AI Meets Design

Smarter, Faster, More Sustainable Packaging

Sustainovation Packaging Conference

17 Sep 2025

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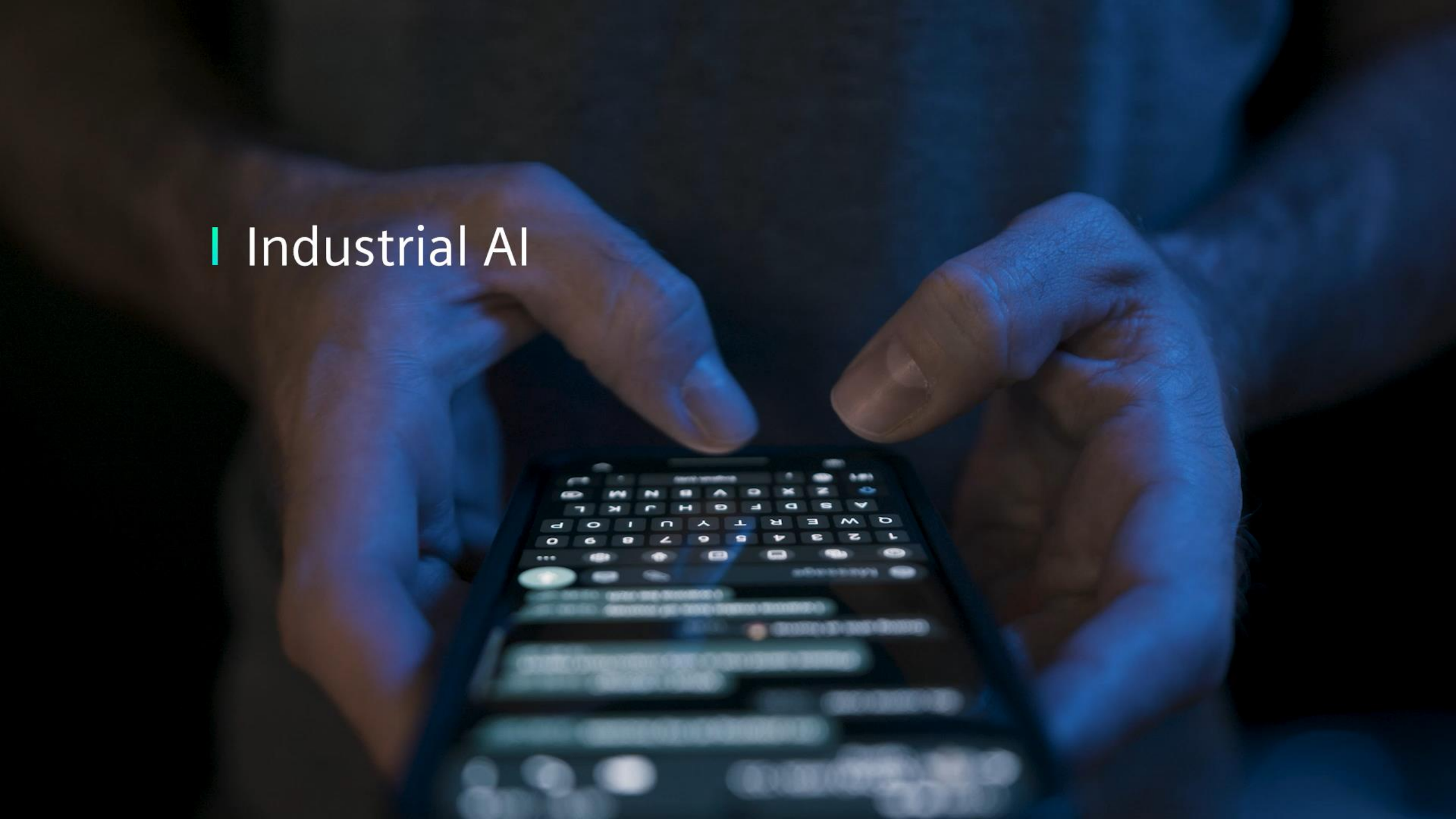

Industrial AI

Artificial Intelligence (AI) refers to machines that can perform tasks typically requiring human intelligence. These tasks include learning from data, recognizing patterns, making decisions, and adapting to new situations.

ChatGPT

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Time to Reach 100M Users

Months to get to 100 million global Monthly Active Users

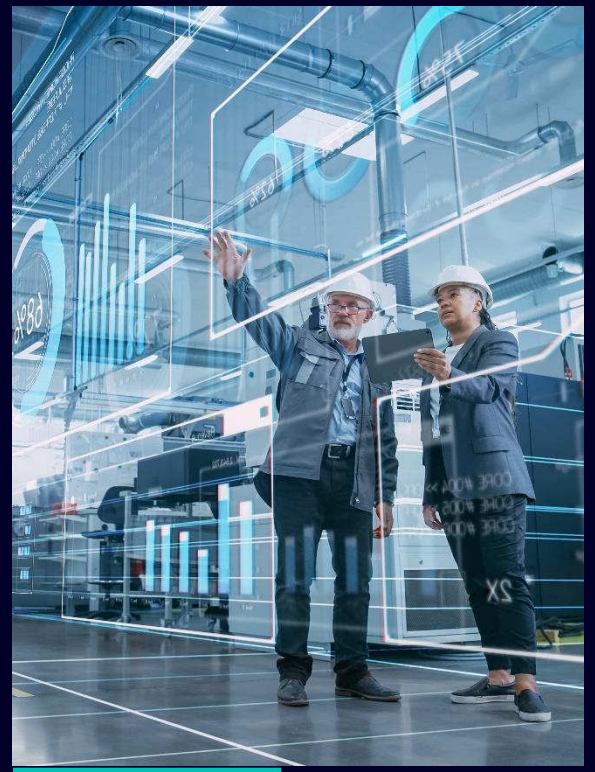
Source: UBS / Yahoo Finance

@EconomyApp

APP ECONOMY **INSIGHTS**

Reference: https://x.com/EconomyApp/status/1622029832099082241

Artificial Intelligence is rapidly changing the world, with manufacturers increasingly adopting it due to these key drivers



Handling increasingly large and complex datasets

Driving operational efficiency and throughput

Mitigating risks in supply chain, cybersecurity, energy, and costs

Improving customer engagement and customer experience

Source: MarketsAndMarkets, 2023; Informa Tech, 2024

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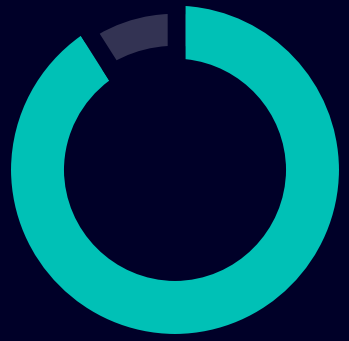
In industry, AI still has a way to go

NEARLY

40%

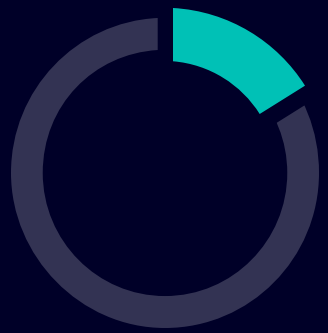
think AI is not trustworthy



A STAGGERING

92%

lack AI-skilled experts



ONLY

16%

achieve their AI-related goals

Source: Gartner, 2024; BCG, 2024

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Siemens turns
Artificial Intelligence into

industrial-grade AI

to meet the highest industry standards.

Start your Industrial AI journey with Siemens to become a

sustainable Digital Enterprise.

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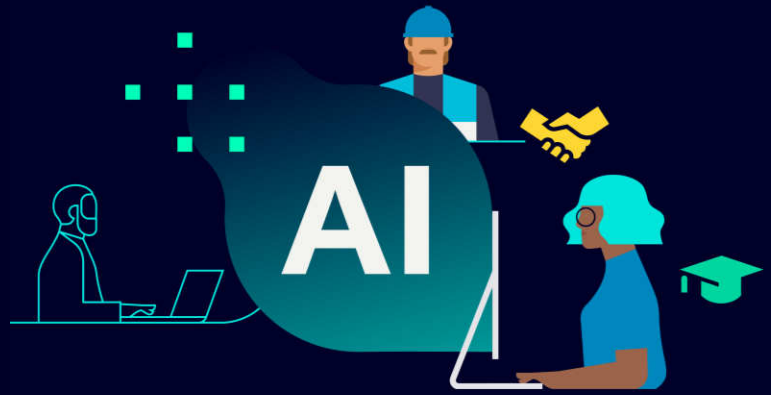
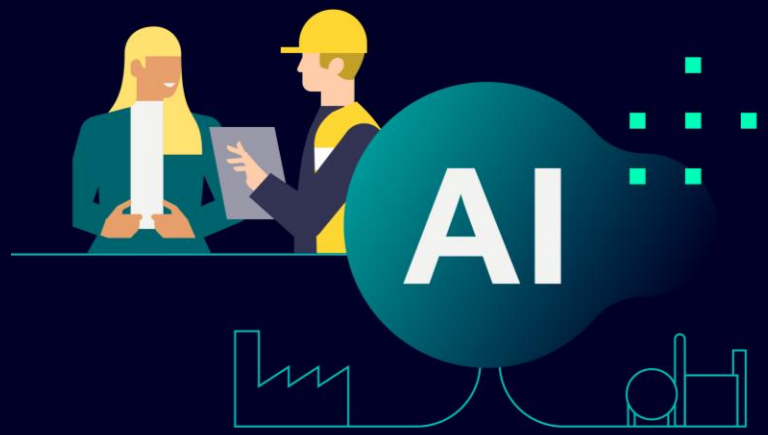
Siemens makes AI ready for industry



Robust

Driving collaboration to achieve reliable, secure, and trustworthy AI for industry



Democratized

Making Industrial AI accessible to everybody, anywhere, and anytime

With purpose

Supporting companies to achieve their scalability, quality, and sustainability targets

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Siemens AI Solutions

Analyze

- “Show me how to…”
- Provide guidance on UX
- Navigate data

Optimize

- “Which option solves…”
- Optimize products
- Balance trade-offs

Generate

- “Create a model of…”
- Perform multi-domain tasks
- Create engineering content

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Siemens Xcelerator AI Landscape

TECH

GPT-4 · OpenAI · TensorFlow · vertex.ai · ANTHROPIC · amazon Rekognition · aws BEDROCK · OpenSearch · Amazon SageMaker

Siemens Xcelerator AI

Teamcenter X · Insights Hub · Opcenter · Easy Plan · Simcenter · Xpedition · Capital · NX

AI Solutions

Analyze · Generate · Operate

AI Domains

large language models

machine learning · planning & decision making · computer vision · agents & multi-agent systems

knowledge representation & reasoning · natural language processing · robotics & control · evolutionary computation

DATA

knowledge bases

CUSTOMER DATA
digital twin

SIEMENS DATA
industry best practices
documentation

PUBLIC DATA

SIEMENS

AI-Powered Packaging Design&Simulation

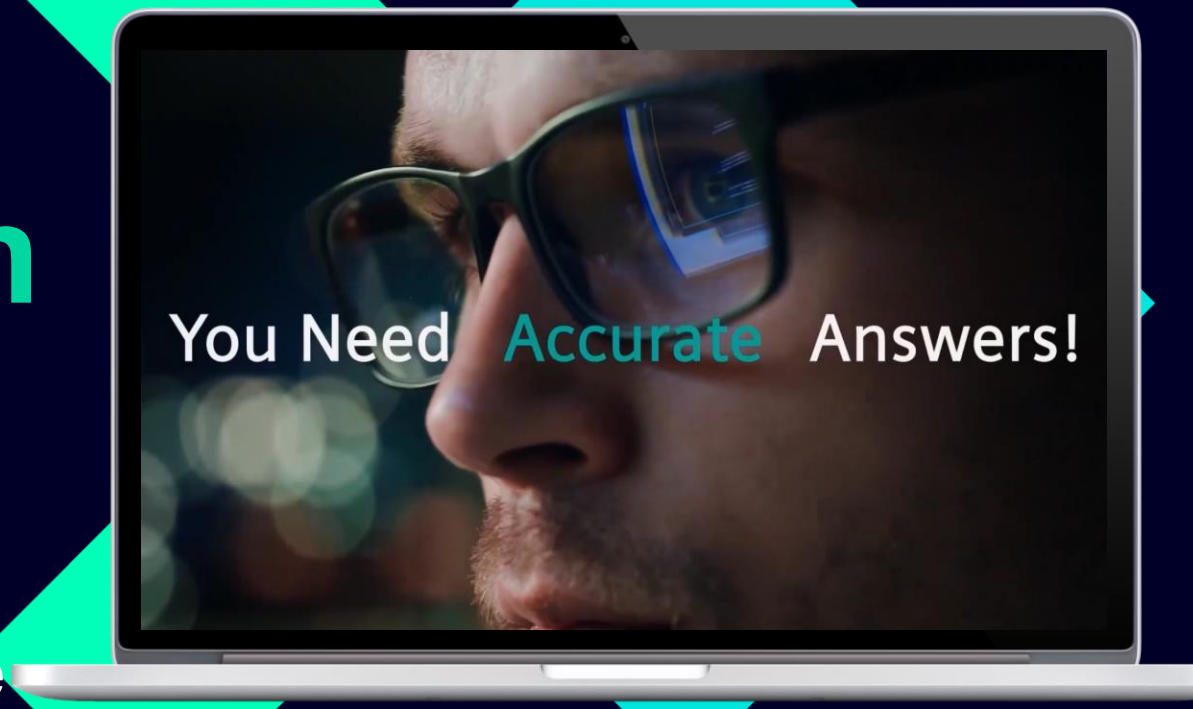
Sustainable Design in the Age of Intelligent Manufacturing

Sustainovation Packaging Conference

17 Sep 2025

AI-Powered Packaging Design&Simulation

Sustainable Design in the Age of Intelligent Manufacturing



Sustainovation Packaging Conference

17 Sep 2025

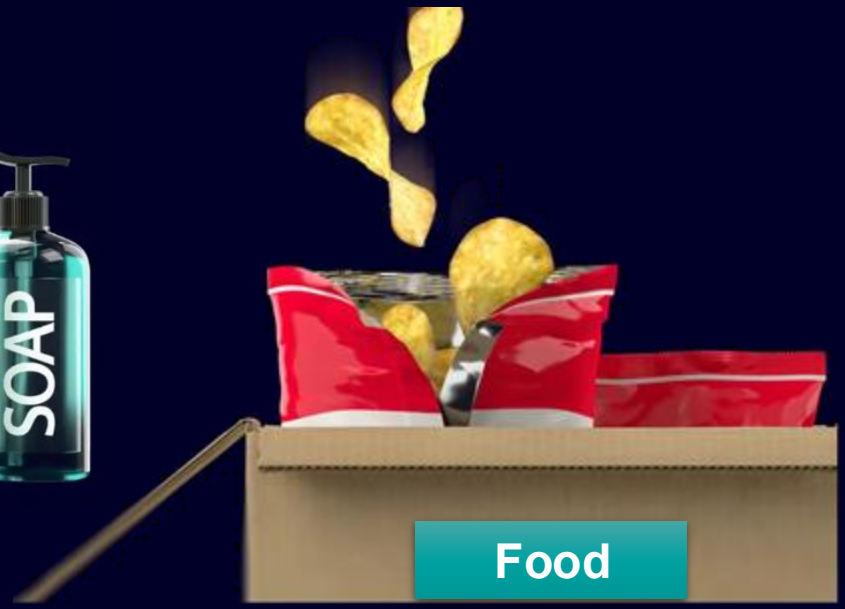
How Simulation Empowers the Packaging Industry?

