGREEMENT

As of June 2016, the FSMA's [Sanitary Transportation of Human and Animal Food]() removed the prescriptive requirements for temperature monitoring devices and continuous monitoring of temperature during transport and replaced these provisions with a more flexible approach, which allows the shipper and carrier to agree to a temperature monitoring mechanism for shipments of food that require temperature control for food safety.

FDA also removed the provision requiring the carrier to demonstrate temperature control to the receiver for every shipment requiring temperature control. In this final rule, the demonstration must only be made if the shipper or receiver requests it, which is consistent with industry best practices and would likely only be done in situations in which it is suspected that there has been a material failure of temperature control.

So, it's up to the food processor (and/or its supply chain partners) and trucking companies to establish a written agreement/contract detailing the requirements for food safety transportation practices, temperature and temperature excursions, whether or not "true" time" data is required, and coordination of temperature data with location data (if location data are needed) and how data are needed (e.g., in real time).

Even though newer FSMA 204 rules push for capturing key data elements (KDEs) and critical tracking events at each step in a process (even at the supply chain), real-time data from trucks showing geolocation and temperature data may not enter food safety and quality management (FSQM) systems on a timely basis — and critical data can get lost in handoffs between carriers.

TOOLS AND EXPERTS HELP WITH EFFECTIVE TEMPERATURE TRACKING

Supply chain track-and-trace tools (including temperature monitoring) are readily available and include:

- Wireless temperature sensors
- Entire cold-chain monitoring services
- Food safety and quality management (FSQM) systems that interface with the collected wireless data and connect to ERP and WMS
- System integration services to help connect complete systems together.

For example, the Swift Sensors wireless monitoring system tracks the temperature and humidity inside the refrigerated cabins of trucks transporting food, says Ray Almgren, CEO. It supplies real-time data and alerts when the temperature or humidity exceeds thresholds. The system protects against food spoilage and losses and provides critical information for compliance reporting.



A Swift Sensors Wireless Temperature Sensor with Probe is mounted to the sidewall of a reefer trailer and inserted into global solution. Photo courtesy of Swift Sensors

Copeland is a global cold-chain monitoring provider, annually tracking more than 3 million shipments of product and protein, food processors, imports, exports and retailers with trackers and loggers to ensure shipment quality and food safety, says Gerd Uldewelligen, director of international sales. Along with the real-time trackers and loggers, Copeland's updated OversightCloud cloud-based platform allows processors to address non-conformance in real time. The OversightCloud platform is available in 15 languages, supporting global access to real-time data 24/7.



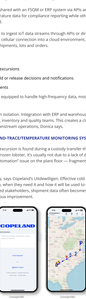
Built for long-haul cold chain shipments, Copeland's GO Real-Time GL XL provides extended visibility and reliability across global supply routes. With a 3,500-mile battery life, the tracker is designed to operate for the entire duration of ocean transit. Cellular technology and WiFi protocols — it delivers continuous insight throughout complex, cross-border journeys. Photo courtesy of Copeland

"With nearly 18 years in the food industry, my focus has been on improving how food manufacturers capture, connect and act on operational data to protect product quality and maximize uptime," says Tiffiny Donica, director of industry consultants. "At SafetyChain, our role is centered on providing a unified plant management platform that digitizes and contextualizes data and aligns plant operations, including the critical handoff from production to warehousing."

"While we do not directly provide temperature monitoring hardware for in-transit tracking, we play an important role in ensuring that all relevant data collected before and during shipment is captured, verified and actionable within a structured system," Donica adds. Within a yard management context, this includes:

- Digitizing pre-shipment inspections, including trailer condition, cleanliness and pre-cooling verification
- Capturing dock activity and load events tied to specific lots, orders and carriers
- Recording departure conditions, including product temperature checks at time of loading
- Monitoring refrigerated/frozen trailers that are preloaded and staged in the yard, including reefer unit status and documented product condition checks prior to pickup
- Integration into external systems like an in-transit temperature monitoring system

This structured data capture creates a reliable point-in-time record of product condition and handling prior to departure, which is essential when investigating in-transit issues or validating compliance with regulations, Donica adds.



