



DIGITALE FABRIKINTEGRATION

Mit Digitalisierung neue Fertigungskonzepte umsetzen

Forum 5 - TRANSFORMATION

11/20/2023

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Digitale Fabrikintegration

Aus Sicht eines Maschinenbauers



Aus Sicht eines Anwenders





Broetje-Automation

World Leaders in Aerospace Assembly Automation



Our Mission

Equipping the Factory of the Future

„Equipping“:
means more than just the equipment itself, it includes services, digitization and processes.

„the factory“:
that is our Competence Area, we know our way around there!

„... of the future“:
stands for up-to-date technology. This implies not only technical and process know-how, but also modern competencies in organization and leadership.



Our Customers – The Global Aerospace Industry

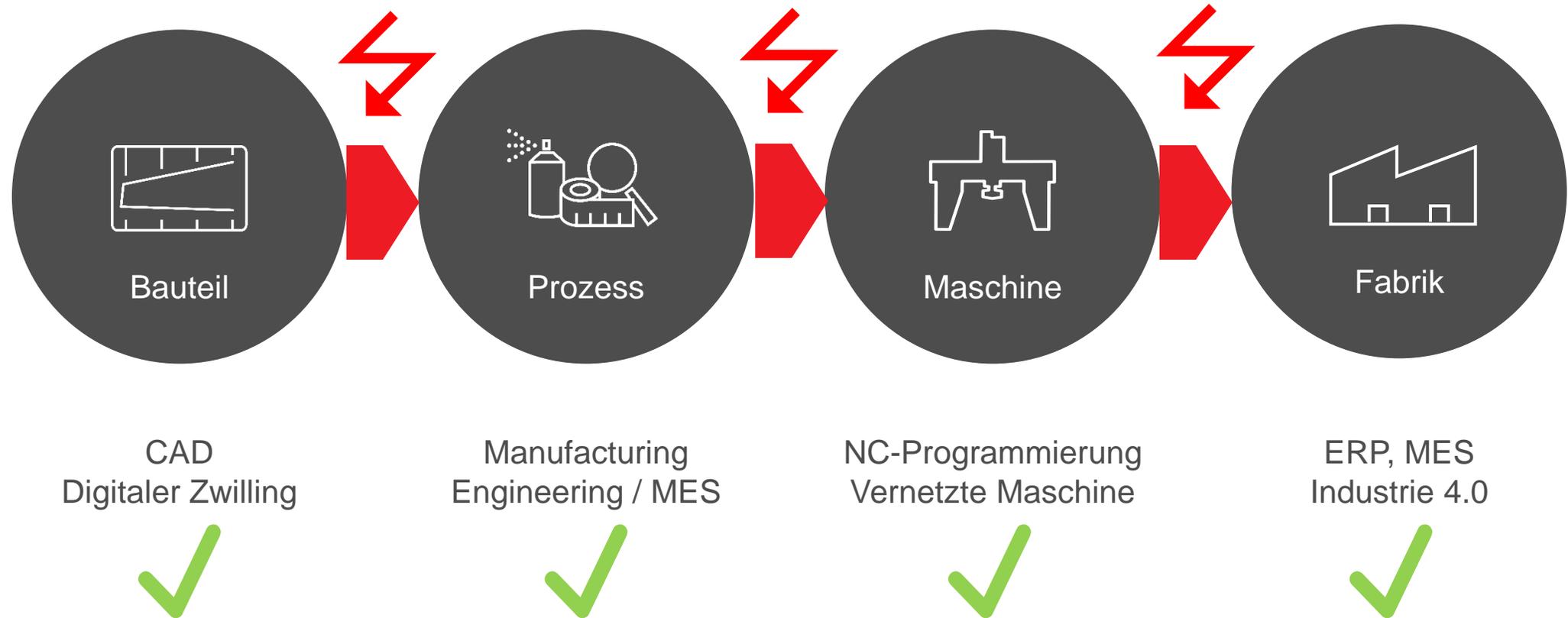


Broetje-Automation is part of almost every civil aircraft programme worldwide!

E175-190, A220, A320 Series, A330, A350, B737(MAX), B787, B777, B747, C919, A380, A400M,....

CONFIDENTIAL

Wo stehen wir in der Digitalisierung der Produktionsprozesse?



**Die Digitalisierung einzelner Komponenten reicht nicht.
An den Schnittstellen entstehen Effizienzverluste und Qualitätsverluste!**

Digitale Fabrikintegration

Aus Sicht eines Maschinenbauers



Aus Sicht eines Anwenders





BROETJE
AUTOMATION

DIGITAL FACTORY INTEGRATION

...the relationship between the virtual and the real world



Digital Solutions

The challenges

Digital Twin meets Reality

Product – Aircraft Fuselage

- High component complexity with low quantities
- Extreme accuracy requirements
- Production-related component deviations
- Data format: CAD data (CATIA), sometimes also 2D drawings on paper

Process - Drilling and Riveting

- Customised process description
- High process reliability
- Non-standardised data format (XLS, PDF)