Strength analyze top load, drop, and vibration tests to ensure packaging durability and reliability

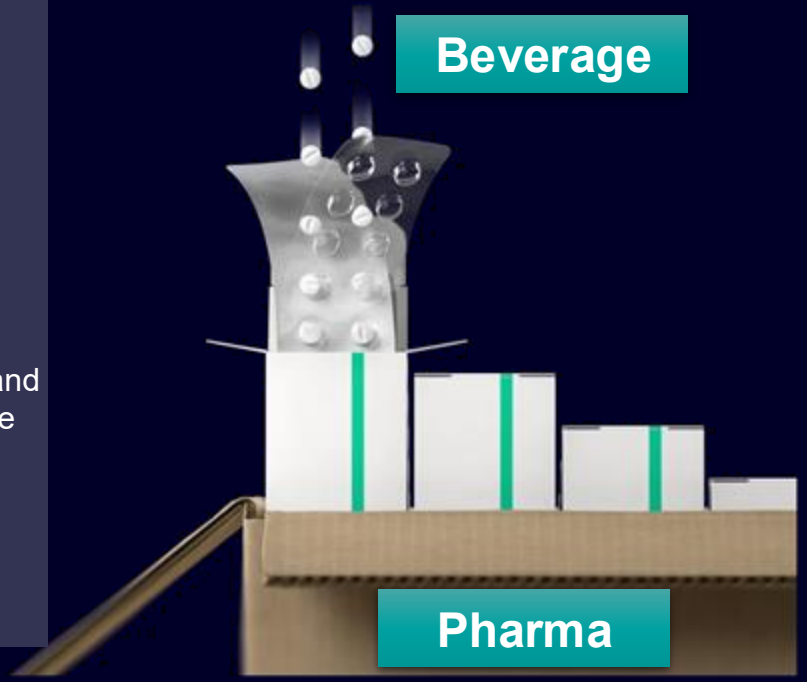
Cost Saving reduce material usage and minimize the number of physical prototypes

Sustainability support eco-friendly design and efficient use of resources for a greener future

Beverage



Food



Pharma

Non-food

NX & Simcenter integrated CAE process
Packaging Industrial

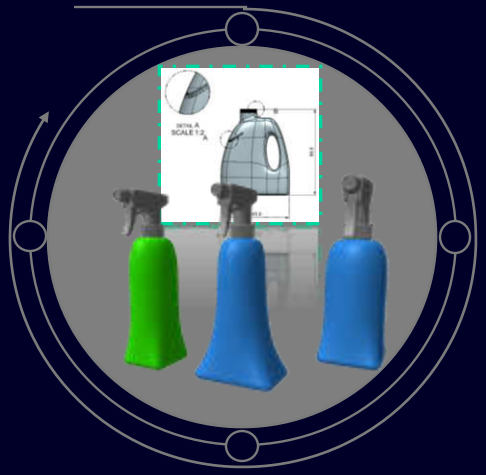
CONTINUIOUS PROCESS IMPROVEMENT & REUSE

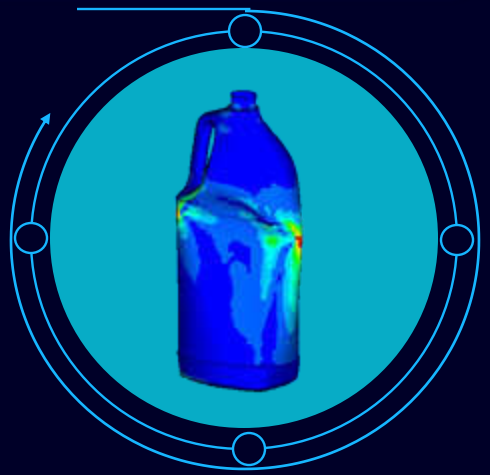
NX CAD

Simcenter (CAE)

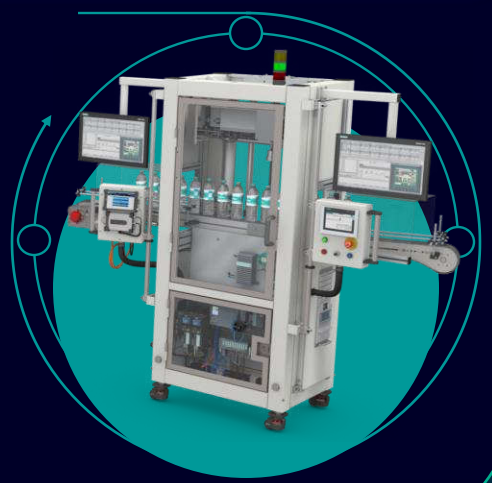
Simcenter AI

NX MCD
Mechatronic Concept Designer





CAD/CAE data + AI



Packaging Design Solution

Machine Manufacturing

NX

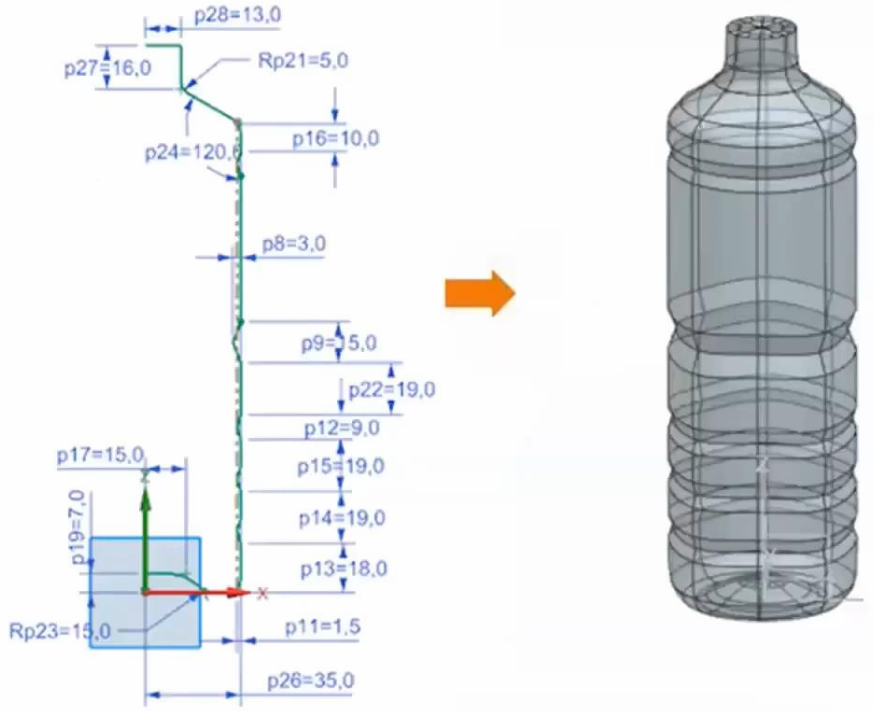
Products Design

- ✓ From concept to detailed design – faster and smarter
- ✓ Flexible modeling for creative and functional packaging
- ✓ Seamless integration with CAE for performance validation

PET Design

MAT Canon
Canon MJ Group

REVOLVE CAGE

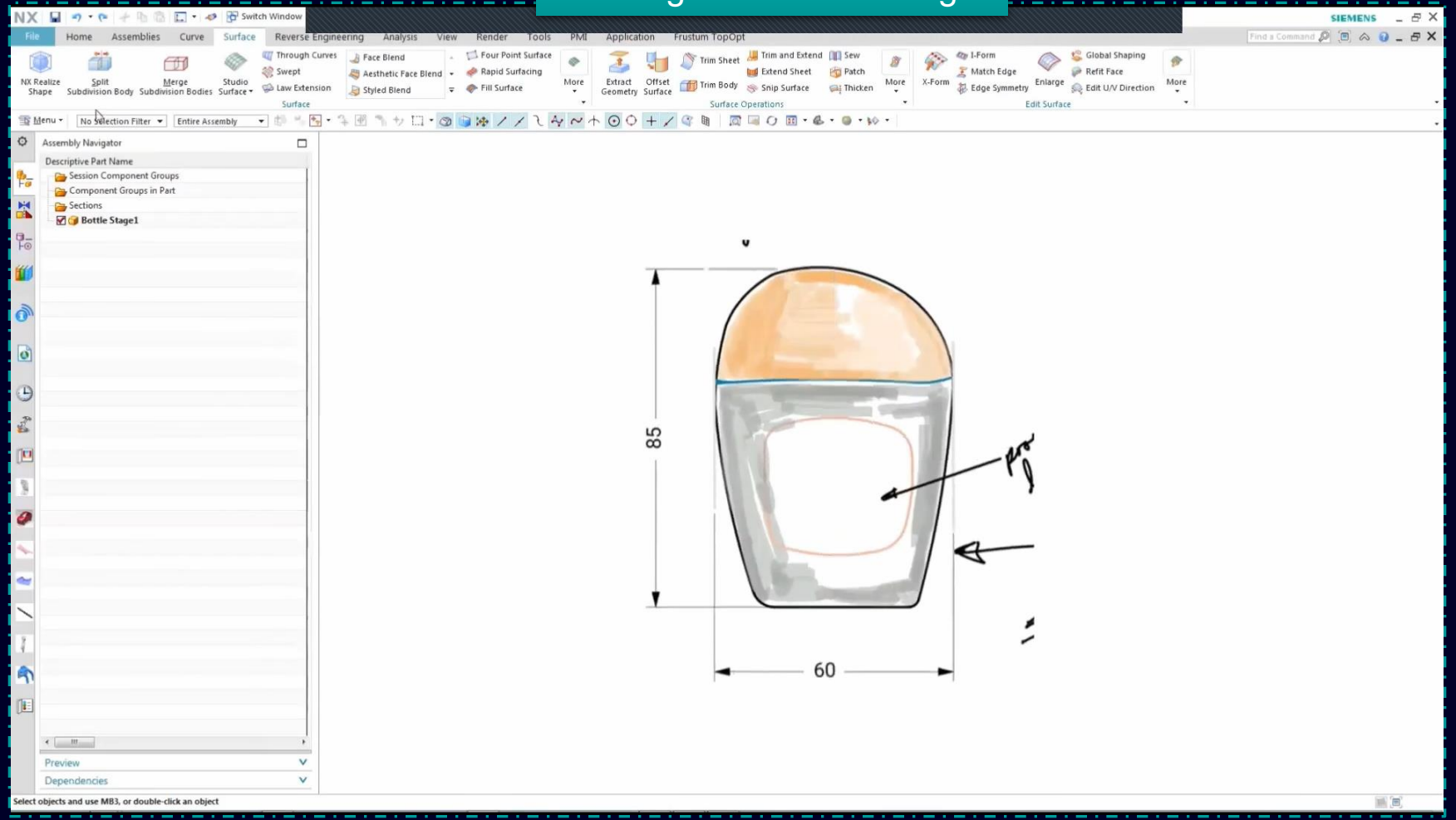


NX

Products Design

- ✓ **Creativity** unlock unique and aesthetic packaging concepts
- ✓ **Precision** ensure accurate design details for premium look & feel
- ✓ Seamless integration with CAE for performance validation

Package Premium Design



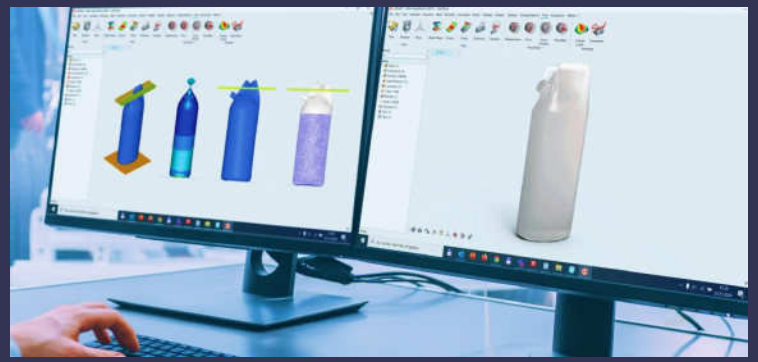
Simcenter (CAE)