The SafetyChain digital plant management platform monitors processes in house and features track-and-trace capabilities to monitor for problems with incoming ingredients, as well as track where product is in the supply chain once it has left the processor's loading dock. Photo courtesy of SafetyChain

For those who need help in putting these systems together, Wipfli, a Control System Integrators Association Partner Member, stands ready to help. "We primarily support food processors on the systems and business process side rather than providing sensors or telematics hardware," says Anthony Shibata, partner in technology consulting. "Our role is to implement and integrate core operational platforms — such as ERP, production, accounting and warehouse management systems (WMS) — and help them define how in-transit data is incorporated into day-to-day operations."

Where processors use temperature sensors or third-party monitoring tools, Wipfli helps integrate that information into core business systems, Shibata says. This includes connecting sensor data to ERP and WMS platforms, aligning receiving and supply chain visibility, and aligning shipment, container and lot data so it can be tied back to production, compliance and quality workflows. The value lies not just in collecting data, but in making it actionable within existing systems.



The SafetyChain digital plant management platform monitors processes in house and features track-and-trace capabilities to monitor for problems with incoming ingredients, as well as track where product is in the supply chain once it has left the processor's loading dock. Photo courtesy of SafetyChain

"Anthony [Shibata, Wipfli]

Real-Time Temperature Data: A Shared Problem Without Shared Standards

The industry is attempting to solve a shared problem without shared standards. Capabilities vary widely across producers, distributors and carriers, and simply having more data does little good when only some parties can see it — and even fewer can act on it profitably.

Most regulatory and business value comes from having reliable temperature data at the time of receipt, enabling receiving sites to accept or reject products immediately. Meaningful intervention while a shipment is in transit is relatively rare, with scenarios such as repairing refrigeration units or turning trucks around only making sense in narrow, early shipment cases.

Temperature data is far more valuable than geolocation data, and adoption will ultimately be driven by cost effectiveness. The technology is available; the challenge is aligning standards, responsibilities and economics so that using the data is both operationally viable and financially sustainable.

— Anthony Shibata, Wipfli

HOW TO GET TRACKING DATA BACK HOME

First, according to Almgren, wireless sensors need to be factory calibrated, and in most cases, will also have NIST-traceable calibration. A simple operation will connect the sensor data via a wireless protocol to a gateway powered by the DC supply in the truck cabin. A cellular modem connected to the gateway transmits the data to the cloud.

For larger geographies and routes, Copeland's solutions provide continuous monitoring of products throughout their cold chain journeys, even as they change transportation modes, cross borders and experience inconsistencies from temperature changes or possible delays. Through these changing conditions, processors maintain continuous visibility of their products, Uldewelligen says.

A major advantage is direct access to reliable data without being solely dependent on third-party systems during transit, Uldewelligen adds. This ensures greater visibility and control over product-in-transit, which is especially important for perishable goods. Processors own their data and control how it's used, while still having the ability to securely share it with other supply chain stakeholders like logistics providers and receivers to ensure a full data compliance. Shared visibility supports collaboration, particularly about reporting and addressing and preventing any issues experienced during shipping.

SafetyChain's Donica points out three critical considerations in setting up a monitoring/tracking system: accuracy, connectivity and ownership.

- First, calibrated sensors are non-negotiable. Processors should ensure probes meet NIST-traceable calibration standards and are validated for the specific temperature ranges of their products.
- Second, connectivity is largely dependent on cellular networks. Wi-Fi is rarely reliable in transit, so devices must support reliable cellular transmission with data buffering capabilities in case of signal loss. The ability to store and forward data ensures continuity even in low-coverage areas.
- Third, and often overlooked, is data ownership and independence. While many carriers provide geolocation data through their own platforms, that data can be easily accessible in real time or in a format that integrates easily with other platforms. Relying solely on carrier data can create blind spots.

"A best practice we see emerging is the use of independent, third-party, device-level devices that combine both temperature and geolocation tracking," Donica adds. This ensures the shipper retains control of the data and can integrate it directly into their system without dependence on third-party carriers or delays.