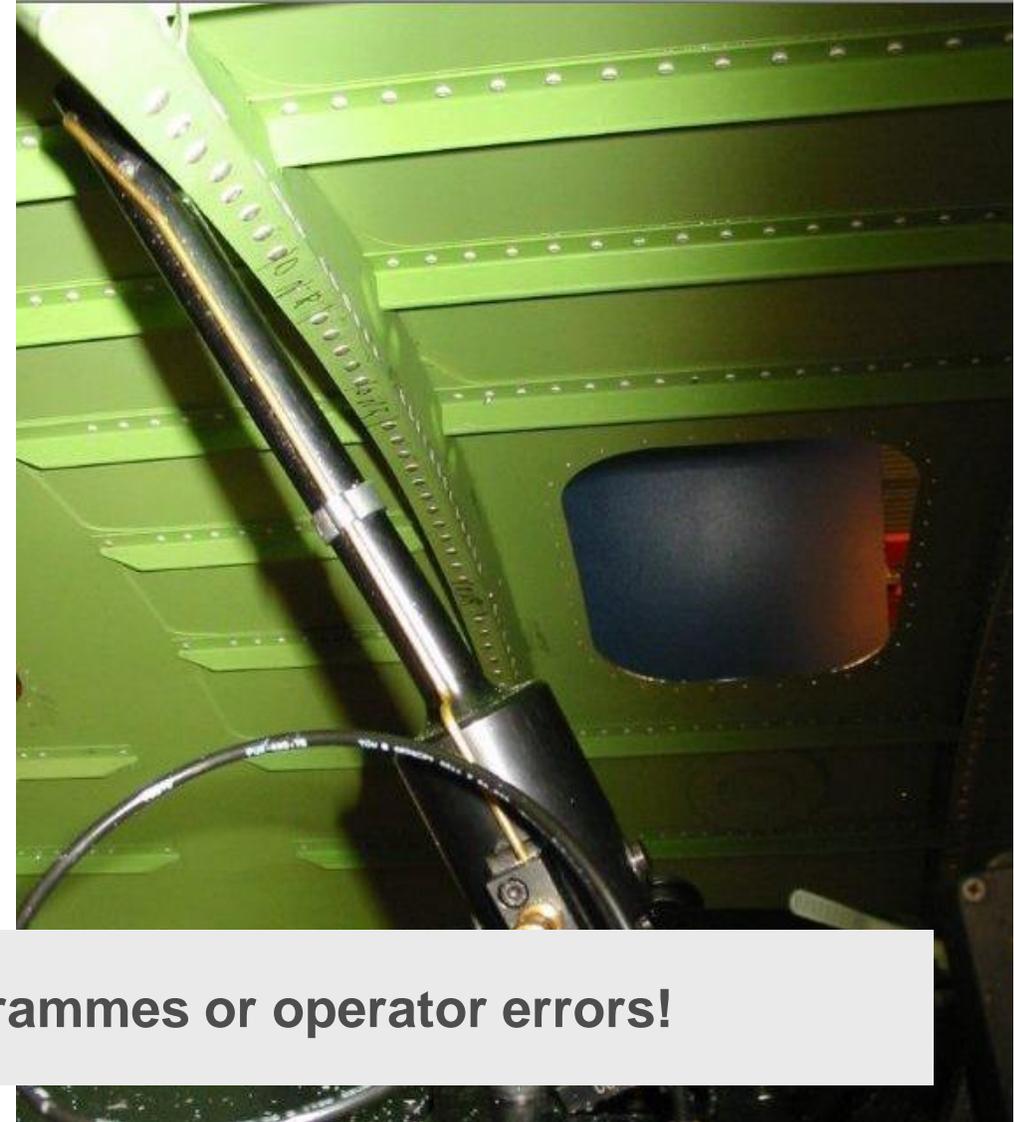
Machine - Fastening system

- Control of different system components (positioner, riveting machine, etc.)
- Deviation between simulation and real machine
- High complexity
- Data format: NC programming

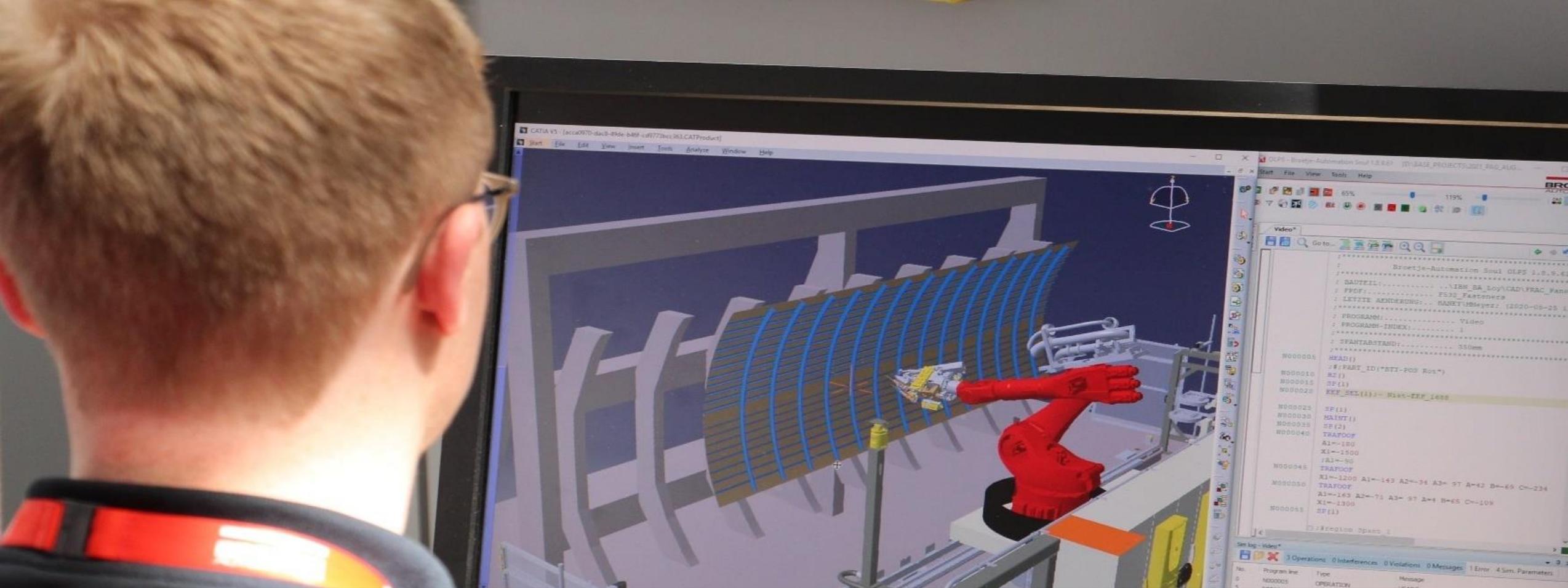
Factory Integration

- Manual and automated activities in the assembly line
- Deviations due to complex components
- High demands on quality assurance and documentation
- MES systems only partially available