Simulation - Driven Product Development

Products validation

Process

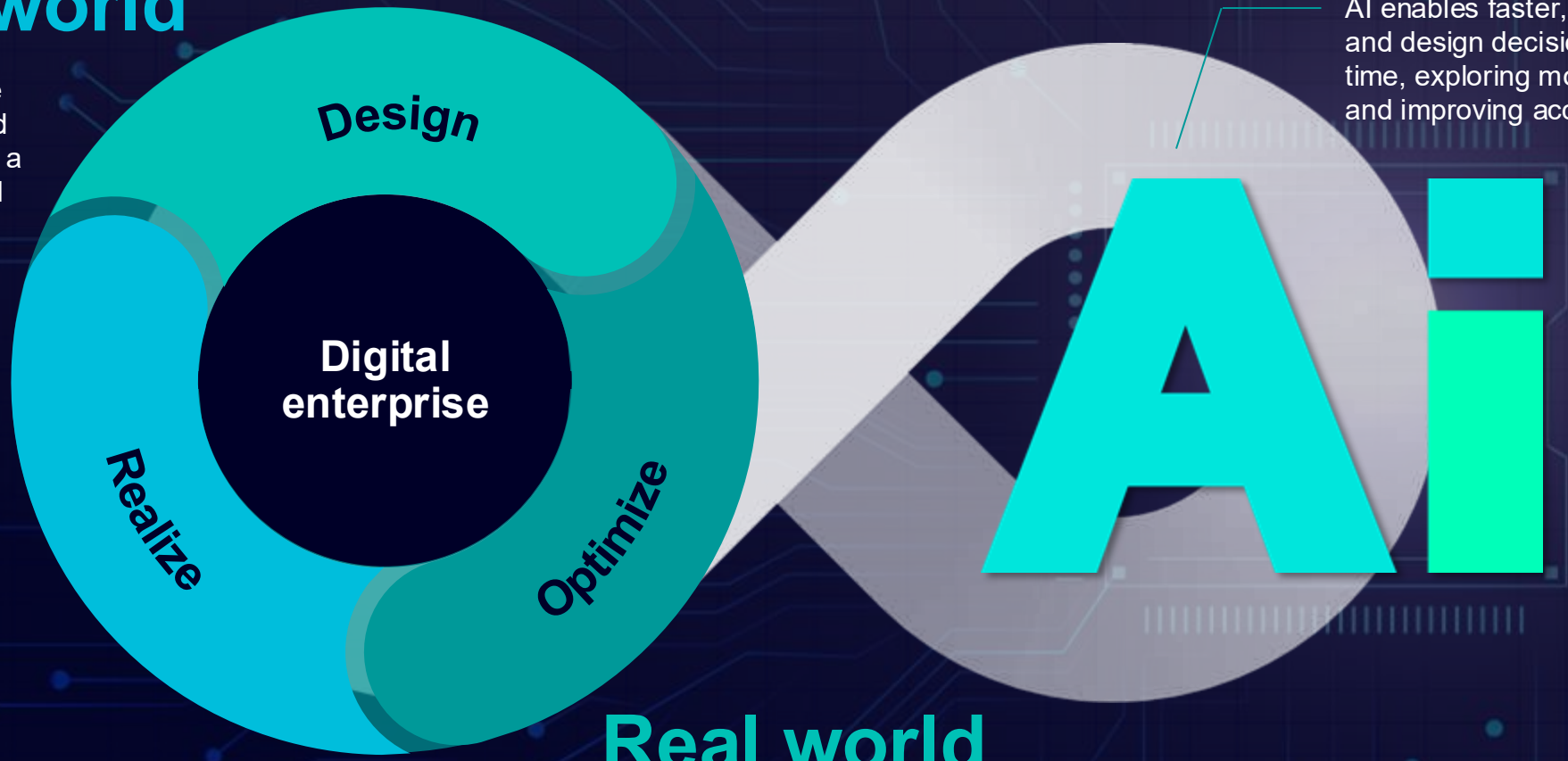
- ✓ Innovation To develop new products or improve exist products
- ✓ **Simulation** validates real load (Top load, Drop Test)
- ✓ **Objective** reduce material cost while maintaining strength



AI-Powered Digital Twin for Smarter Simulation & Manufacturing

Digital world

The Digital Enterprise combines the real and the digital worlds with a comprehensive digital twin approach.



AI-Powered

AI enables faster, smarter simulation and design decisions – reducing run time, exploring more design options, and improving accuracy.

Real world

This enables continuous optimization of design, simulation, engineering, commissioning, automation, service, and recycling.

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Simcenter (CAE)

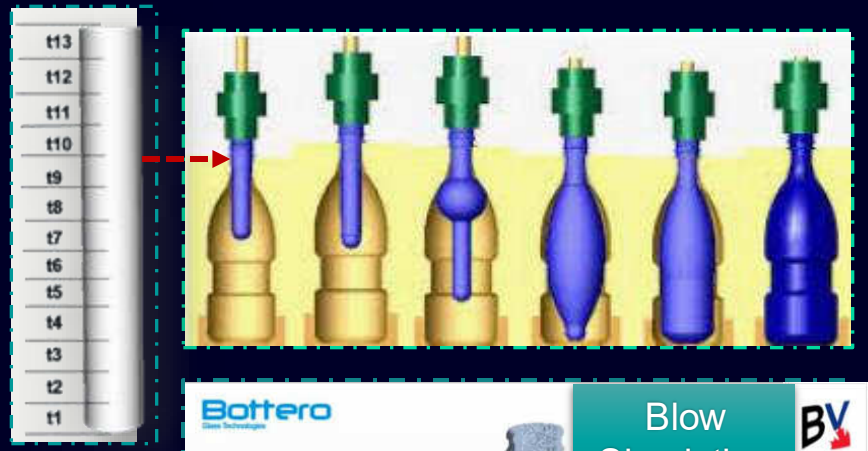
Products validation

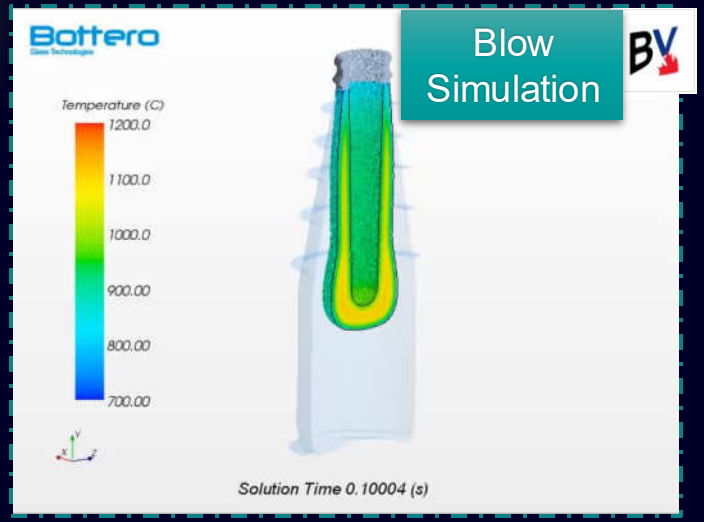
- ✓ **BlowView** provides wall thickness directly from the manufacturing process
- ✓ **Simcenter** validates real load (Top load, Buckling)
- ✓ **Objective** reduce material cost while maintaining strength

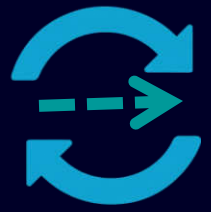
Objective: 1.Minimize Preform Cost
2.Maximize Top Load

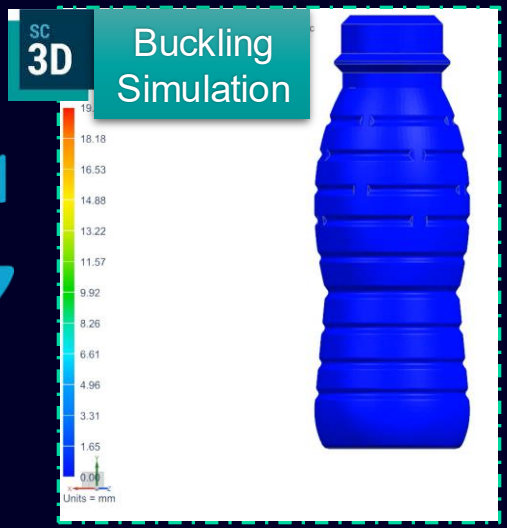
Constraints : Peak Force ≥ 12,000 N (Top load)

By varying: Preform section thickness variables (t1, t2, t3 … t13)







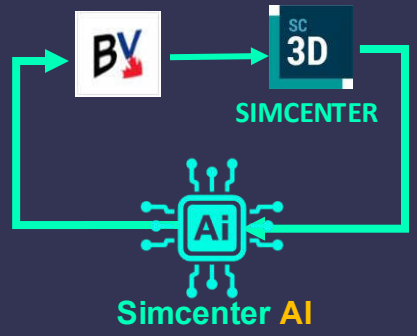


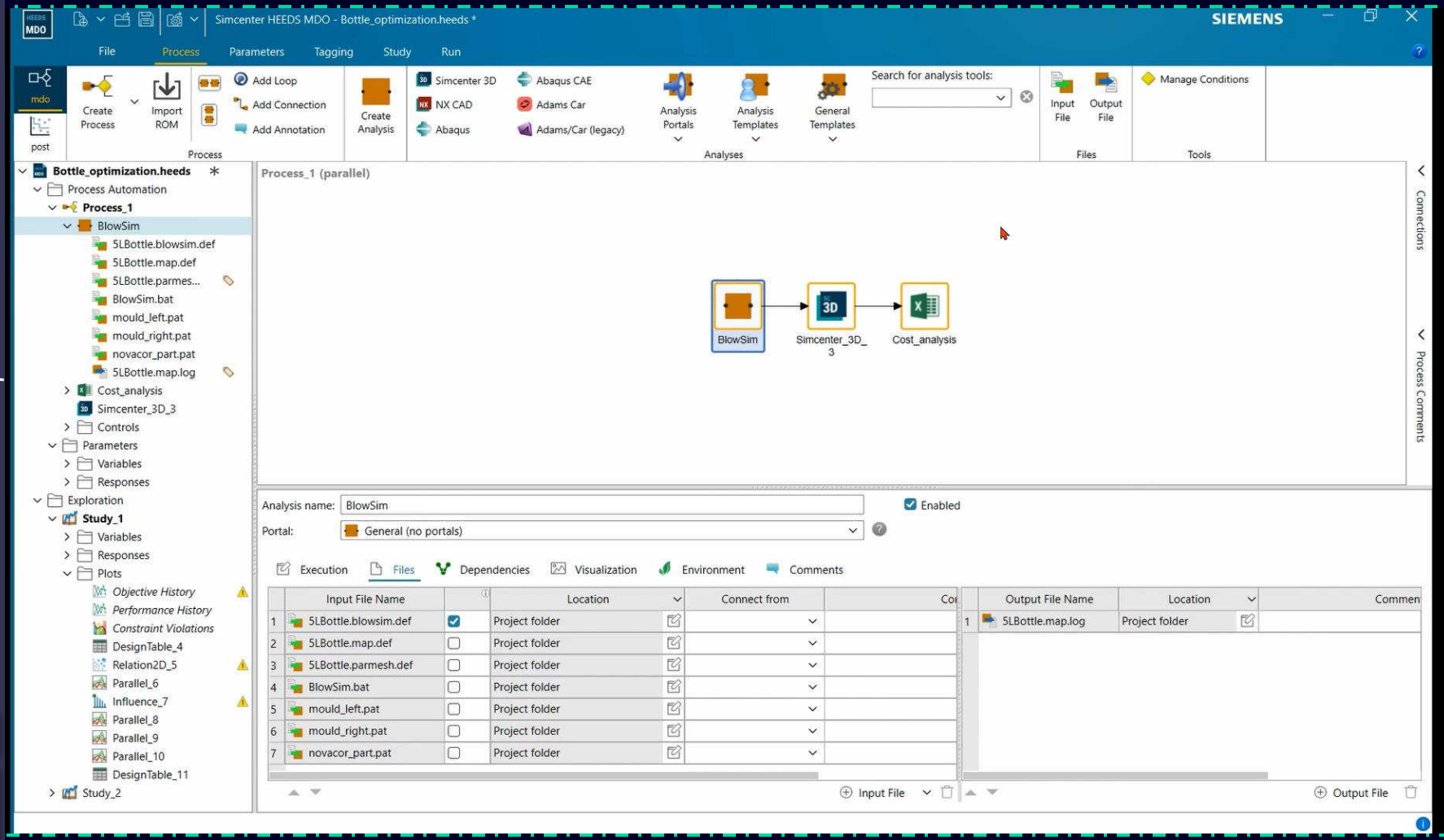
Simcenter AI

Products validation

Process

- ✓ **Explore** AI searches for ***best design***
- ✓ **Accelerate** use AI surrogate for faster prediction than full simulations
- ✓ **Optimize** achieve both cost reduction and structural strength