Picking up on the lack of Wi-Fi, Wipfli's Shibata notes that since shipments have fixed facilities, cellular connectivity is typically required. Introducing ongoing costs and technical overhead. For wholly owned fleets, these costs can often be included in landed costs and allocated at the SKU level. For third-party carriers, especially smaller operators, the cost benefit calculation is more complex.

Ultimately, Shibata advises, processors need to consider what mitigation actions are realistically possible if a temperature excursion is detected. In many cases, intervention options are limited once a shipment is underway. The cost of monitoring and response must be weighed against the likelihood and financial impact of spoilage, making this more of a strategic "should we?" decision than a technical "can we?" decision.

Pointers for Locating Sensors in a Truck/Trailer/Freight Car

Assume a trailer load of fresh/frozen seafood or a load of refrigerated raspberries. Where should temperature sensors be located to obtain critical measurements during transit? How important is average air temperature in the space? How does the shipper ensure that measurements remain in place?

Anthony Shibata: Many carriers already provide geolocation data and leveraging that information is often more cost effective than duplicating it with shipper-owned devices. The most practical approach is usually to combine carrier-provided location data with temperature sensor data and the shipper's own production, shipment and lot records.

Ray Almgren: Swift Sensors recommends placing temperature sensors in the refrigerated cabin would be needed to ensure proper temperature of the frozen seafood. The mainline sensor would be placed on the top of the cabin at the front and back and would measure the air temperature. The sensors can be easily mounted with Velcro® or zip ties in a location not subject to damage or disturbance.

Tiffany Donica: Sensor placement is critical and should reflect both product risk and airflow variability within the trailer.

For loads like seafood or berries, I would recommend:

- One sensor near the rear doors (most vulnerable to temperature fluctuations)
- One in the center of the load
- One over the evaporator (hottest/top zone)

For higher-risk or high-value shipments, adding product-level sensors (embedded within cases or pallets) provides deeper insight beyond ambient air readings.

It's not always necessary or important, but it's not sufficient on its own. Air temp can fluctuate rapidly and may not accurately reflect product core temperature. Combining ambient and product-level sensing provides a more complete picture.

To ensure sensors remain in place:

- Use tamper-evident packaging or mounting systems
- Integrate sensors into pallets or cases when possible
- Implement chain- of-custody procedures during loading

Consistency in placement is key for reliable data comparisons across shipments.

Gerd Uldewelligen: Product condition, not just ambient air temperature, is what determines food quality and regulatory compliance. Air temperature can serve as an indicator of product condition, but quality and acceptance decisions are ultimately based on the product temperature. Therefore, temperature sensors should be placed as close to the product as possible in order to obtain critical measurements during transport.

To support this, Copeland technology operates at the pallet or carton level, allowing monitoring across one or multiple pallets or boxes within a shipment. This is especially important since trailers often contain multiple purchase orders, delivery points or even multi- temperature compartments with different pickup and delivery times — potentially resulting in different air temperatures.

By focusing on product-level measurement rather than relying solely on air temperature, shippers gain clearer understandings of product quality, consistency and potential risks, enabling more accurate, data- driven quality and compliance decisions.

MOVING TIME/TEMPERATURE TRACK AND TRACE DATA TO FSQM SYSTEMS

Copeland's OversightCloud platform supports both real-time, trip-level monitoring and broader performance analysis across lanes, commodities, locations and shipping and receiving operations, Uldewelligen says. Individual shipments can be monitored with automated alerts delivered via email or mobile app, enabling fast, issue-specific response capabilities.

For deeper analysis, Copeland's platform can be accessed on a PC, where the portal provides information on multiple trips that can be aggregated to support lane assessments, vendor management and performance scoring. This enables stakeholders to move beyond reactive actions and conduct proactive, detailed, data-driven evaluations that are often not available within traditional FSQM systems.

The platform supports multi-stakeholder visibility, ensuring shared access to the same validated data, so quality and food safety decisions are visible and aligned across shippers, receivers and logistics partners. It also supports data integration, allowing customers to combine data with other existing FSQM systems for compliance documentation while leveraging OversightCloud's software for advanced analytics and operational insights.