Problem: Damage to machine and component



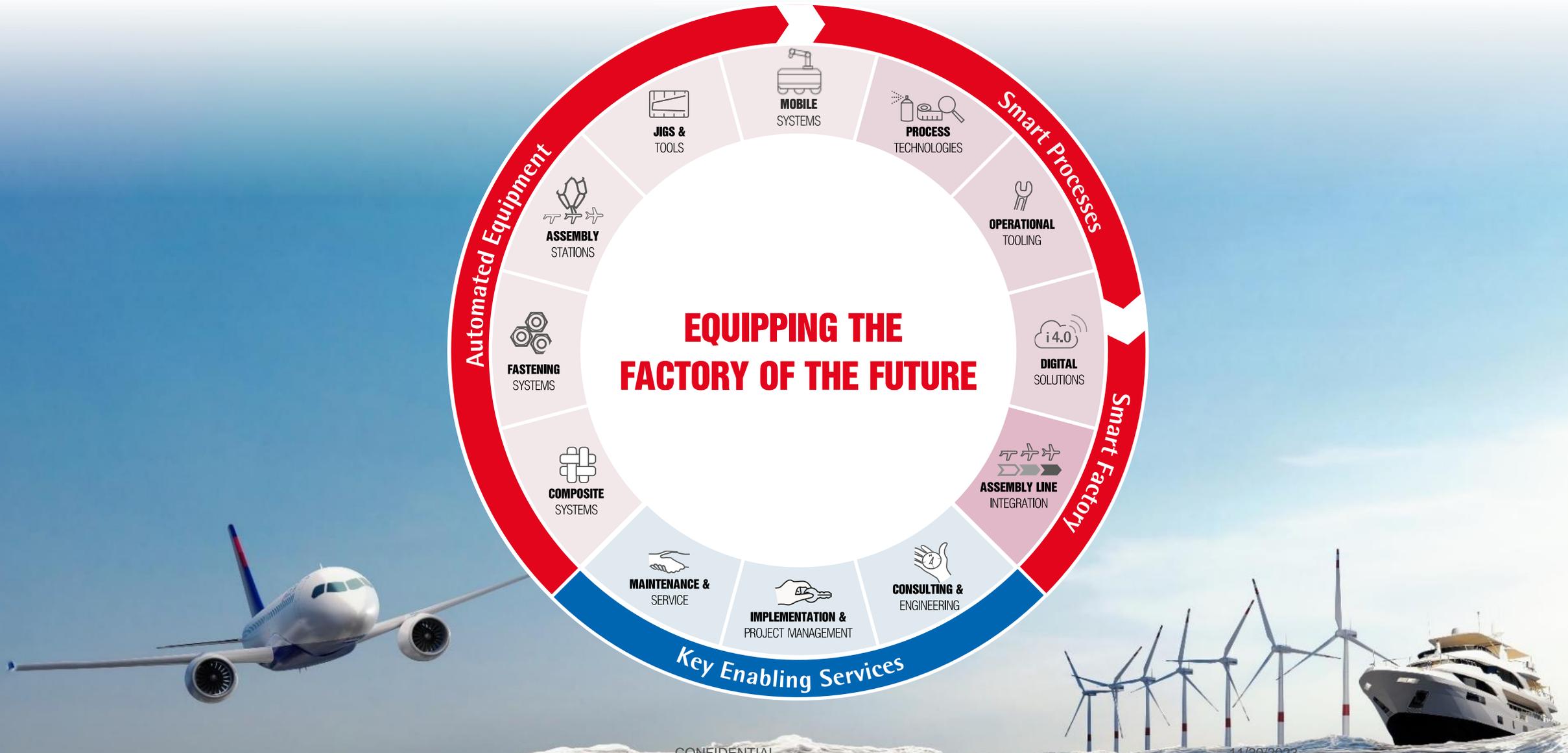
Damage due to faulty programmes or operator errors!



DIGITALISATION FOR A MACHINE BUILDING COMPANY

Transformation of the company into a software provider

Our Product portfolio

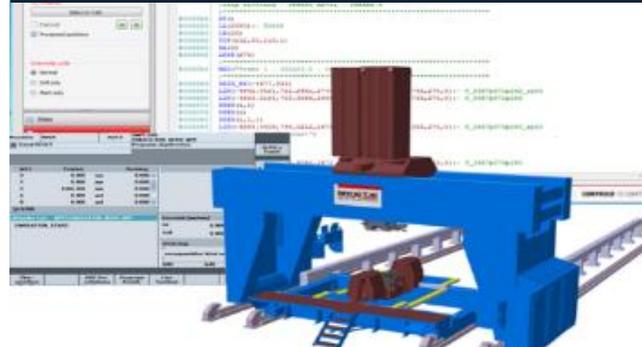


Digital Solutions

Digital Solutions

End-to-End Digitalized Factory

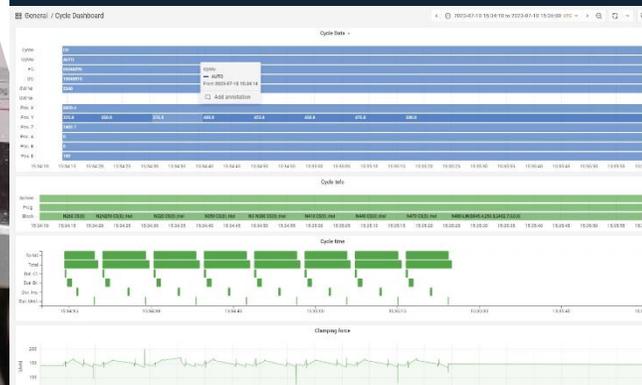
SOUL OLPS Offline Programming



SOUL SIMULATION



SOUL DATA



LMS Line Management System



Soul OLPS V5 interfaces

CAD models

- Panel and/or Tooling CAD-Data
- 3D CAD Models

Process Information

- Textfile, HnF, CATIA, customer defined
- Position and Orientation
- Status and Process Information

Manufacturing Information

- Textfile, Excel, PowerPoint, PDF, customer defined
- Tool information
- Schedule