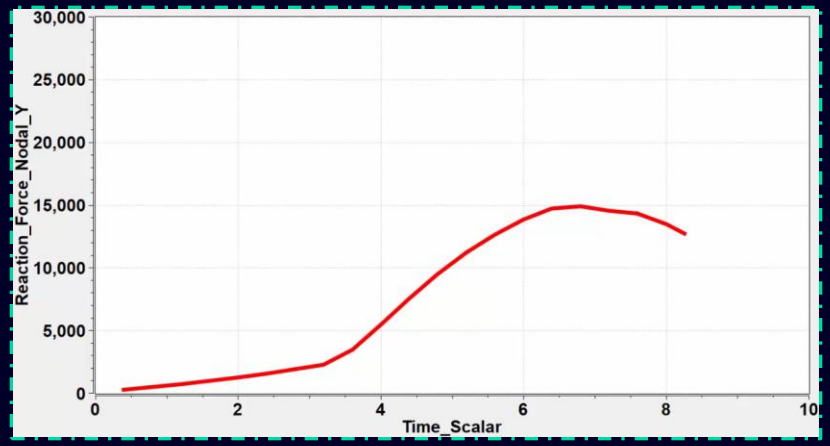


Simcenter AI

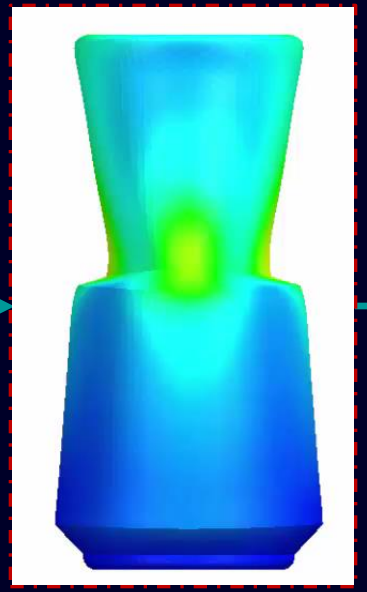
AI-driven Design Exploration

Design ID	Min_thickness	Max_thickness	Diff_max_min
1	1.754	7.051	5.297
2	0.7272	5.156	4.4288
3	0.5432	7.015	6.4718
4	0.8946	9.809	8.9144
5	0.9226	6.627	5.7044

Blow m g



Buckling

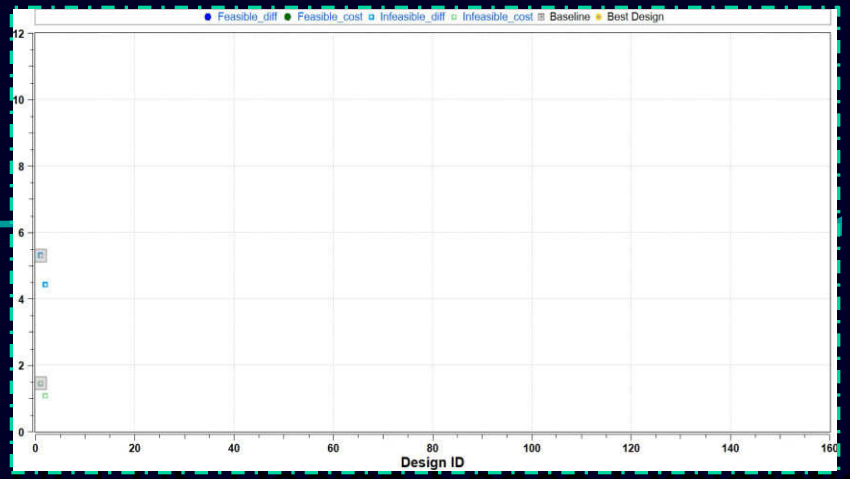


Post-Pr ng

SC 3D

HEEDS MDO

Directed Modifications

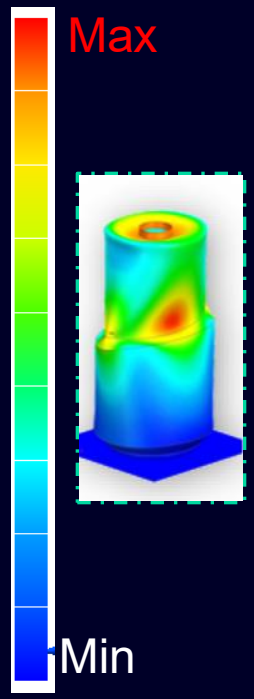


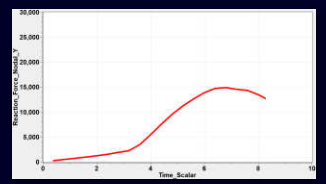
HEEDS Design Space Exploration

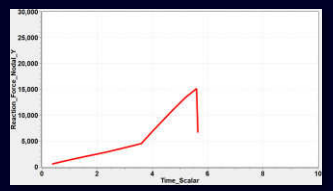
Simcenter AI

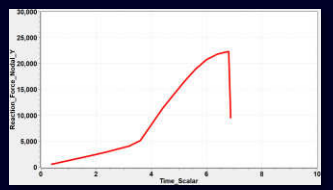
Design Candidate Summary

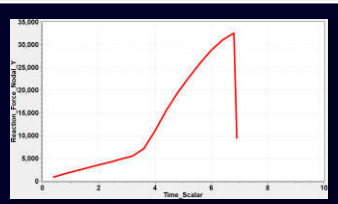
Designs (150)	Baseline	A (Best Design 133)	B (Design 134)	C (Design 125)
Cost (baht)	57.6	50.16 (13% ⬇)	50.71 (12% ⬇)	53.09 (5.7% ⬇)
Reaction Force (kN)	14.872	22.317 (50% ⬆)	15.112 (1.6% ⬆)	32.504 (119% ⬆)

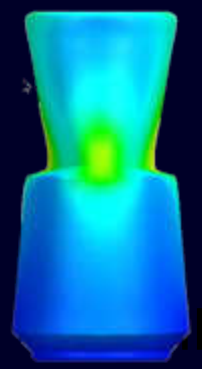


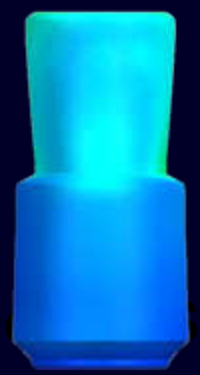


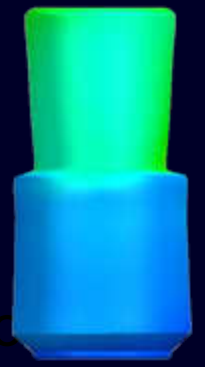


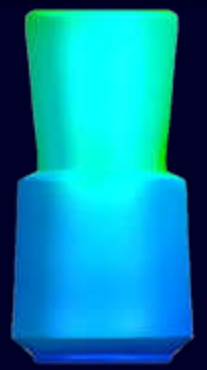












NX & Simcenter integrated CAE process
Packaging Industrial

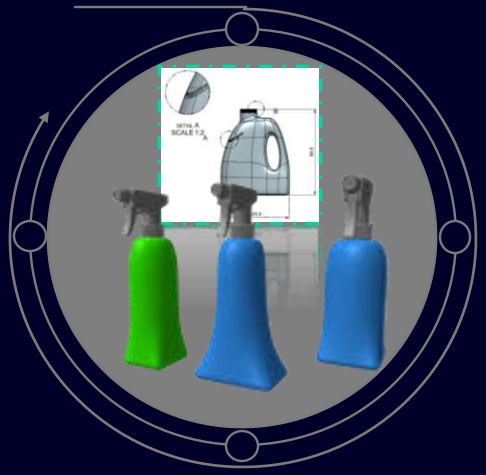
CONTINUIOUS PROCESS IMPROVEMENT & REUSE

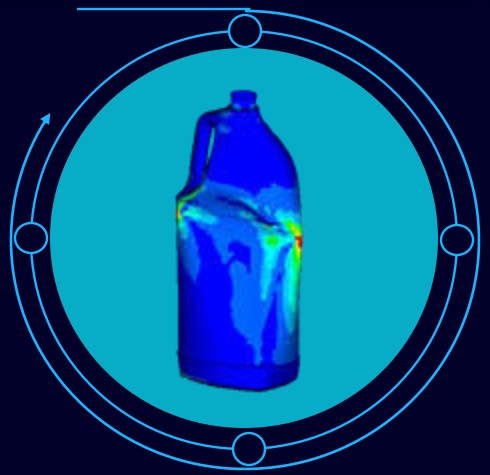
NX CAD

Simcenter (CAE)