Data from the sensing system can be shared with an FSQM or ERP system via APIs and webhooks, says Swift's Almgren. Some shippers want the actual temperature data for compliance reporting while others only want the alerts noting when the temperature exceeded a threshold.

Modern FSQM platforms are designed to ingest IoT data streams through APIs or direct integrations, says SafetyChain's Donica. Data flows from the device via cellular connectivity into a cloud environment, where it is immediately contextualized and linked to specific shipments, lots and orders.

From there, systems enable:

- Real-time alerts for temperature excursions
- Automated workflows such as hold or release decisions and notifications
- Dashboard visibility across shipments

While not all legacy FSQM systems are designed to handle high-frequency data, modern platforms are increasingly built for this level of integration.

Importantly, this data should not be in isolation. Integration with ERP and warehouse management systems is essential for linking temperature events to inventory, inventory and quality teams. This creates a closed-loop system where decisions made in FSQM can directly impact shipment execution, Donica says.

DATA FRAGMENTATION IN TRACK-AND-TRACE/TEMPERATURE MONITORING SYSTEMS

When an out-of-bounds temperature excursion is found during a custody transfer three days after it happened, which has totally damaged say, a trailer load of blueberries, is it usually not due to a lack of digital monitoring/tracking tools. Rather, it's similar to the "Islands of automation" issue on the plant floor — fragmented and unconnected, untimely data that never reaches the right person.

Data fragmentation is a problem today, says Copeland's Uldewelligen. Effective cold chain monitoring starts with determining who needs access to data, when they need it and how it will be used to drive operational change. Without clear visibility, defined goals and aligned stakeholders, shipment data often becomes fragmented, creating silos that prohibit corrective action and continuous improvement.



Copeland's OversightCloud gives users an smartphone and track products' location and temperature as they travel toward their destination. Image courtesy of Copeland

Although real-time air monitoring inside trailers, reefers or railcars can provide useful indicators, it can also introduce fragmentation when transportation modes change, Uldewelligen adds. By measuring the product temperature directly, stakeholders maintain consistent, uninterrupted visibility regardless of transport method or carrier systems, ensuring continuity of data — even in complex multimodal supply chains This supports accurate quality, food safety and compliance decisions based on product condition rather than the characteristics of the transport environment.

Data fragmentation remains one of the biggest barriers to effective in-transit tracking and monitoring, says SafetyChain's Donica.

Temperature, location and shipment data often exist in separate systems, including:

- Carrier telematics
- Sensor provider platforms
- Internal ERP or warehouse systems

This fragmentation delays decision-making and often results in reactive rather than proactive responses. Real-time monitoring within trailers significantly reduces this fragmentation, but only if the data is centralized. The real value comes from aggregating all relevant data streams into a single platform where they can be analyzed together. Without that consolidation, the problem will not be solved, Donica says.

Compounding the problem, real-time data isn't necessarily real time. Wipfli's Shibata explains: In most cases, in-transit data is not truly real time. Data is typically uploaded on a scheduled basis — hourly or daily with cellular connectivity — or retrieved only after delivery, because continuous transmission can be cost-prohibitive. This information is primarily used during receiving and quality assurance checks rather than for mid-transit intervention.

When live data is available, it requires monitoring software capable of issuing alerts and predefined mitigation protocols to be effective. Many FSQM systems can be configured to store this data or link it to QA records, but real-time alerting is usually outside the FSQM system.

FSQM systems typically retain compliance data; WMS platforms manage quarantine or rejected inventory, and ERP systems handle financial impacts such as credits or write-offs. Only in limited scenarios — such as treating a truck as a mobile warehouse — would in-transit status be managed directly within WMS workflows, Shibata says.