CAD-Data
Interface

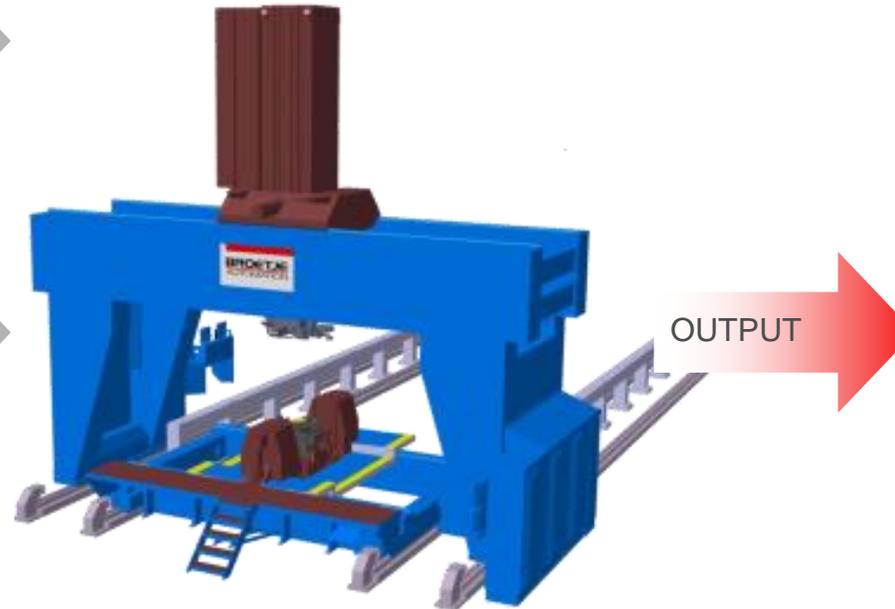
INPUT

Process information
Interface

INPUT

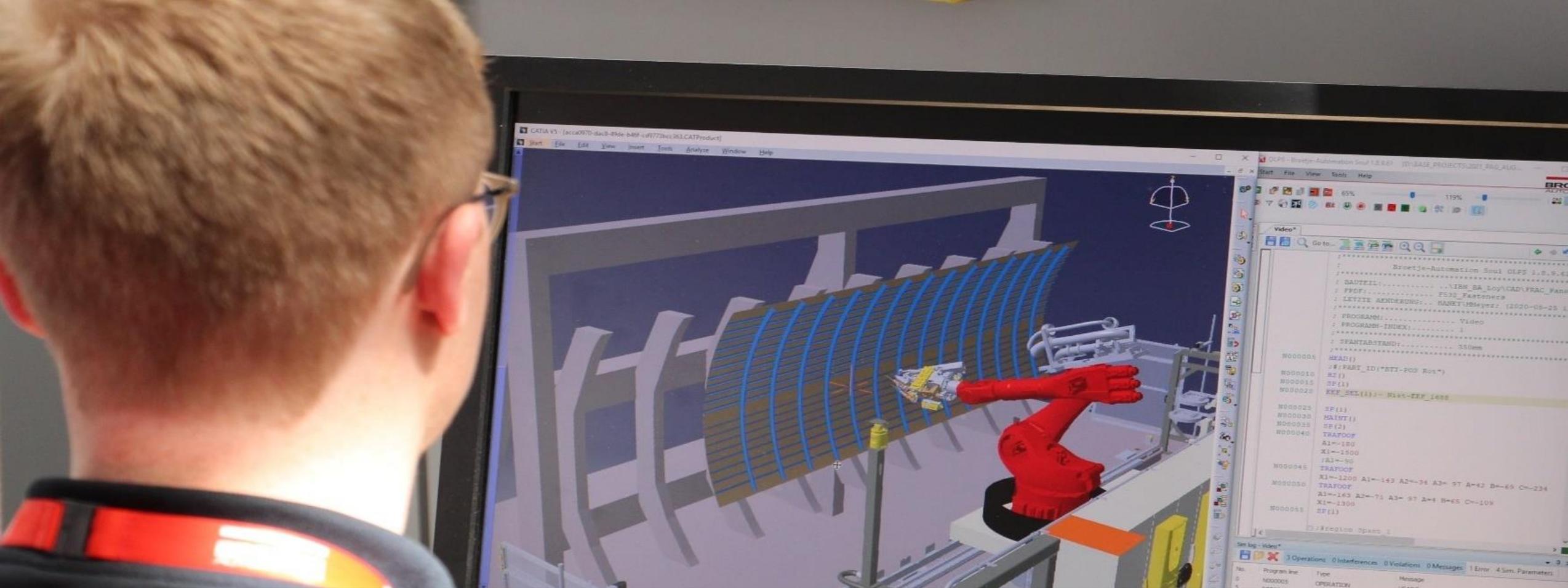
Manufacturing-Data
Interface

INPUT



NC-Programs and Information files

- Operator Instructions
- Machine Setup Information
- Positioning Instructions
- Machine Operation Instructions
- Fastener Setup Information
- Tool Change Instructions



SOUL OLPS

Machine-Independent Offline Programming System

Digital twin as the basis for flexible and efficient production

SOUL OLPS

Production planning, simulation, offline programming of all machine types, production optimization as well as virtual commissioning and virtual operation