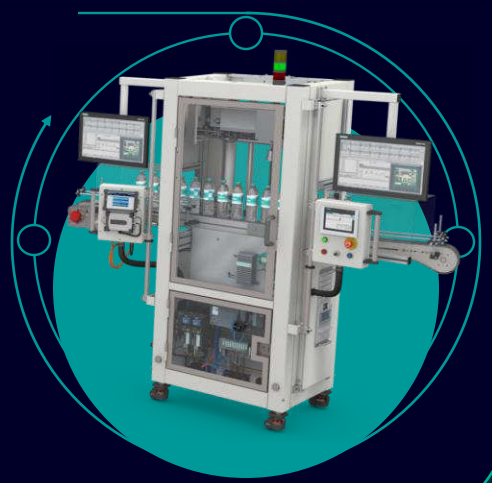
Simcenter AI

NX MCD
Mechatronic Concept Designer





CAD/CAE data + AI



Packaging Design Solution

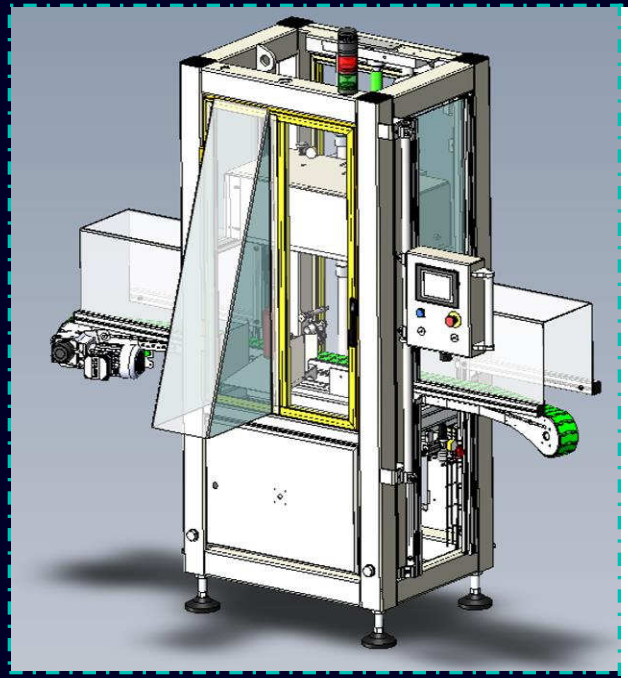
Machine Manufacturing

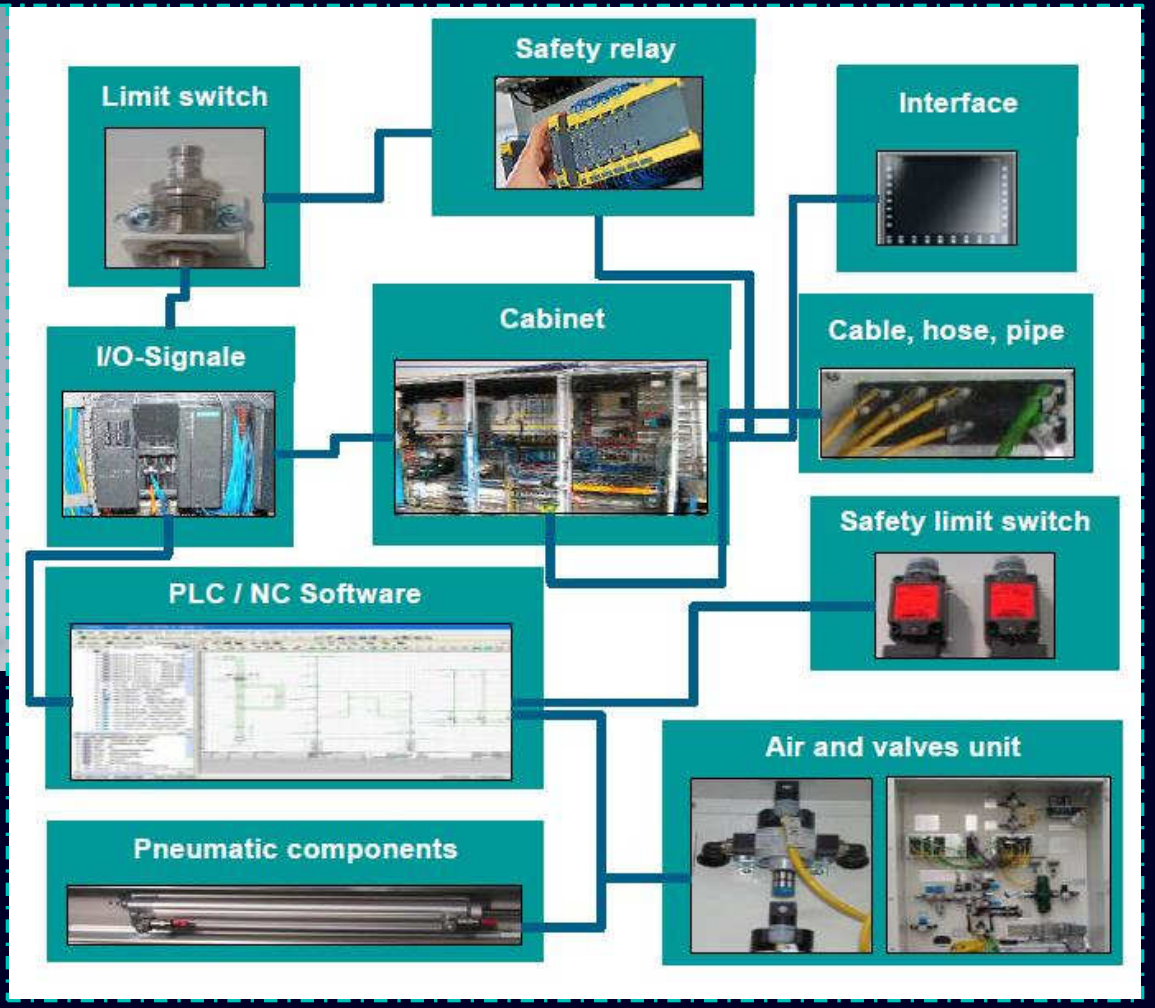
NX MCD
Mechatronic Concept Designer

Design Machine

Process

- ✓ Integration & Collaboration
- ✓ Mechanical
- ✓ Electrical
- ✓ Software

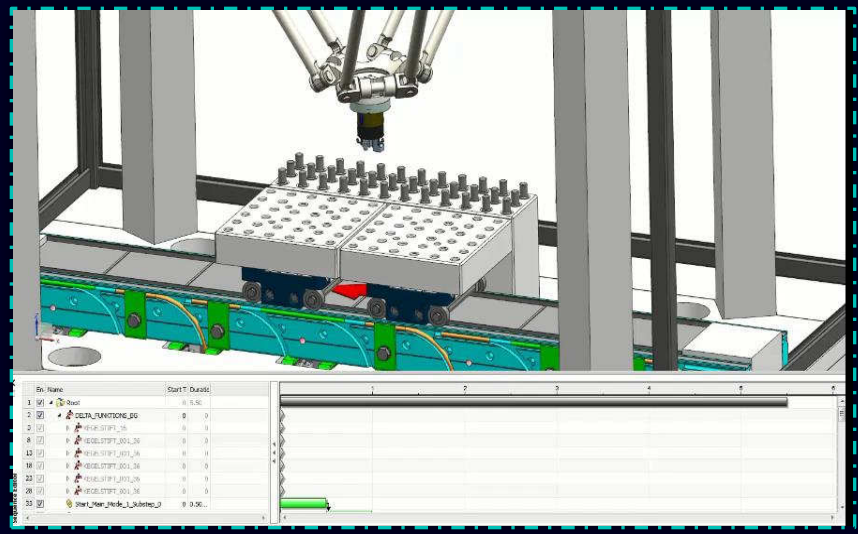


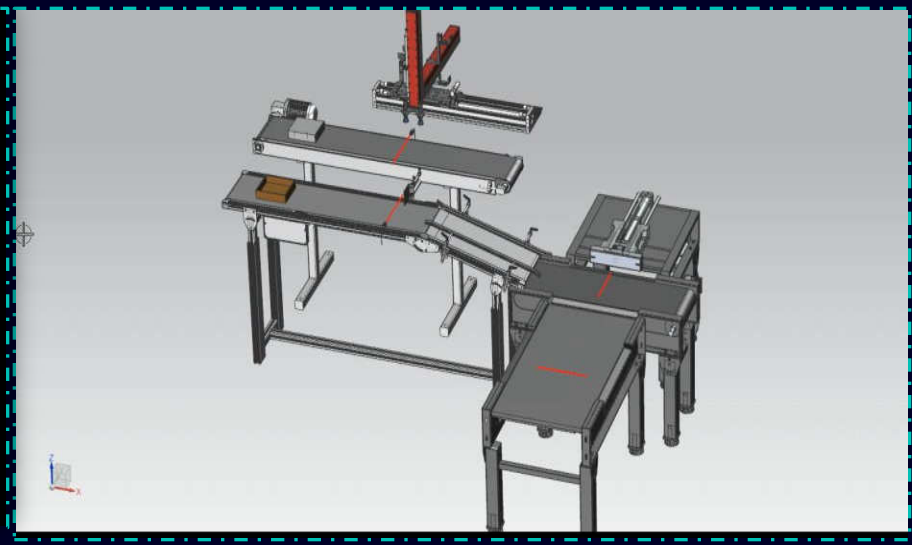


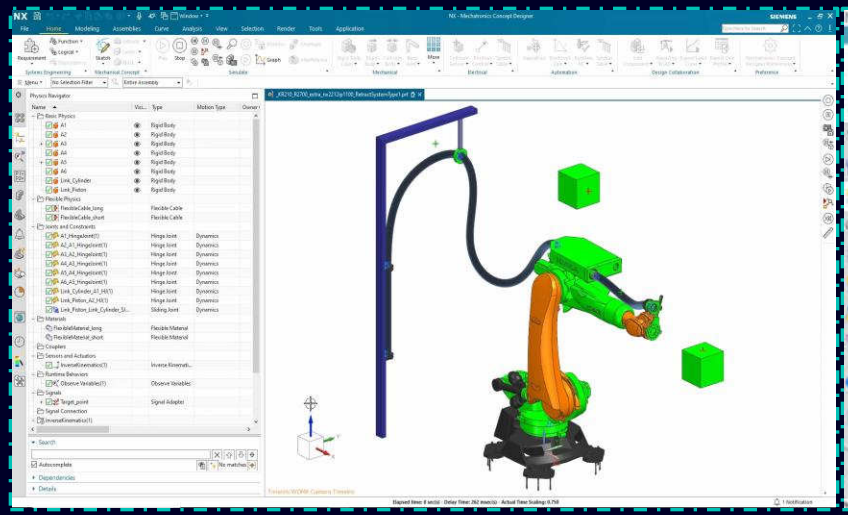
NX MCD
Mechatronic Concept Designer

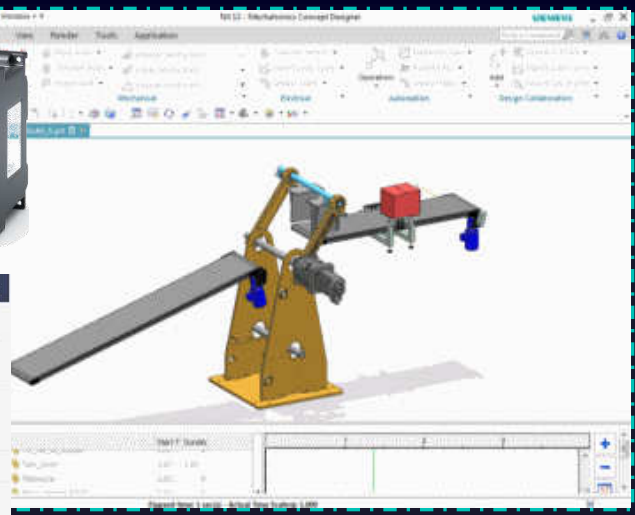
Capabilities of NX MCD

- ✓ Define sequences of operation
- ✓ Define sensors & actuators
- ✓ Select & size motors
- ✓ Flexible cable
- ✓ Gripper tool
- ✓ Virtual commissioning PLC program





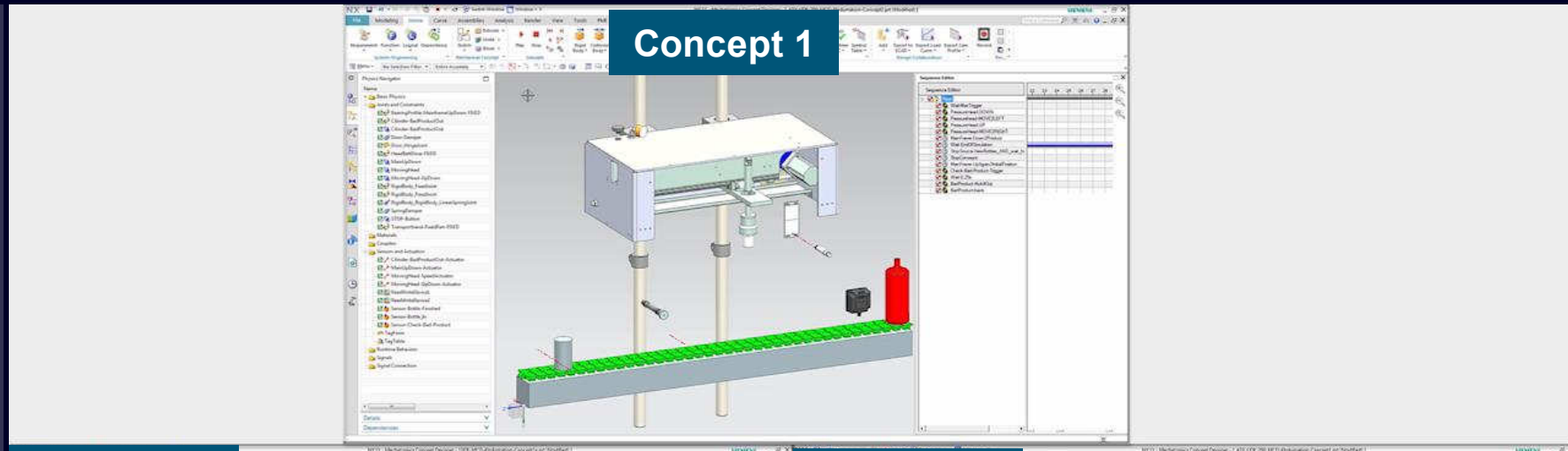


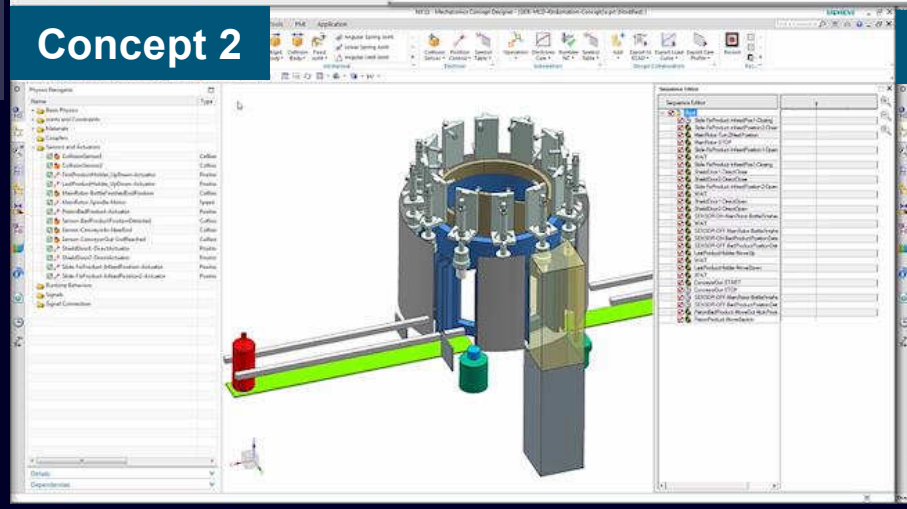


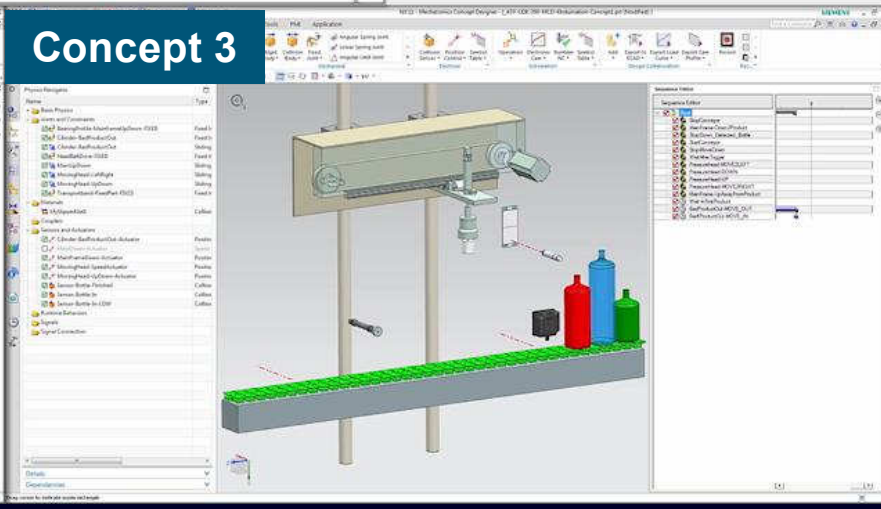
NX MCD
Mechatronic Concept Designer

The CONCEPT

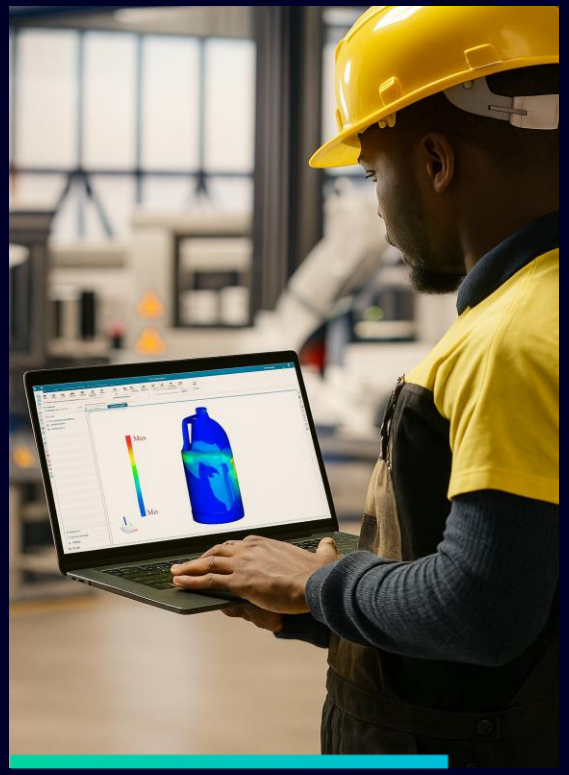
✓ Create multiple design







AI-Powered Digital Twin:
Transforming Packaging Design in Intelligent Simulation & Manufacturing



Fully Integrated CAD/CAE Solution

Modify CAD and Auto-update in simulation reduce error

AI-Driven Design Optimization

Run multiple simulation scenarios in parallel.
Find the Best Design faster with fewer simulations.