MORAL OF THE STORY:

Monitoring temperature and location of high-value, critical loads is ultimately, according to FDA, the shipper's responsibility. Having fully legal and binding contracts with trucking companies defining food temperatures, monitoring them and explaining what's responsible for what excursions will be of utmost importance. In addition to your legal team, your insurance underwriter/agent will no doubt have a say in protecting the right monitoring schemes and helping with contracts. FT

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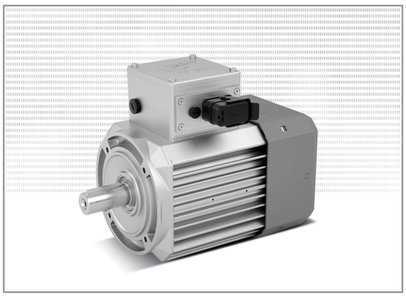
IE5+ Permanent Magnet Synchronous Motors

NORD's IE5+ permanent magnet synchronous motors are characterized by an efficiency of up to 95% over a wide torque range. The motors are now available in three sizes and cover a range of applications with their extended power range from 0.35 kW to 11 kW and continuous torque from 1.6 Nm to 43.9 Nm.





UPM AND FELIX SCHOELLER

Recyclable Barrier for Flexible Packaging

UPM Specialty Materials and Felix Schoeller have developed a customizable recyclable barrier solution designed specifically for flexible food packaging. In response to the growing demand for recyclable packaging, this food-safe, fiber-based solution is based on UPM Solide Lucent packaging paper.

MESSER

KwikChiller

The KwikChiller was designed to eliminate the need for CO_2 pellets when chilling fresh poultry in combo bins. Its rapid, uniform temperature control system improves product yield. In addition, the inline chilling system features an integrated exhaust, offering a safer and more efficient alternative to manual CO_2 pellet handling. **FE**



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REGULAT

FDA: Infant Formula is Safe But Investigation Continues



Image credit: Olga Yastremska / Getty Images

THE U.S. FOOD AND DRUG ADMINISTRATION HAS SHARED RESULTS FROM ITS EXAMINATION FOCUSED on chemical contaminants in infant formula available on the U.S. market.

“We tested more infant formula than ever before, and the results are clear: most products meet a high safety standard — but even small exposures matter for newborns,” says Health and Human Services Secretary Robert F. Kennedy, Jr. “We will hold manufacturers accountable, and give parents honest, transparent data they can trust. Protecting our children’s health is nonnegotiable.”

Across the products tested, most samples had undetectable or very low levels of contaminants, which the FDA says affirms that the U.S. infant formula supply is safe. The agency tested more than 300 infant formula samples representative of products sold at retail across the U.S.— generating more than 120,000 data points — for lead, mercury, cadmium, arsenic, pesticides (including glyphosate and glufosinate), per- and polyfluoroalkyl substances (PFAS), and phthalates. The samples, which included powders, ready-to-feed liquids and concentrated liquids, were tested and analyzed in FDA laboratories.

While overall levels of contaminants in the infant formula samples tested were low, the FDA is following up with additional testing as part of the agency’s ongoing monitoring and oversight efforts and will take additional action where appropriate. This includes conducting further testing, including for additional contaminants, continuing to engage with manufacturers on measures to reduce the levels of contaminants to as low as possible, and working to establish action levels for contaminants in infant formula.

“You can judge a society by how it treats its most vulnerable members. That’s why we’re doing everything in our power to make sure our babies and infants have safe, high quality formula options that are backed by a resilient supply chain,” says former FDA Commissioner Marty Makary. “The results of this study are encouraging. We will continue to advance formula innovation and safety for the millions of families who depend on it.”

Small amounts of contaminants may be present in foods — including infant formula and breast milk —because they occur naturally or enter the environment through human activities in the areas where ingredients are grown or produced.

This testing was conducted as part of Operation Stork Speed, the FDA’s Closer to Zero initiative, and the FDA’s routine food surveillance work to help ensure safe, reliable and nutritious infant formula for families across the U.S. The FDA will continue to test infant formula as part of Operation Stork Speed and ongoing surveillance of foods, including testing infant formula products that have entered the U.S. market since this initial survey began and conducting additional compliance sampling. The agency will share results from follow-up surveys.