The screenshot displays the SOUL OLPS software interface. On the left, a 3D CAD model of a machine is shown in a wireframe view. The central part of the interface features a code editor with G-code, including comments and program data. On the right, a control panel provides real-time information about the machine's status and parameters.

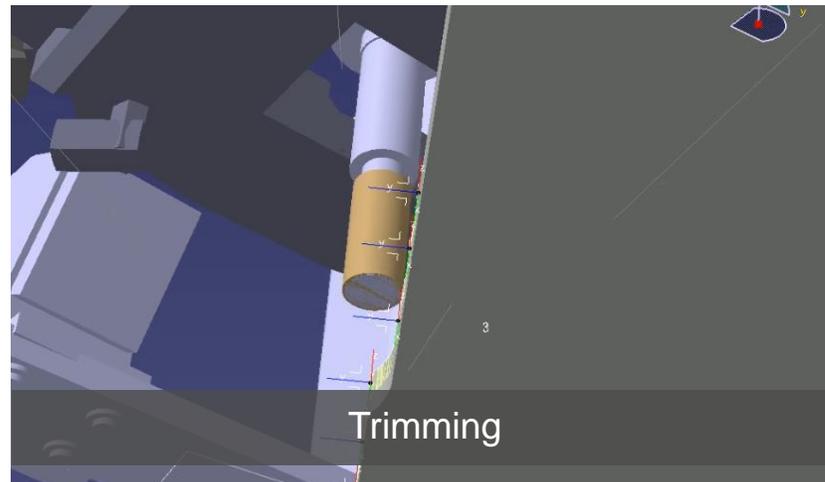
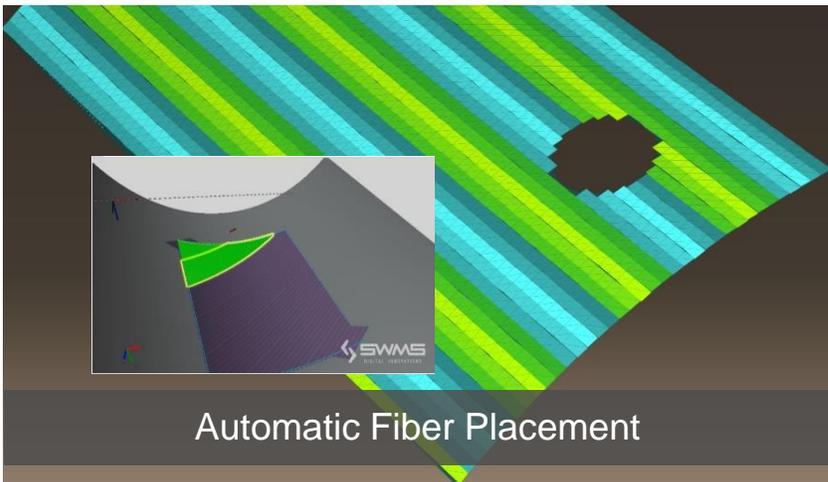
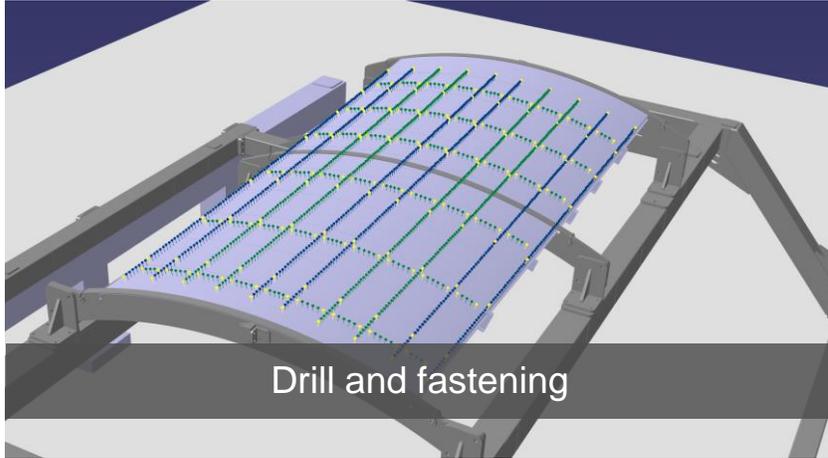
Machine	IPAC	Auto	WKS DIRVNC_SIM.WPD SIM_1.MPF
Channel reset			Program aborted