Reduce Cost & Time

Minimize physical prototypes.
Lower cost & shorten development cycle.

Enable Data-Driven Decisions

Visualize trade-offs for quality, cost, and sustainability.

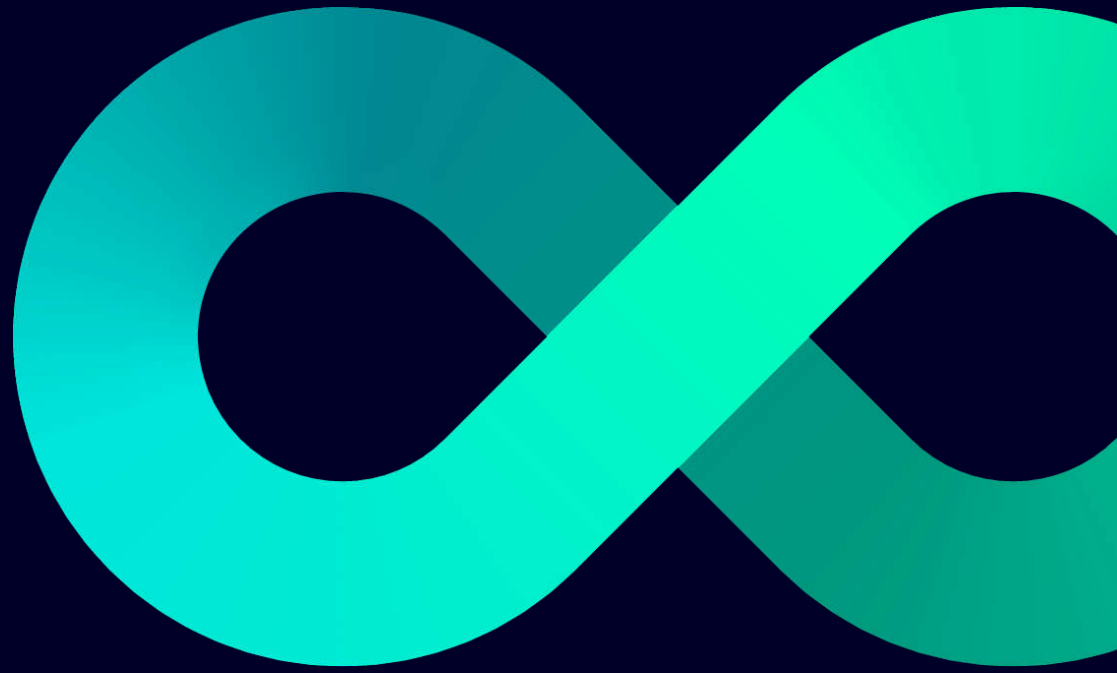
Thank you

Jhakkrapong Intarasing
Material Automation (Thailand) co. ltd
Email : Jhakkrapong@mat.co.th
Phone : 063-315-9111

SIEMENS

AI-Powered Digital Twins

Sustainable Design in the Age of Intelligent Manufacturing



Sustainovation Packaging Conference

17 Sep 2025

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From Concept to Manufacturability

Sustainable Design in the Age of Intelligent Manufacturing

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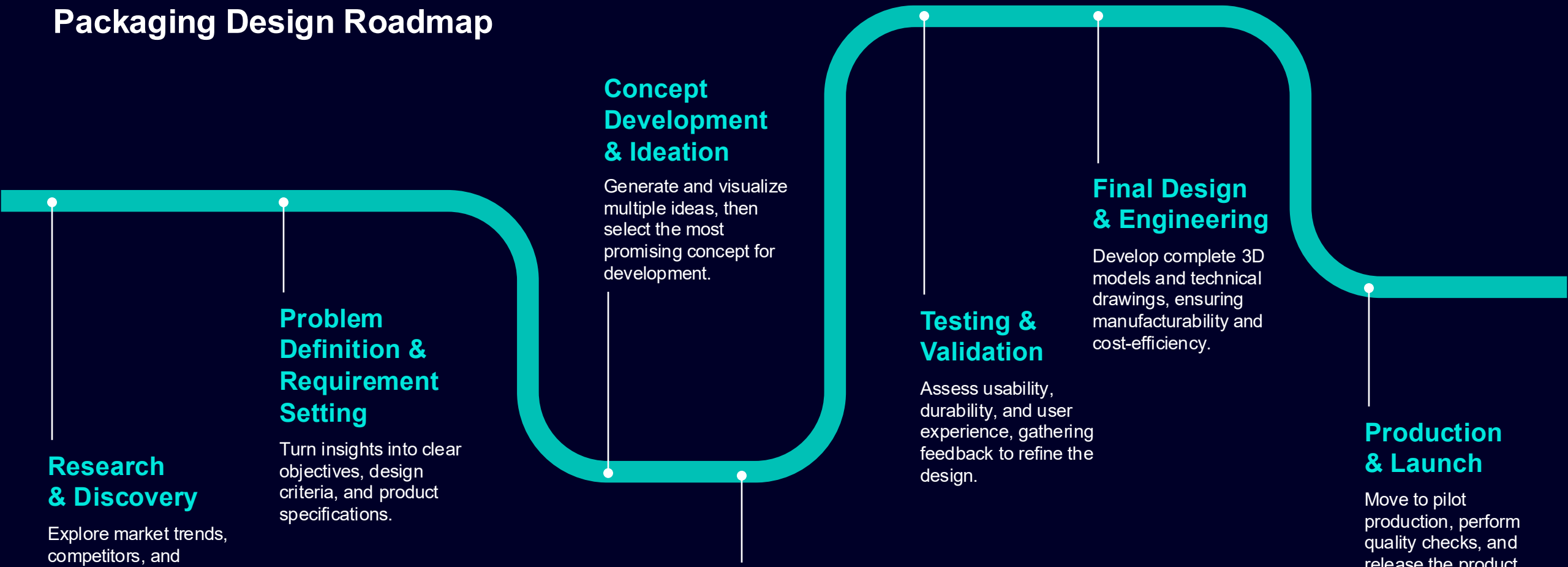
Packaging Design Roadmap



Research & Discovery

Explore market trends, competitors, and customer needs to identify real problems and opportunities.

Problem Definition & Requirement Setting

Turn insights into clear objectives, design criteria, and product specifications.

Concept Development & Ideation

Generate and visualize multiple ideas, then select the most promising concept for development.

Design & Prototyping

Transform ideas into functional designs and create prototypes for early testing and evaluation.

Testing & Validation

Assess usability, durability, and user experience, gathering feedback to refine the design.

Final Design & Engineering

Develop complete 3D models and technical drawings, ensuring manufacturability and cost-efficiency.

Production & Launch

Move to pilot production, perform quality checks, and release the product to the market.

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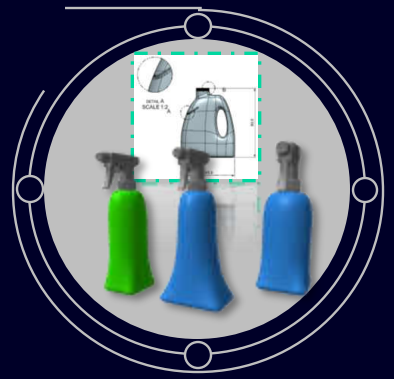
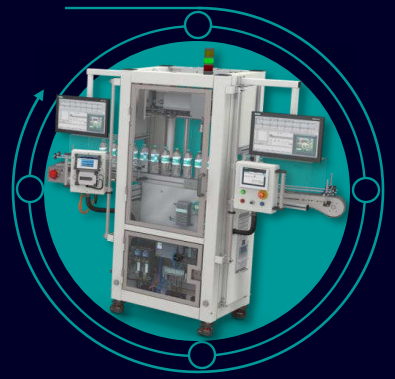
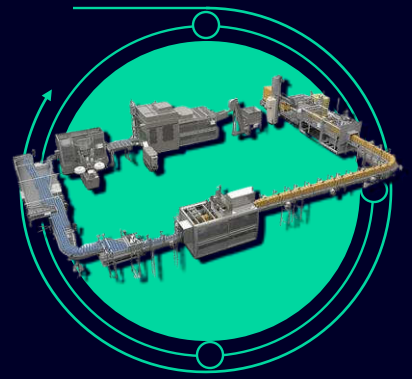
Seamless Path from Packaging Design to Manufacturing

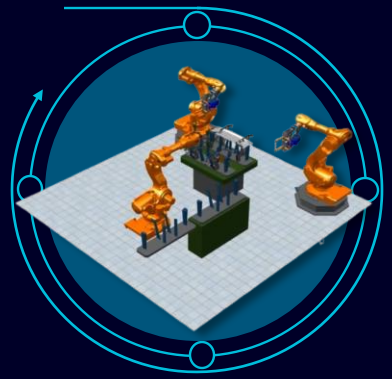
CONTINUIOUS PROCESS IMPROVEMENT & REUSE

NX (CAD) | **Simcenter** (CAE) + AI | **NX MCD** Mechatronic Concept Designer | **Plant Simulation** | **Process Simulate**









Packaging Design Solution | **Packaging Manufacturing Solution**

PACKAGINNG DESIGN MEETS MANUFACTURABILITY

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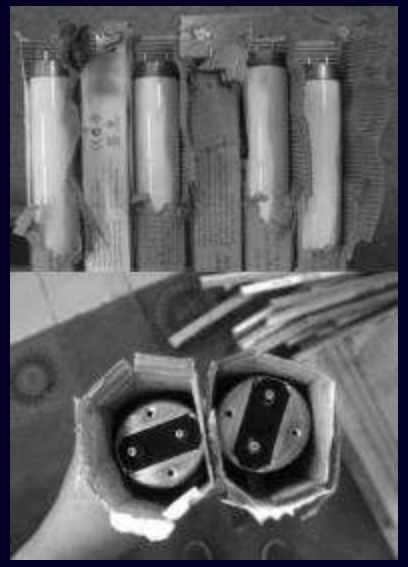
Impacts of Design - Manufacturing Misalignment



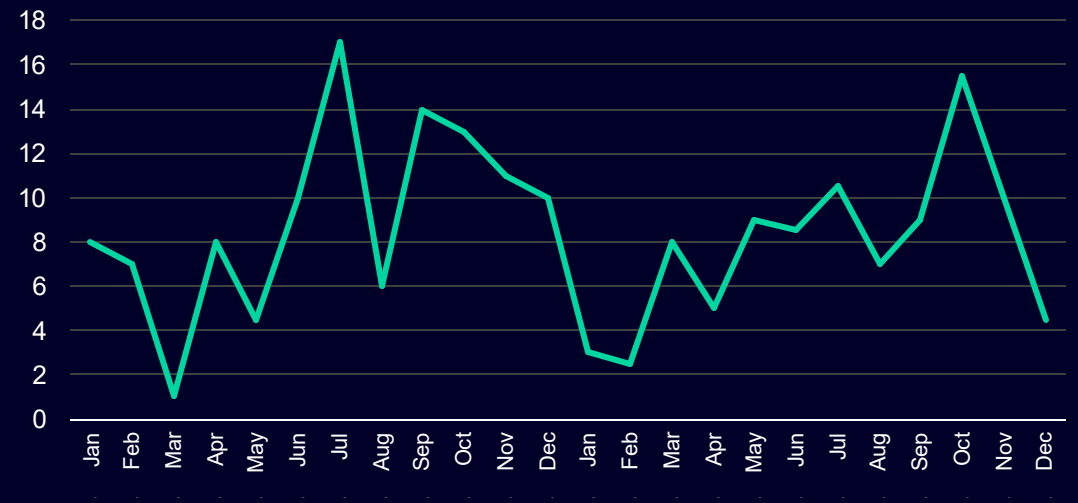


Fig: Characteristics of Packaging Defects and Monthly Average Defect Rate (2021-2022)

8.43%

of packaging was damaged during the automated packing process.

1.80%

defect rate reflects the outcome of optimized production conditions

Source: Packaging waste reduction by design of experiments (2017), Kasetsart University (Thailand)

9MB

in annual savings highlights the tangible impact of production process optimization

Source: Asia - Pacific Journal of Science and Technology, APST

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How can you …

leverage process analysis to avoid hidden manufacturing challenges in packaging design?

