

## FACTORY AUTOMATION

**Your journey towards the digital transformation  
of design and manufacturing starts  
with 3D simulation**

- ✓ **Process design optimization**
- ✓ **Improvement of productivity and cost**
- ✓ **Establish a design process that eliminates rework**
- ✓ **Virtual commissioning**
- ✓ **Digitalization of knowledge**



# 3D Simulation Solving Manufacturing Challenges

In the era of digital transformation, accelerating the process from product planning to commercialization is essential.

However, this progress is often hindered by issues such as rework caused by equipment or line startup problems, increased on-site adjustment time, and delays in decision-making due to unclear investment effectiveness.

Mitsubishi Electric dramatically improves these challenges

with a 3D simulator that enables verification of production lines and equipment in a digital environment.

It visualizes the “results” even before the actual startup.

**Challenges such as these faced at each phase of manufacturing—  
3D simulation can solve them all at once.**

## ● Process design team



We want to verify productivity and layout before equipment startup...

The **optimal design** was achieved through trial and error in verifying productivity and layout.

Solved! with 3D Simulation

## ● Equipment design team



With 2D drawings, it's not possible to notice collisions between machines and other problems related to motion...

Accurate understanding of machine operation among related members. **Issues were identified in advance.**

Solved! with 3D Simulation

## ● Production engineering team



We want to try various improvement plans on site, but it isn't possible to stop the line to verify them...

It is now possible to **verify an unlimited number of improvement plans** in a virtual space without stopping the line.

Solved! with 3D Simulation

## ● Maintenance team



If a sudden problem occurs with the equipment, it takes such a long time to recover...

**Streamline the investigation of the cause** of trouble. A shorter recovery time is now possible.

Solved! with 3D Simulation

## ● IT/DX promotion team



We want to promote digital transformation, but resistance from shop floor workers often hinders its implementation...

Visualize what DX will look like and its associated benefits using data. **People in the company are now able to better understand.**

Solved! with 3D Simulation

## ● Business owners



Facing challenges such as labor shortages and rising costs, we want to make optimal decisions and investment decisions...

Verify layout and productivity in advance. Achieve **optimal decisions and investment decisions.**

Solved! with 3D Simulation

## ● Sales team



It is difficult to make the optimal proposal because each customer's shop floor environment differs...

Customer's shop floors are reproduced in 3D. Backed by concrete data, **optimal proposals** can be presented.

Solved! with 3D Simulation

By sharing the same 3D model across departments, the entire manufacturing process is standardized, which in turn strengthens corporate competitiveness.





# MELSOFT Gemini

Mitsubishi Electric's 3D Simulator MELSOFT Gemini is software that can simulate factories, equipment, and machines in a digital space.

With MELSOFT Gemini,  
**optimize everything** from process  
to detailed design — **all in one tool!**



In typical 3D simulators, process design and detailed equipment design are handled in separate tools, requiring separate investments. MELSOFT Gemini integrates both in a single platform, improving optimization accuracy.

**By iterating** between process and detailed design, MELSOFT Gemini enables **a highly accurate digital twin environment.**

## ● Achieving Overall Optimization

### Line simulation (conception and process design)

Verify line productivity in advance and support optimization of workflows for people and AGVs, as well as calculation of the optimal number of robots.

Calculate throughput for the entire line    Factory logistics

Process sequence planning    Work sequence planning etc.

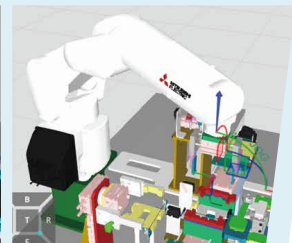
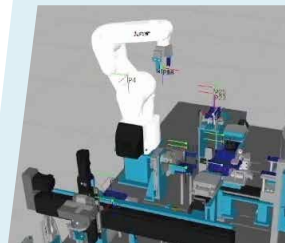


## ● Achieving Partial Optimization

### Machine simulation (detailed design)

Identify potential issues early — from mechanical interference to control program errors. Verify process feasibility, equipment interaction, and takt time accuracy before production.

- Confirmation of the feasibility of each process (confirmation of interference between machines, validity of takt time), etc.