Work	Position	D.-to-go	
X	4843.331 mm	0.000	
Y	15.406 mm	0.000	
Z	1375.435 mm	0.000	
W	1375.435 mm	0.000	
A	-1.600 deg	0.000	

Current block	WKS\VNC_SIM\SIM_1.MPF	Feedrate [mm/min]
N000315	AXPOS(4843.3306,15.4055,1375.4346,1375.4346,-1.5999,90.0); P_p01547p0087p01961;R09	Act. 0.000 100.0 % Set 0.000

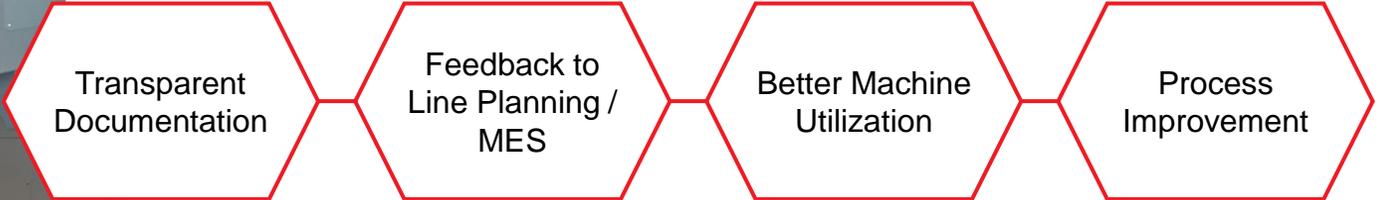
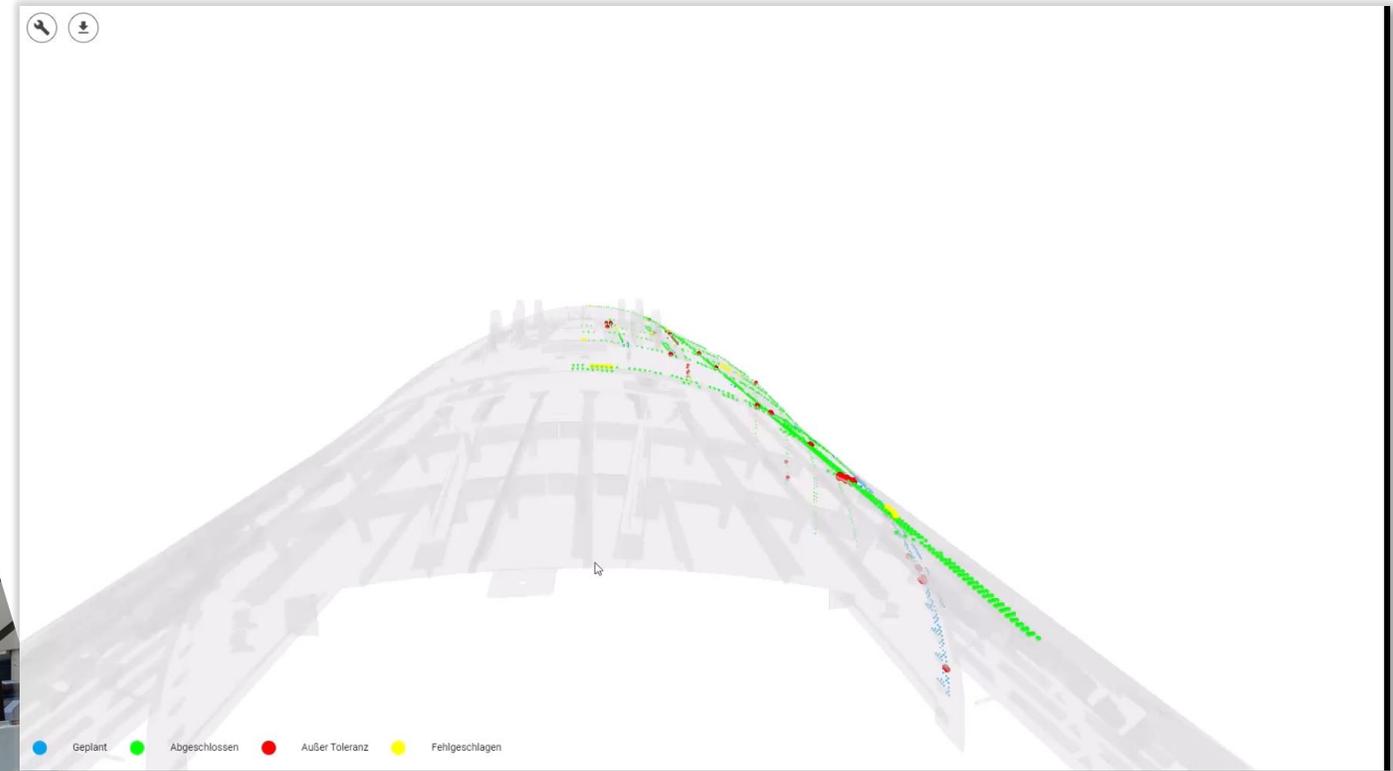
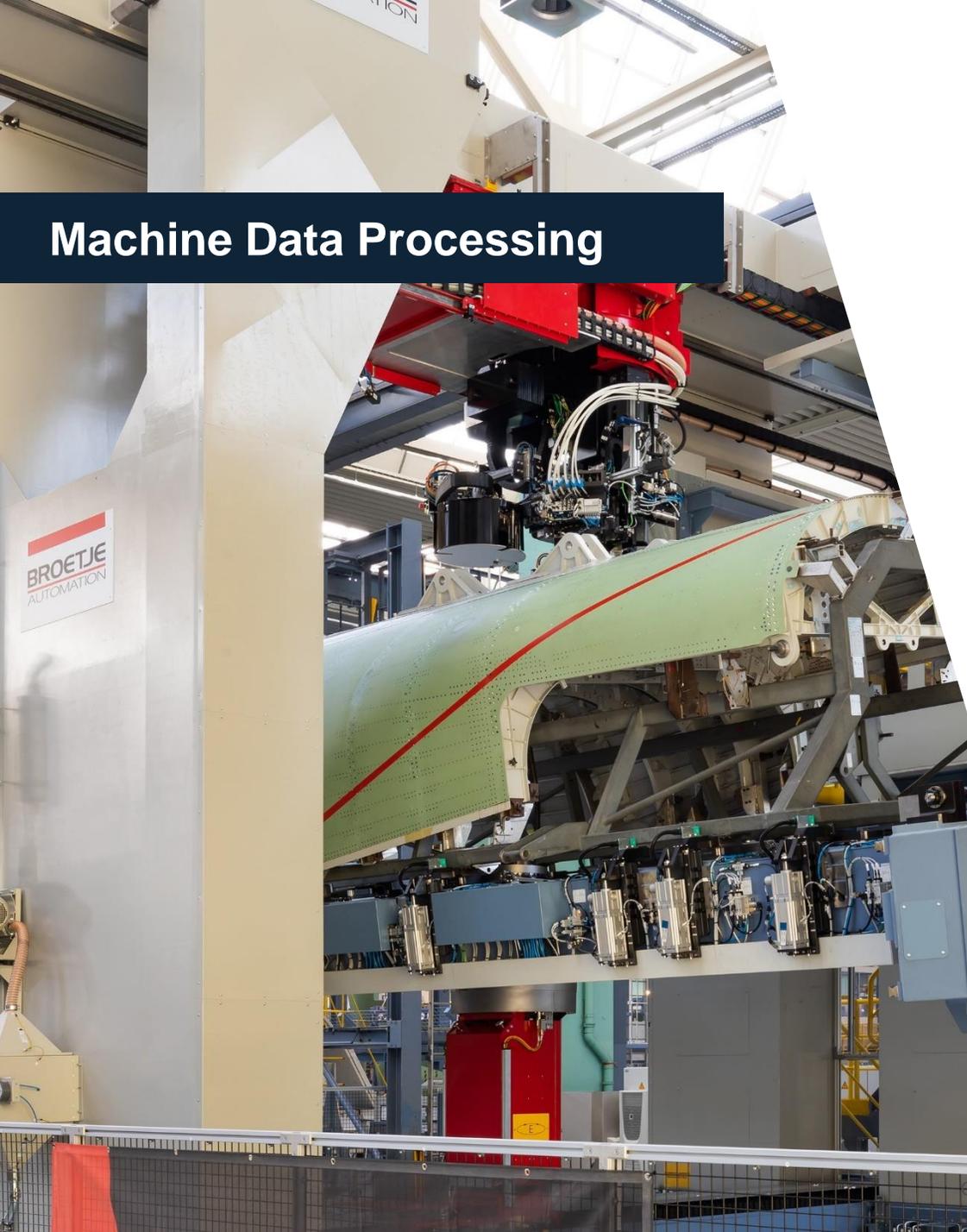
Tool	Act. val. WCS	Program levels
Preselected tool:		
G00	G40	Program overview