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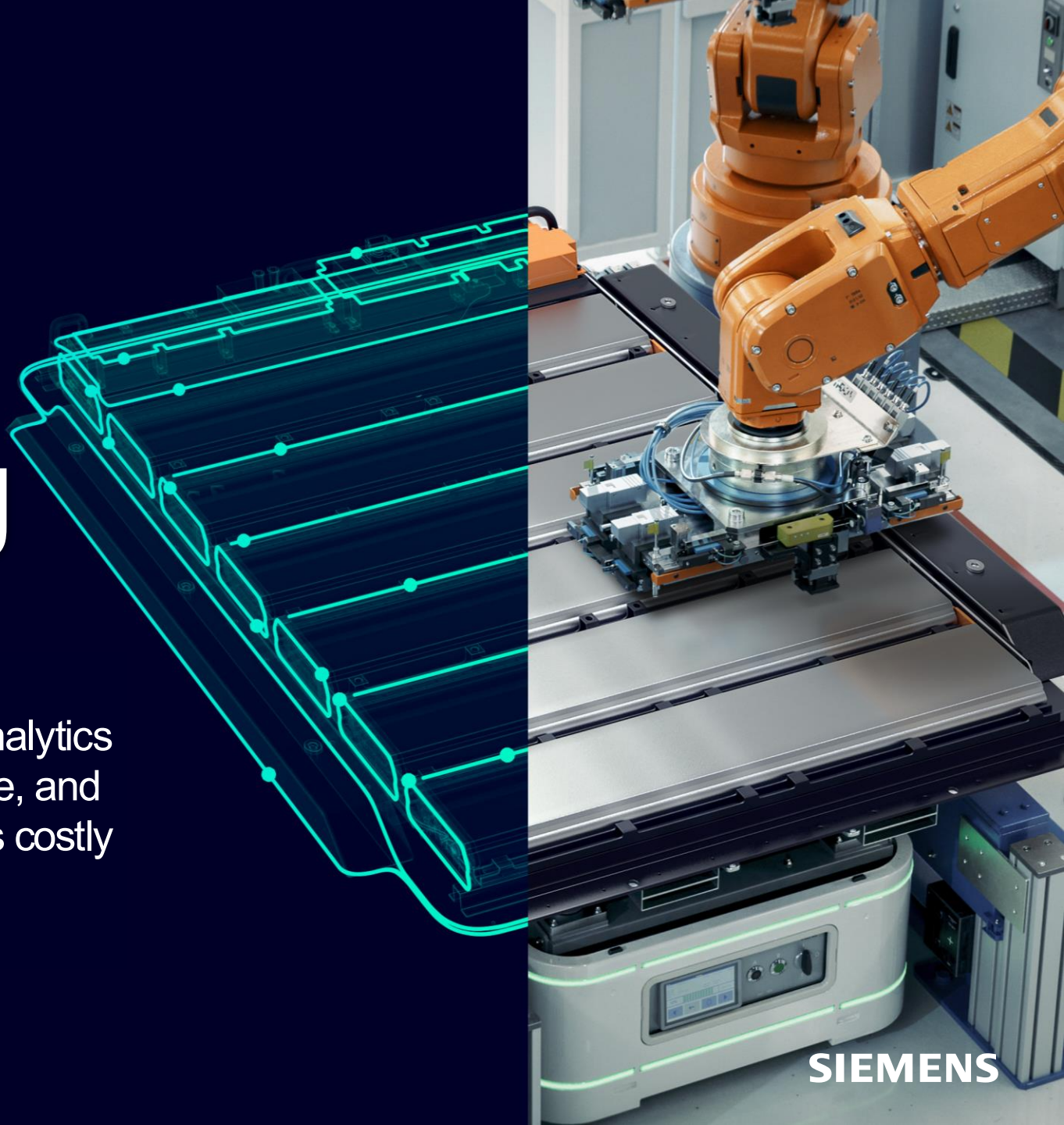
What is a...

Smart Manufacturing

In packaging design refers to the integration of advanced production simulation and AI-driven analytics to optimize design decisions, predict performance, and ensure manufacturability. This approach reduces costly design iterations, shortens time-to-market, and improves overall production efficiency.



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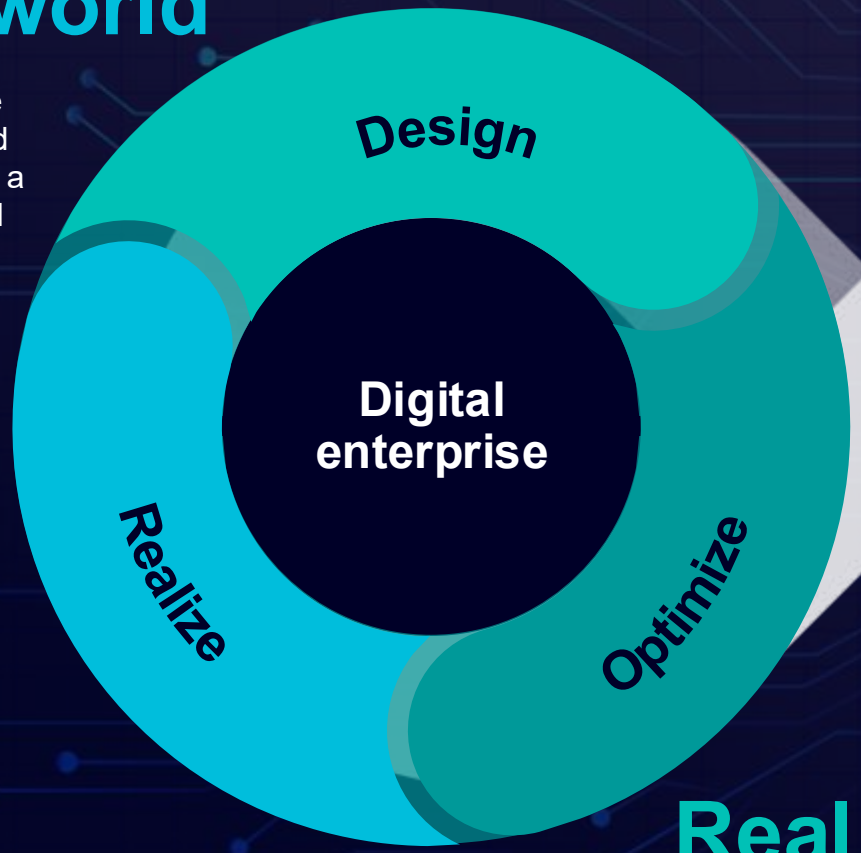
AI-Powered Digital Twin for Smarter Manufacturing

Digital world

The Digital Enterprise combines the real and the digital worlds with a comprehensive digital twin approach.



AI-Powered

AI enables smarter, autonomous optimization across design, simulation, engineering, and operations - boosting speed, accuracy, and efficiency

Real world

This enables continuous optimization of design, simulation, engineering, commissioning, automation, service, and recycling.

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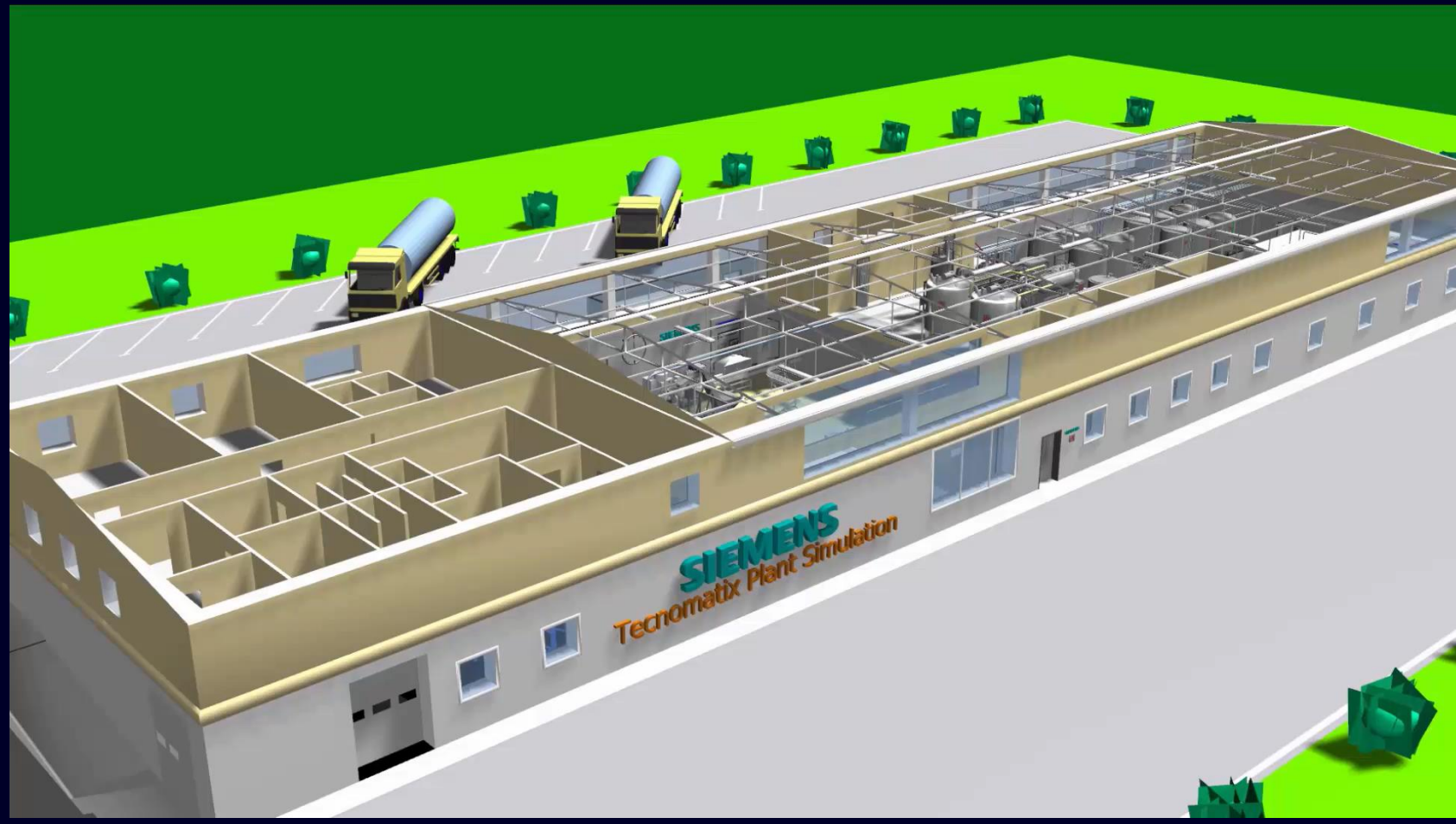
AI-Powered Digital Twin Core Solutions

Production Process

Process virtualization

Digital Production Process

- Detect and prevent production issues early, avoiding costly corrections during packaging line ramp-up.
- Minimize investment in production lines while ensuring required output.
- Optimize existing packaging systems by validating improvements in simulation before implementation.



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AI-Powered Digital Twin Core Solutions

Customization by AI

Process customization

AI-Assisted SimTalk

- Generate SimTalk methods quickly from natural language prompts.
- Copilot suggests correct syntax and helps fix errors faster.
- Provides examples and best practices, helping new users learn SimTalk faster.
- Automates repetitive coding so engineers can focus on logic and process flow.

*** Slide content represents directional plans and is not a delivery commitment. Plans are subject to change based on Siemens' evolving business priorities.

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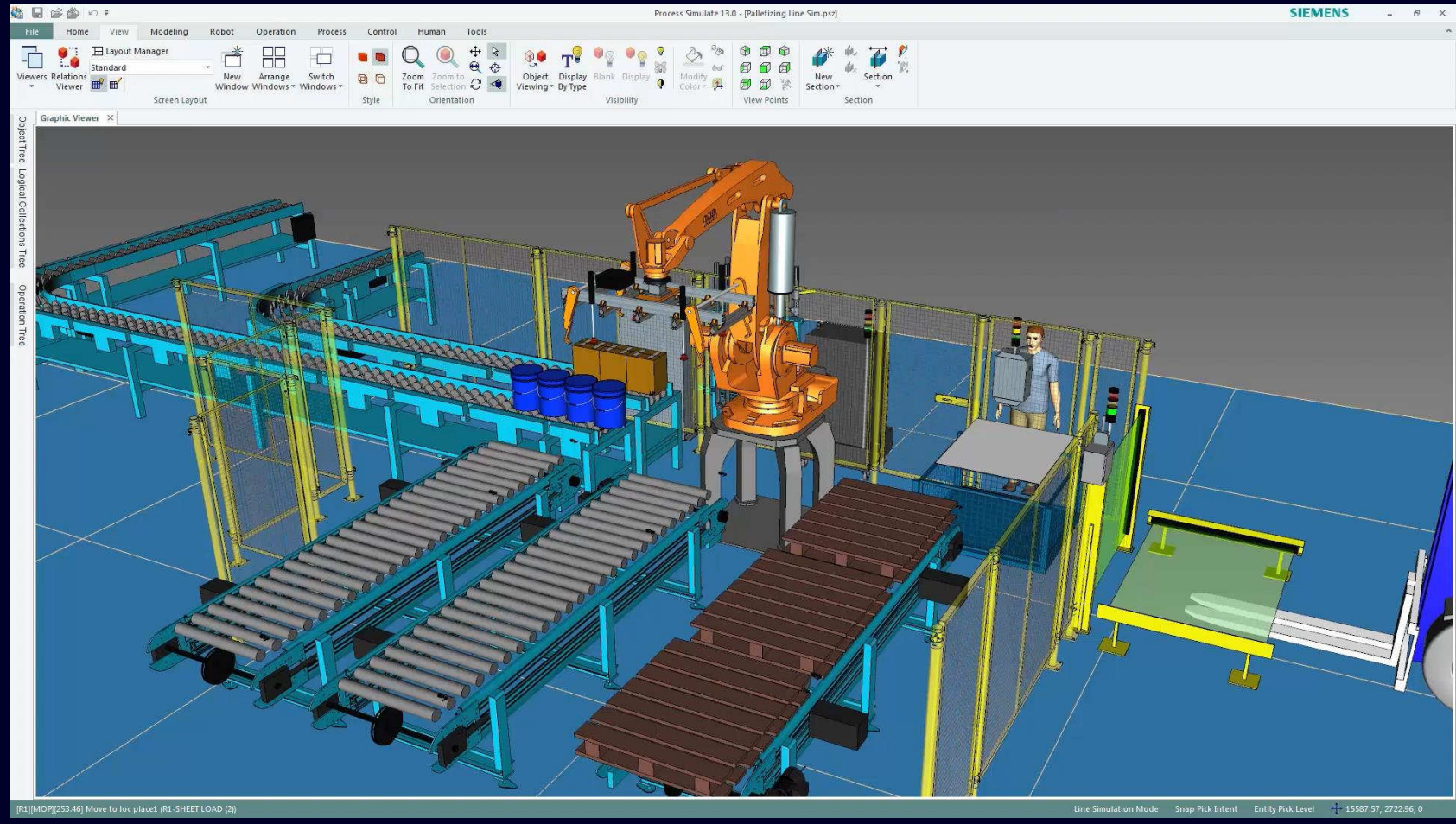
AI-Powered Digital Twin Core Solutions

