



**SAFETY FIRST:
HOW SIMULATION TECHNOLOGY
PROTECTS WORKERS IN
MANUFACTURING**

MEET OUR EXPERT



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Now in his 22nd year with DELMIA, John began his career as the company's VP of R&D, eventually becoming Director of Strategic Deployments & Solutions. In this role, John manages a global team of subject matter experts in industrial engineering. John's team is responsible for defining and positioning new products as well as enhancing existing products to better serve DELMIA's customers. John is also the DELMIA leader for Transportation & Mobility.



2020: HOW MANUFACTURERS COPEd WITH A GLOBAL DISRUPTION

“When the pandemic started, many companies simply stopped production because they couldn’t do it safely.”

– John Eskuri

Manufacturers have long sought ways to brace themselves against disruption. Understanding that unexpected incidences can substantially slow down production, leaders have prioritized operational agility to ensure they can navigate safely through any event.


Still, never has this ability to adapt been tested the way it was at the start of the COVID-19 outbreak.

When the pandemic first broke out, many manufacturers recognized at once that they were in for some tough times. As early as March 2020, a majority anticipated that they would be forced into a change of operations.¹

They were right. Demand soared for products to combat this global health emergency. While many factories floundered, agile manufacturers rose to the challenge. Car, sportswear and beverage manufacturers reconfigured their systems and began producing ventilators, hand sanitizers and facemasks instead.

Of course, manufacturers had to worry about more than sudden, drastic changes to supply and demand. They now also had to contend with the possibility of a highly contagious airborne disease within their factory walls.

A McKinsey study on the impact of disruptions on a scale of severity from ‘theft’ to ‘meteoroid strike’ ranked the pandemic as the most disruptive event that has ever occurred.²



Though a major disruptor, COVID is far from the only hazard that affects the industry. In the UK, manufacturing sees an average of 66,000 non-fatal injuries per year.³ Nearly half of these are due to slips, trips or falls (23 percent) and lifting and carrying (22 percent). Thirty-five thousand of the country's manufacturing workers are suffering from new or long-standing musculoskeletal disorders. Among private industries in the US, manufacturing accounts for 15 percent of non-fatal injuries or illnesses.⁴

This ebook explores how simulation technology, a long-time friend of manufacturers and their employees, is doing far more than improve productivity and profit. It is helping companies achieve their health and safety targets, to keep workers safe from both common industry hazards and any unexpected events that might threaten their well-being.



PART 1

**SIMULATING A SAFE
WORKING ENVIRONMENT**

The power of simulation lies in how quickly and effectively it reveals the shortest path to a desired, real-life outcome. Whether that outcome takes the shape of a product, process or the factory itself, simulation enables manufacturers to explore and analyze countless options to reach the best one for their needs.

Virtual twins

A factory's virtual twin is an accurate and highly detailed representation of the actual plant. It provides a virtual testing environment in which to observe the effect of various scenarios on manufacturing safety.

With virtual twins, manufacturers can find the answer to questions such as:

- What happens if you move a machine to this location?
- What if you add a robot to this production line?
- What if we use cobots to allow for more space—and social distancing—between human workers?
- What adjustments can be made to reduce injuries caused by repetitive movements?

Your factory's virtual twin provides unparalleled insight into the workings of its real-life counterpart and predicts how it will behave under different circumstances.

What's more, a factory's virtual twin is connected to the real factory by various data sources. Therefore, any changes that are made to the real plant are mirrored virtually. In effect, the two factories 'age' together.

Layout and reconfiguration

Once you have a virtual twin of your factory, you can explore different floor configurations with ease. Before 2020, one of the primary goals of factory traffic flow simulation was to ensure safe distances between people and machines. Since the COVID-19 outbreak, it has become necessary to think about how workers can keep a safe distance from one another.

Surprisingly, despite the recommended gap of two meters (six feet), simulation technology has shown that social distance has little to do with actual distance at all. Under certain circumstances, two people facing each other across a small table are less risky to one another than a worker several meters 'downwind' from their colleague.

Airflow simulation—which has traditionally protected workers from airborne hazards such as dust and toxic gases—is now being used to study the spread of particles from a sneeze and improve ventilation to design work areas and avoid contagions.



3D scanning

While factories that already have a virtual twin of their operations have a clear advantage, 3D scanning offers a shortcut for everyone else to catch up with their more agile competitors.

“We use 3D scanning lasers and cameras to scan your existing plant and quickly create a 3D virtual model,” explains John. “Within this virtual environment, you can simulate various scenarios by changing equipment, parameters, layout and assessing the impact of these changes on production performance as well as worker safety.”

“It has been a huge benefit to be able to use 3D virtual twins of factory assembly lines; to be able to simulate different configurations to find the optimal solution for this new world.”

– John Eskuri

Whatever method you explore, whatever new resources you consider, your real-life factory keeps running as you try out these scenarios in the virtual world, without having to buy new equipment, stop production or put your workers at risk.



PART 2
SIMULATING EQUIPMENT
AND WORKERS

Beyond layout, simulation plays a vital role in improving safety by taking into consideration a factory's moving parts: Its machines and workers.

Automated equipment

For much of their history, the machines that powered factories were as dangerous as they were useful.

Over the past several decades, factory equipment has evolved considerably. Among the most remarkable innovations was the increasingly pervasive use of robotic systems, which are automated machines that work independently or with limited operators' input.

In the US alone there are more than a quarter of a million industrial robots⁵ operating with strength, precision and endurance that humans cannot match.