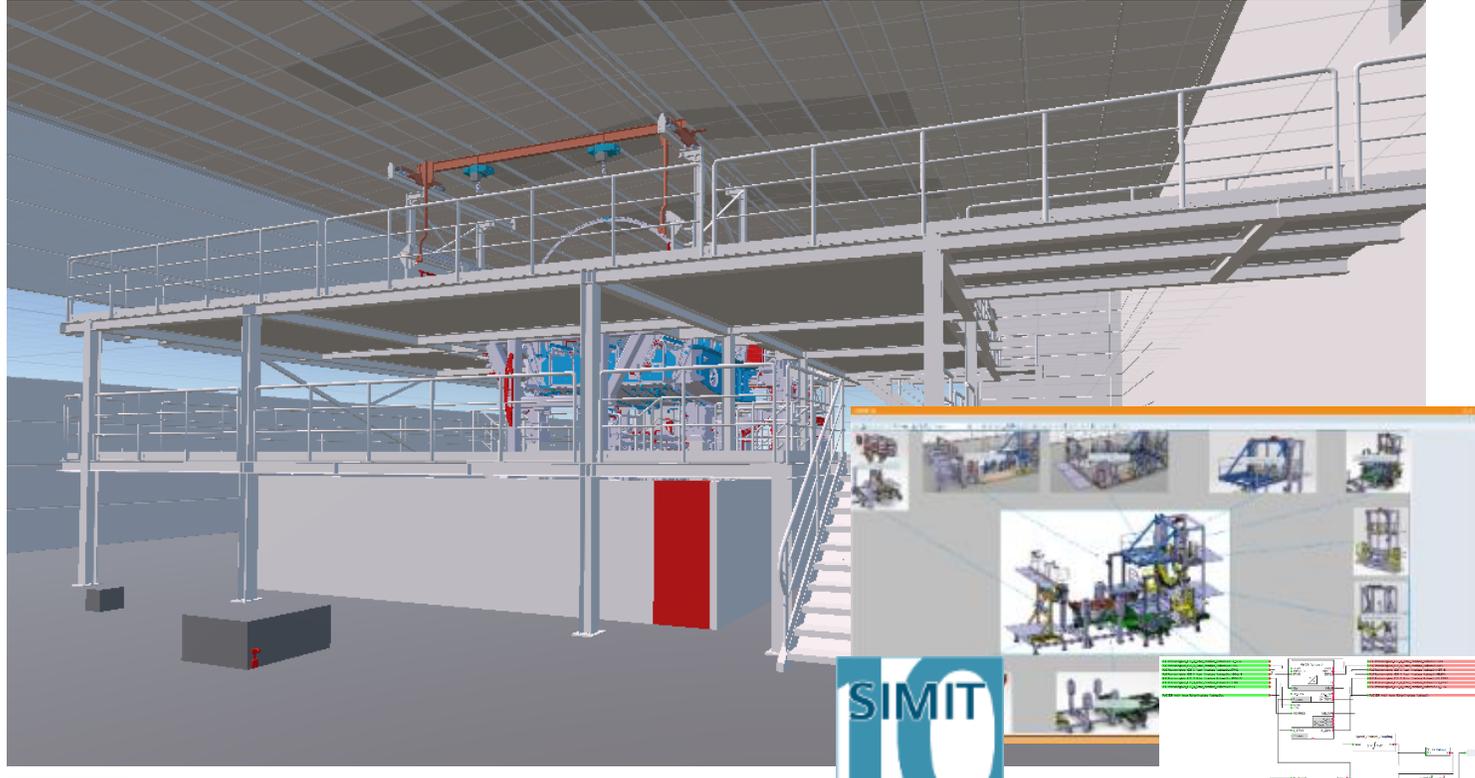
Soul OLPS – Manufacturing processes



- Real machine control (you see what you get!)
- Fast support
- Customized solutions
- No annual licence fee (ALC)
- Optional maintenance
- One software and licence for all applications

Machine Data Processing





- Representation of complete processes with real machine code
- Visualisation of complex processes
- Testing of the entire production process
- Early optimisation and error prevention

Customer benefit:

With the help of virtual commissioning with Unity and VR, complex systems can be tested and optimised in a safe and cost-effective environment.

This leads to a reduction in errors, shortened commissioning times and overall more efficient production.

Boeing 777-X Panel Assembly

Mitsubishi Heavy Industries, Hiroshima

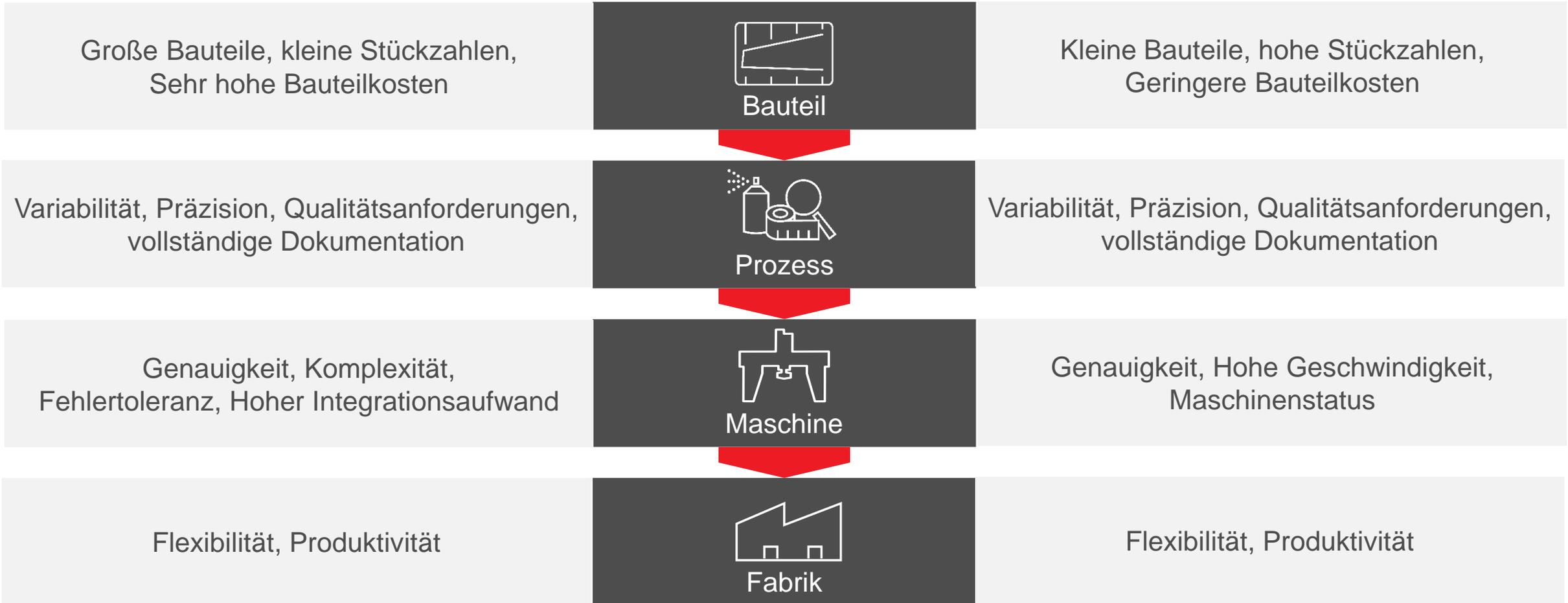
Factory Planning & Engineering for Flow Line Concept

- 6 Multi Panel Assembly Cells (MPAC)
- 3 Frame Clip Assembly Cells (FRAC)
- Digital Twin for all machines and parts
- Offline Programming with Broetje-Automation OLPS V5
- Live Simulation of NC programmes
- Detailed Data Collection