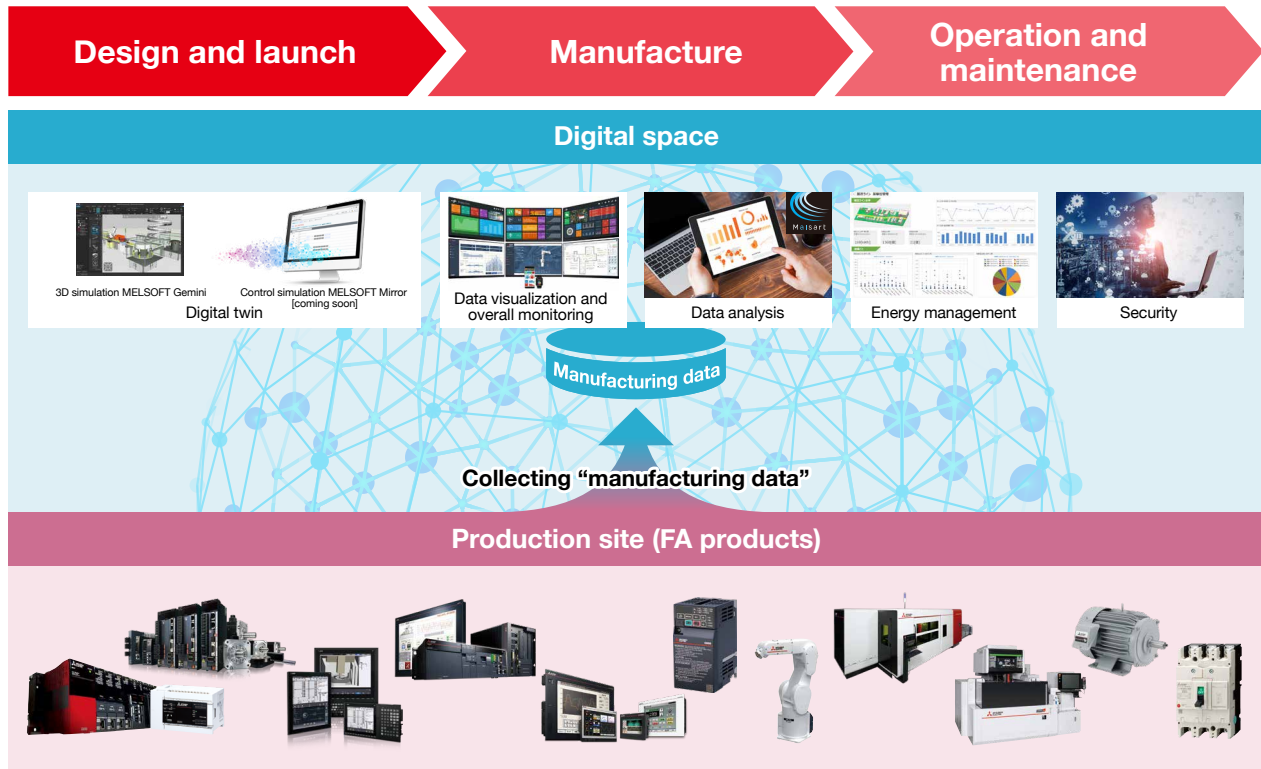




## Point 1

### Don't Let Simulation End with Simulation

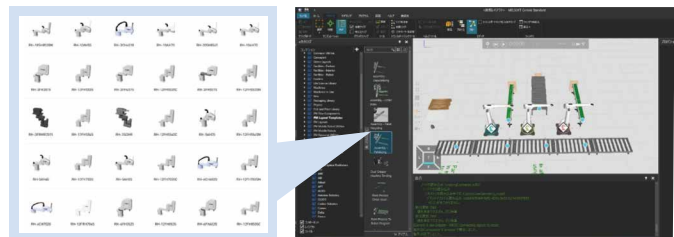
Simulation is a means to enhance real-world operations, and its true value lies in how well the results can be applied to actual sites. As Mitsubishi Electric provides both the key components for equipment control and advanced simulation technology, we deliver a one-stop software and hardware solution that makes true digital integration possible.



## Point 2

### A rich library and no-code operation make it easy to use

- A library of over 3,500 models, including robots and equipment from Mitsubishi Electric and other manufacturers. Each model can be intuitively placed using the drag-and-drop function.
- No-code (low-code) enables process simulation and swift integration into business processes.



# Using 3D Simulation to Optimize the Logistics Process

## Empowering the on-site team to make meaningful improvements

### Toyota Motor East Japan, Inc., Japan

MELSOFT Gemini converts logistics warehouse processes into 3D data, making it possible to gain a bird's eye perspective of the entire process flow, and creating an environment to promote improvement activities driven by the shop floor itself.

#### 〈Toyota Motor East Japan, Inc., Japan〉

Primarily in the Tohoku region, Toyota Motor East Japan oversees the entire manufacturing process of compact cars, from planning and development to production. The factory produces a variety of models including Yaris, Aqua, Sienta, and Lexus LBX.



## Key Points 1

### 3D modelling and simulation of logistics operations in a virtual environment

- In the pursuit of safety, quality, and productivity, the company was constantly planning shop floor layout and logistics.



By utilizing MELSOFT Gemini...

**it is possible to share issues with all relevant members and reproduce the current conditions of each shop floor in 3D!**



#### Comment

Kohei Hanzawa  
Digital Engineering  
Support Group,  
Information Systems  
Division,  
Toyota Motor East  
Japan, Inc.