As machines became smarter, they have also made factories safer. Robots are commonly used to perform dangerous tasks and jobs prone to causing injuries such as heavy or repetitive lifting. Despite this, the most recent numbers from the National Safety Council lists "contact with an object or equipment" as one of the top three causes for non-fatal injuries in the US.⁶





“ There’s a different safety dimension to evaluate when it comes to automated equipment. Robots, cobots and automatic guided vehicles need to be deployed properly and carefully to ensure there is no danger to the humans working alongside them.”

– John Eskuri

The most effective way to safely place and use automated equipment is simulation. Robotic systems can be virtually designed, installed and programmed within the 3D virtual twin. Accurate representations of how the systems will impact the manufacturing process enable manufacturers to only deploy the real robots after uncovering the best solution in terms of performance and safety.

Co-robots, or ‘cobots,’ are a new breed of robots that work cooperatively with humans, occupying the same space. An unexpected benefit to using cobots and robots came about when the COVID-19 pandemic required social distancing.

Simulation technology allowed manufacturers to explore opportunities to use automated systems to fill in the wide gaps between workers on the production line, thereby circumventing disruption to their operations.

Digital human modeling

Generally, factory equipment is designed for an average user, though it's important to note that the 'average' factory worker depends greatly on where in the world the plant is located. Even when machines are designed to accommodate a wide range of body types and shapes, there are always outliers.

In such cases, an otherwise safe piece of equipment becomes a hazard. For example, a worker who is much taller than average might have to stand in a posture that hurts their back. A much shorter worker may have to strain to reach controls and end up with a shoulder injury.

To prevent these and other injuries, manikins—digital models of human anthropometry—can be used to determine the ergonomics of their factories.

Manufacturers can draw on an extensive library of manikins with different body sizes, body types, capabilities, limitations and needs, then place them in their factory's virtual twin. As the manikins are made to interact within this digital environment, the user gains insight into whether any worker can perform certain tasks and, more importantly, perform them safely.



“You don’t want to use a real-world system to test worker safety and risk anybody getting sick or hurt.”

— John Eskuri

When designing a workstation, it is also possible to perform ergonomic analyses on a specific person. In other words, the person’s exact shape and capabilities can be used to design a real-world workspace where the operator can work with maximum comfort, safety and performance.





PART 3
SIMULATION AND
COLLABORATION ON THE
3DEXPERIENCE PLATFORM

From safety to efficiency to productivity, simulation can be applied to every aspect of manufacturing. However, this powerful technology loses much of its potential if it is handled in silos.

A factory is not just the sum of its parts, but the sum working together towards a common goal. In the same way, simulation technology is at its most effective when the input and requirements of all stakeholders are taken into account. To make this happen, they need the right collaboration platform –the **3DEXPERIENCE®** platform.

The **3DEXPERIENCE** platform enables multiple and diverse stakeholders to work together to create accurate and relevant simulations that enable manufacturers to fulfil their strategic goals.

Shared global visibility

The **3DEXPERIENCE** platform on cloud enables manufacturing solutions for globally distributed manufacturing stakeholders. As long as they have an internet connection, they can collaborate anytime and from anywhere.

Access to cloud computing accelerates how quickly analyses are conducted on scenarios. This enables faster response to disruptions or the time to run even more scenarios to find the best solution. Furthermore, it alerts users whether and how any changes impact workers, machines or processes.



Collaborative safety: MyHealth@Work

In 2020, Dassault Systèmes introduced a new service that would empower manufacturers to reduce the risk of preventable injuries. MyHealth@Work is a collaboration between Dassault Systèmes, manufacturers and their insurance companies.

Visualize, analyze, prevent

First, a high-resolution 3D scan is performed to **visualize**—that is, to create a digital twin—of the factory.

Next, the model is used to simulate precise activities, movements and behaviors of the people, machines, fixtures and systems within the factory. The simulations are **analyzed** to reveal potential instances of injury-causing hazards.

Now the cloud-based MyHealth@Work dashboard lets all stakeholders work collaboratively to explore their options. They review ergonomic analyses and recommendations for each operator and operation and implement the necessary changes to prevent cases of illness and injuries.



MyHealth@Work works

Pilot projects have shown encouraging results with benefits to the manufacturer, employees and the insurance company. Among them:



Manufacturer

- Lower insurance rates
- Reduce absenteeism
- Improve productivity



Employees

- Better working conditions
- Improve health and safety
- Reduce stress and anxiety



Insurance Companies

- Fewer claims
- Increase margins
- Better understanding of customers and industry





Productive collaboration

All technologies share the same data model, which promotes cross-functional, cross-discipline collaboration as internal and external users are able to work together and design the best solutions for manufacturing safety.

The shared data model has removed the need for non-value-added activities, such as the need to translate data when moving it between systems.

An early study conducted by Dassault Systèmes showed that 80 percent of a manufacturing engineer’s time was spent collecting data and putting it into useable form. The 3DEXPERIENCE platform reduces that activity to almost zero, a 500-percent potential productivity improvement.

For further reference:



“Simulation talks: Series of simulation-focused discussions”

[Watch the series](#)

REALIZE SAFER FACTORIES TODAY

Disruption is not about events, but about how well the impact of such events is managed. Factories that run traditionally cannot adapt to severe disruptions and will continue to struggle when the next disruption hits.

On the other hand, manufacturers that use simulation technology adapt more quickly to new conditions. Simulation in manufacturing is the fastest, most accurate way to identify what is not working and how it can be improved.

Whether it is to increase productivity or reduce workplace injuries or to satisfy any other number of goals, simulation enables manufacturers to continuously explore opportunities for improvement and to face any disruption head-on.

Want to learn more? Discover other insights and actionable ideas on manufacturing [here](#).



Our **3DEXPERIENCE®** platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit www.3ds.com.



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