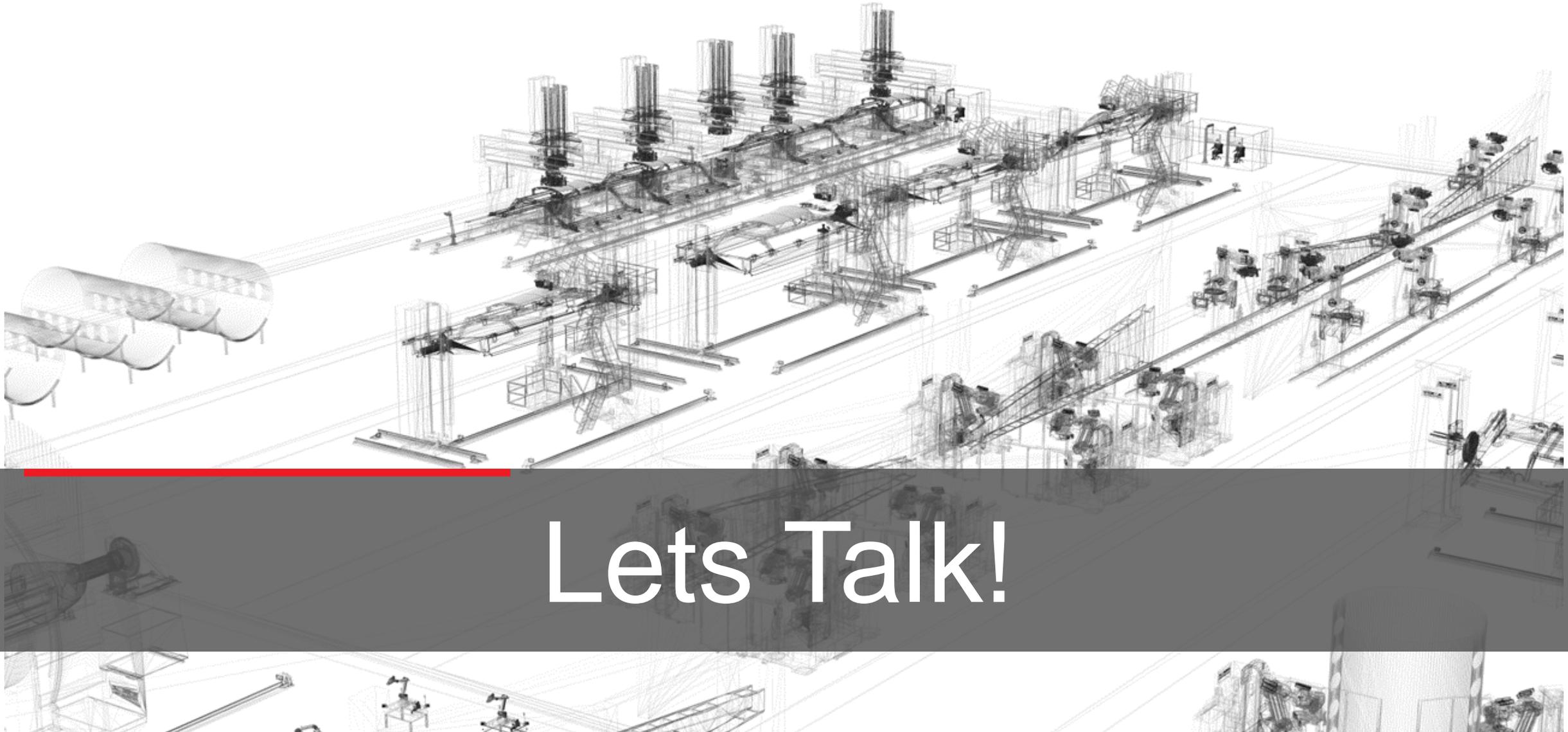
Outcome

- NC-program sharing and re-distribution between machines using BA SOUL Job Control software
- Digital MES integration with integrated Digital Line Management System

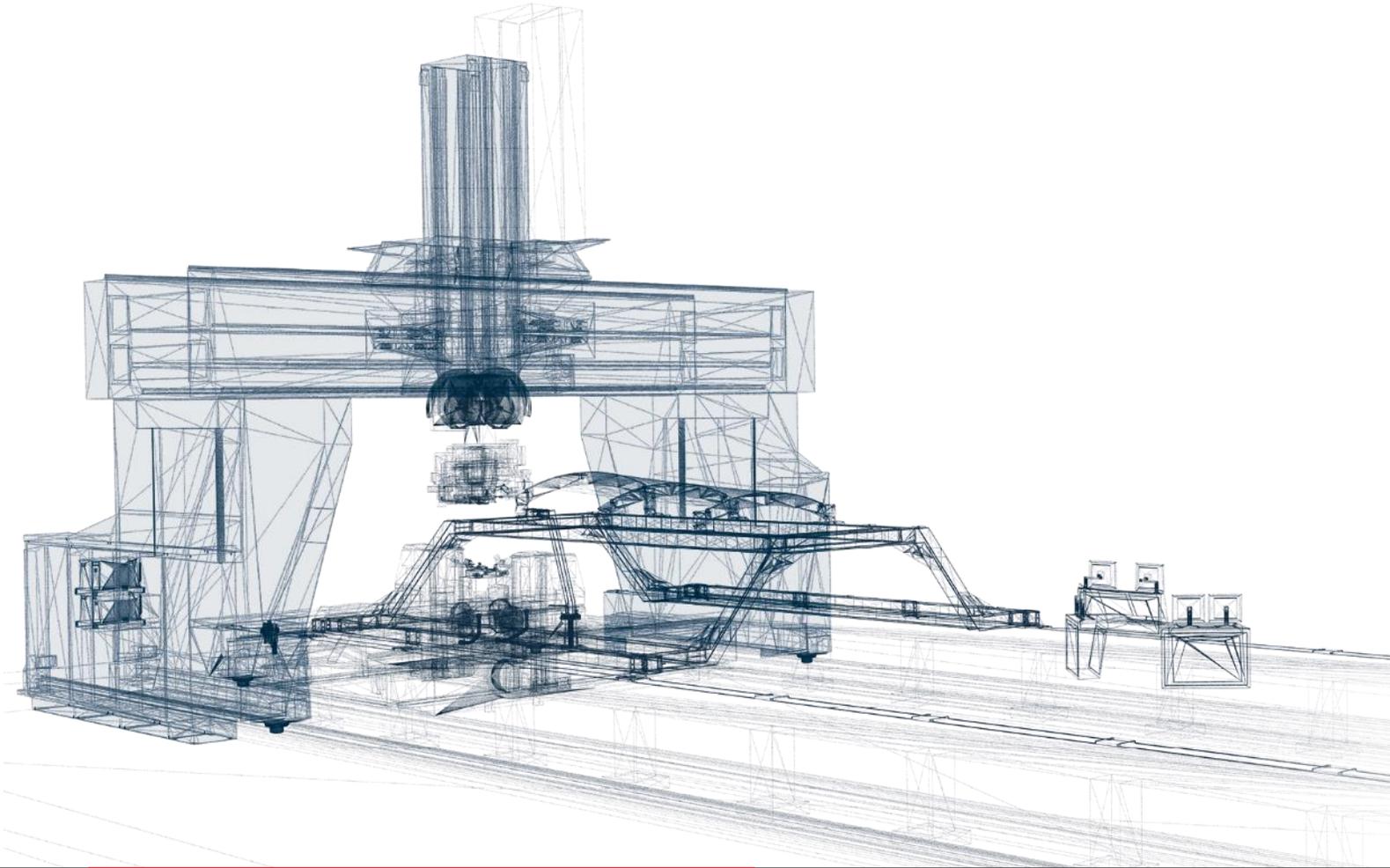
Digitale Fabrikintegration - Zusammenfassung



Die Zukunft der Produktion?



Lets Talk!



Amir Moayed, Produkt
Manager Digitalisierung



Norbert Steinkemper, Leiter
Kommunikation und Marketing

FUTURE STARTS NOW!

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