Virtual Pick & Palletizing

Robot Palletizing Planning

VCommissioning for Packaging

- Motion planning and simulation
- Use Cyclic Event Emulation (CEE) to design and validate manufacturing process
- Part appearances
- Safety Logic in Virtual Commissioning



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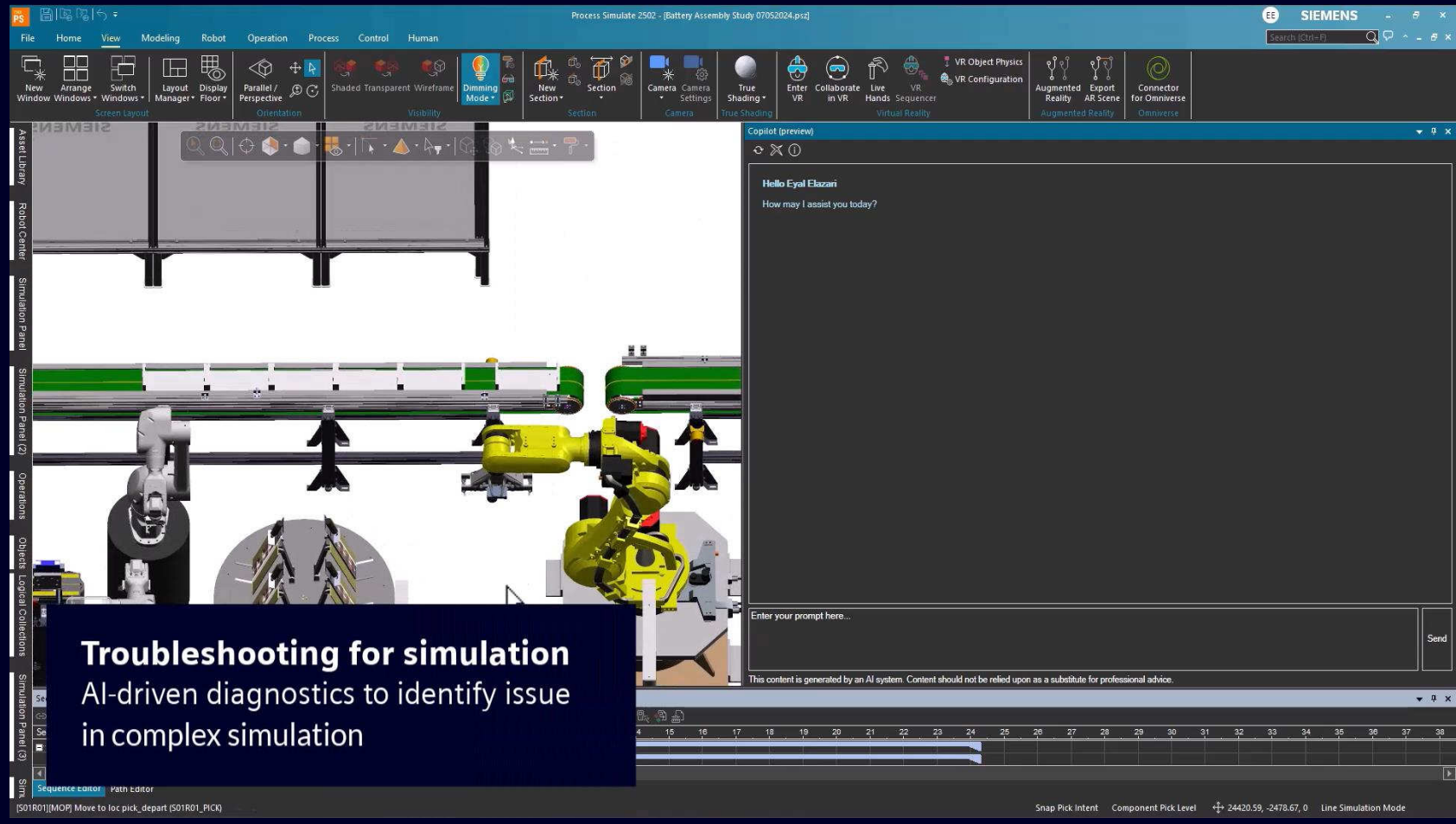
AI-Powered Digital Twin Core Solutions

AI-Driven
Diagnosis Assistant

AI-powered Troubleshooting

Troubleshooting assistant

- Help users quickly identify and resolve issues in complex robot simulation
- Reduce production downtime by providing AI-driven automated debugging
- Lower technological barrier by making troubleshooting easier and more intuitive



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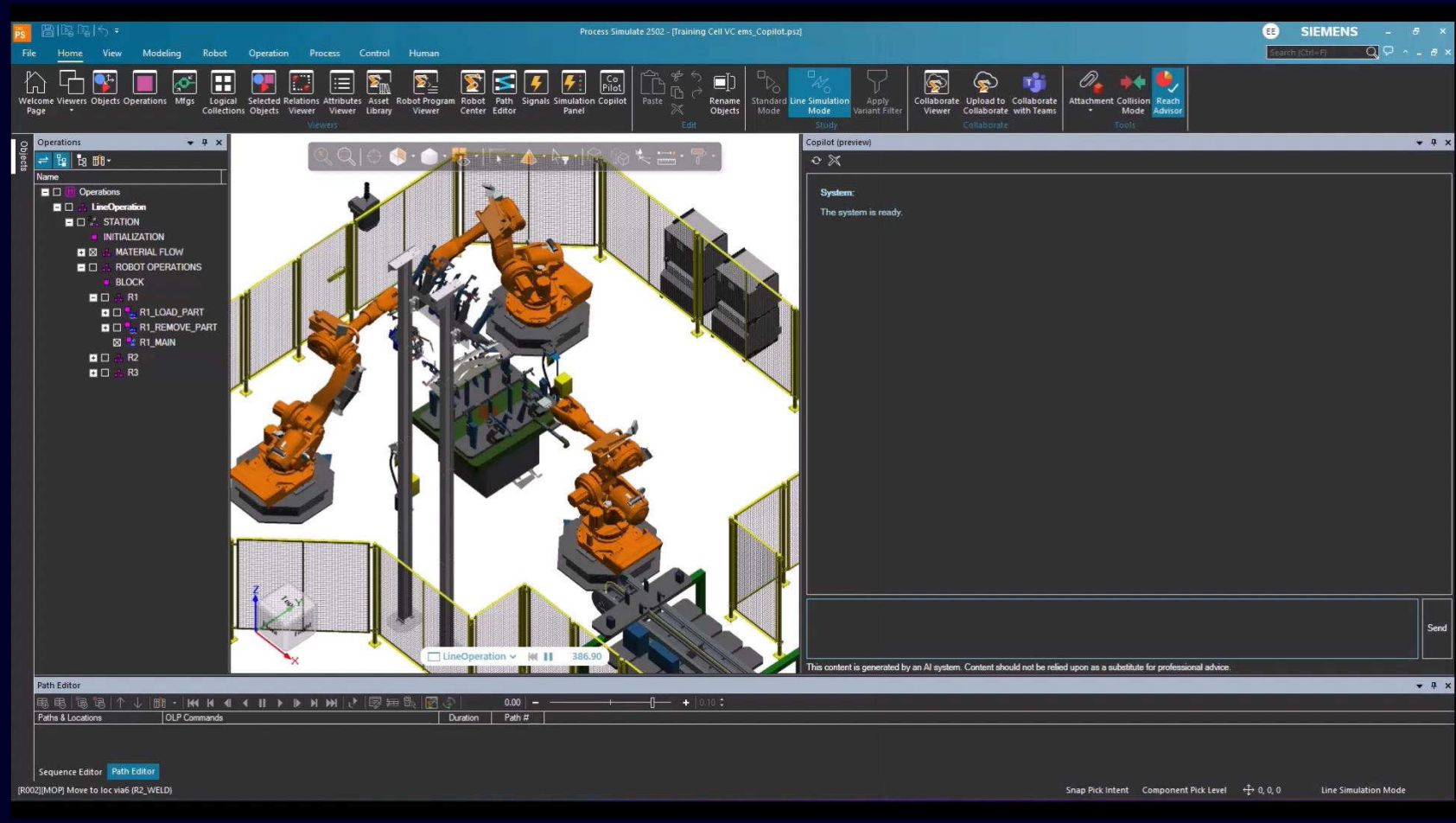
AI-Powered Digital Twin Core Solutions

AI-Driven Optimization

AI-powered recommendations

Improvements and recommendations

- Reduce delays and ramp-up time by increasing production throughput
- Improve quality by reducing defects from inefficient robotic motion
- Boot efficiency and support continuous improvement by making production adaptable



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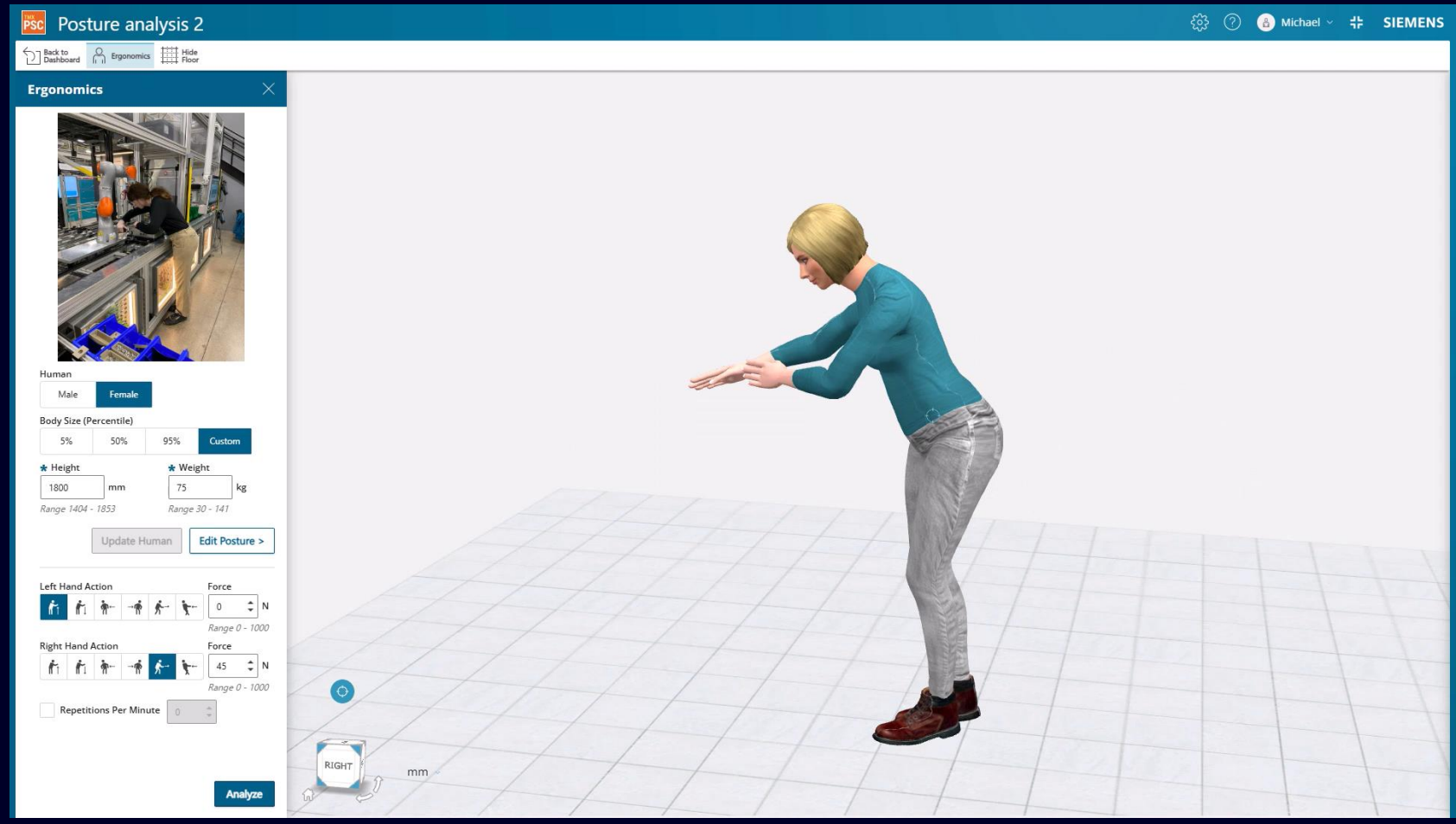
AI-Powered Digital Twin Core Solutions

AI-powered Ergonomics

Ergonomics posture design

AI solution for image conversion

- 2D to 3D image conversion for enhanced human modelling
- Human ergonomics analysis with risk mitigation recommendations
- Automated task evaluation and safety recommendations for improved workplace safety and efficiency



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by …

AI-powered digital twins optimize packaging by uncovering production challenges

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AI-Powered Digital Twin:
Transforming Packaging Design in Intelligent Manufacturing

Predict Production Impact Early

Simulate line performance before physical changes.

AI-Driven Optimization

Recommend optimal packaging size, pallet patterns, and line settings.

Reduce Cost & Time

Minimize retooling, shorten time-to-market.

Enable Data-Driven Decisions

Visualize trade-offs for design, cost, and sustainability.

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Thank you

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