Secretary Kennedy was set to host chief executives from leading infant formula companies in May for a roundtable discussion focused on modernizing FDA’s infant formula oversight and continued implementation of Operation Stork Speed, which includes aspects of nutrition, chemical and microbiological food safety. **FE**

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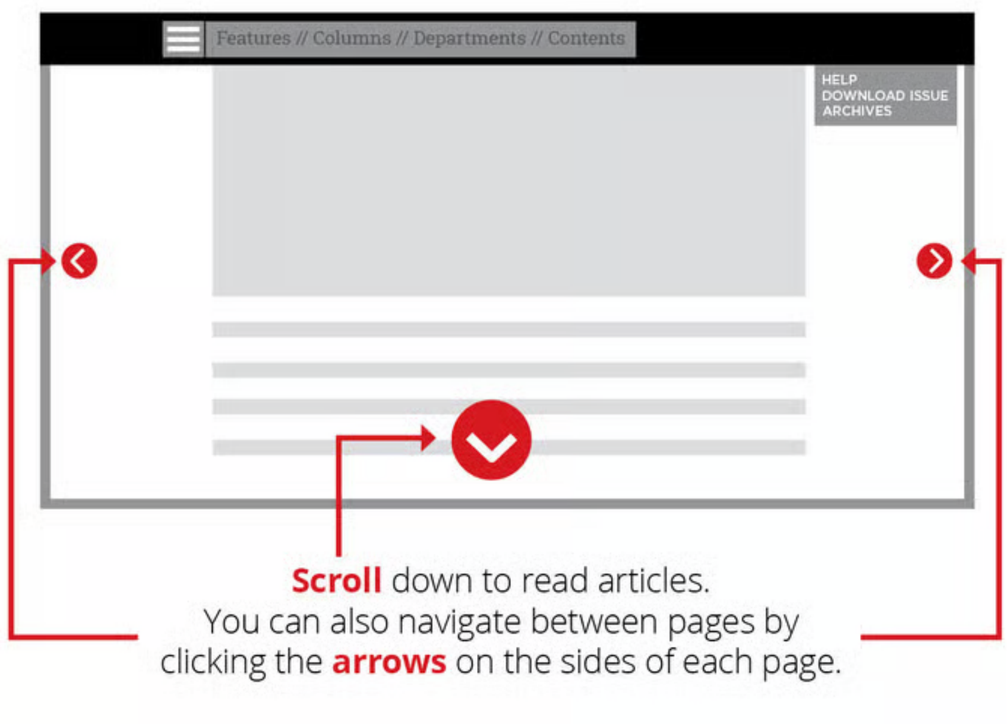

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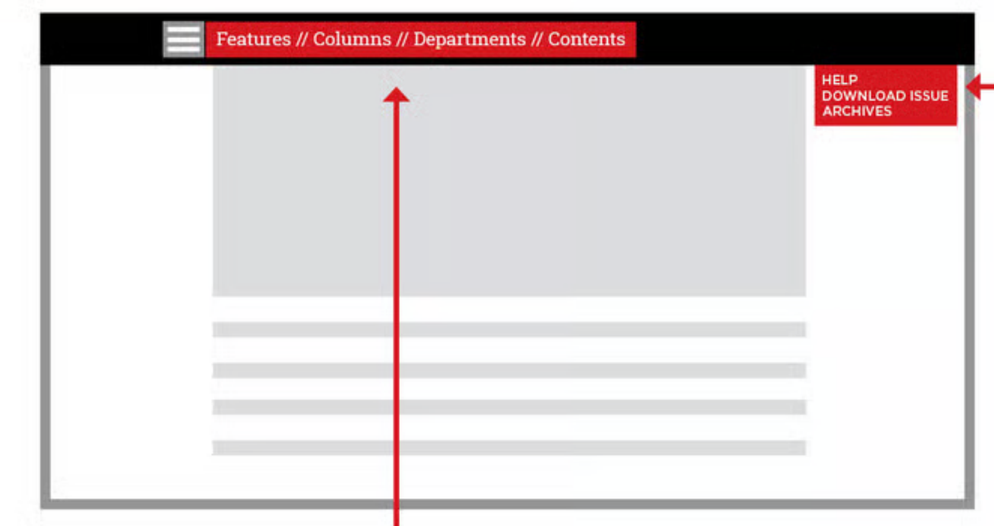

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