Performing various planning in 3D is progressing into something commonplace. We hope this initiative to take root.

## Key Points 2

### Enhanced visualization makes complex processes easier to understand

- In reality, the shop floor differs from the 2D drawings, and speaking with the person in charge at the time was time-consuming. The layout in the logistics warehouse was reproduced using Gemini and the ideal process and work procedure were planned.



By utilizing MELSOFT Gemini...

**it is possible to gain a bird's eye perspective of the overall flow, enabling prompt detection of problems and countermeasure planning!**



#### Comment

Seichi Kamio  
Digital Engineering  
Support Group,  
Information Systems  
Division,  
Toyota Motor East  
Japan, Inc.

Many standard parts are available for easy conversion into 3D data. Mitsubishi Electric's support at the time of implementation was very courteous and efficient.

## Key Points 3

### On-site teams empowered to identify problems and propose improvements

- In the logistics warehouse, the flow of forklifts has been causing interference for a long time, creating work delays.
- Since production fluctuates on a daily basis, the process had to be checked on paper, and the issues could not be fully extracted.



By utilizing MELSOFT Gemini...

**it is possible to achieve visualization of issues hidden in the shop floor. This makes it easier to identify and share issues, and progress in improvement!**



#### Comment

Masato Totsuka  
Molding Process  
Toyota Motor East  
Japan, Inc.

Compared to 2D drawings, the 3D version of the shop floor makes it easier for anyone to grasp and objectively evaluate.

Click here for the online version  
that also includes a case study video



<https://www.mitsubishielectric.com/fa/our-stories/044/index.html>

## Case Study

### Seiko Co., Ltd. (Packaging Machinery Manufacturer)

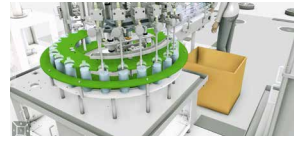
Design and manufacture of packaging machinery including liquid filling machines

#### Issue

The packaging line varied depending on the customer's factory layout, and it was necessary to make adjustments after the equipment was introduced to achieve a better production line.

#### Implementation effect

By conducting simulations during the planning stage, we can provide our customers with better proposals.



Click here for a case study video

[https://www.youtube.com/watch?v=s\\_PzWSlr0jQ](https://www.youtube.com/watch?v=s_PzWSlr0jQ)

## Case Study

### Mitsubishi Electric's in-house process design simulation

#### Issue

As demand increases, production cannot keep up with the current line, so there is an urgent need to increase production capacity. Therefore, we are planning to add a human work station, but we would like to verify the line change in advance and build a system to increase production without rework.

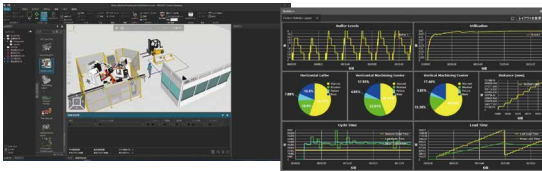
Conventional Production volume	69 units/month	Cycle time	128 min/unit
Target Production volume	80 units/month	Cycle time	103 min/unit

#### Implementation effect

1. Improvement verification in multiple patterns is possible
2. Easy to review by visualizing improvement measures
3. Prevent time loss due to rework

Advance verification of the flow lines and line layout of workers in the assembly line.

**As a result, a system has been established that increases production without rework!**



Establish a system to increase production and further reduce cycle time

**from 128 min/unit to 92 min/unit (actual operation)!**

**Approx. 30% reduction**

## Case Study

### Mitsubishi Electric's in-house machine design simulation

#### Issue

Delays in upstream mechanical design put pressure on the overall project schedule, resulting in insufficient debugging time with actual equipment for downstream control design. This led to significant on-site adjustment.

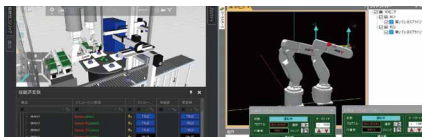
**Machines need to be simulated in advance to achieve front-loading!**

#### Implementation effect

1. Reduce on-site engineering work hours
2. Enable accurate and swift interference check
3. Shorten takt time before going to the site

Verify machine operation in a digital space and improve control accuracy before on-site adjustment

**Front-loading development has enabled shorter project periods!**



Click here for details of internal case studies

<https://www.mitsubishielectric.com/fa/products/software/simulation-tools/gemini/introductions.html>

Front-loading in a digital space has reduced the overall project period

**from 40 weeks to 34 weeks!**

**6-week reduction**



Mitsubishi Electric's e-F@ctory concept utilizes both FA and IT technologies, to reduce the total cost of development, production and maintenance, with the aim of achieving manufacturing that is a "step ahead of the times". It is supported by the e-F@ctory Alliance Partners covering software, devices, and system integration, creating the optimal e-F@ctory architecture to meet the end users needs and investment plans.



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