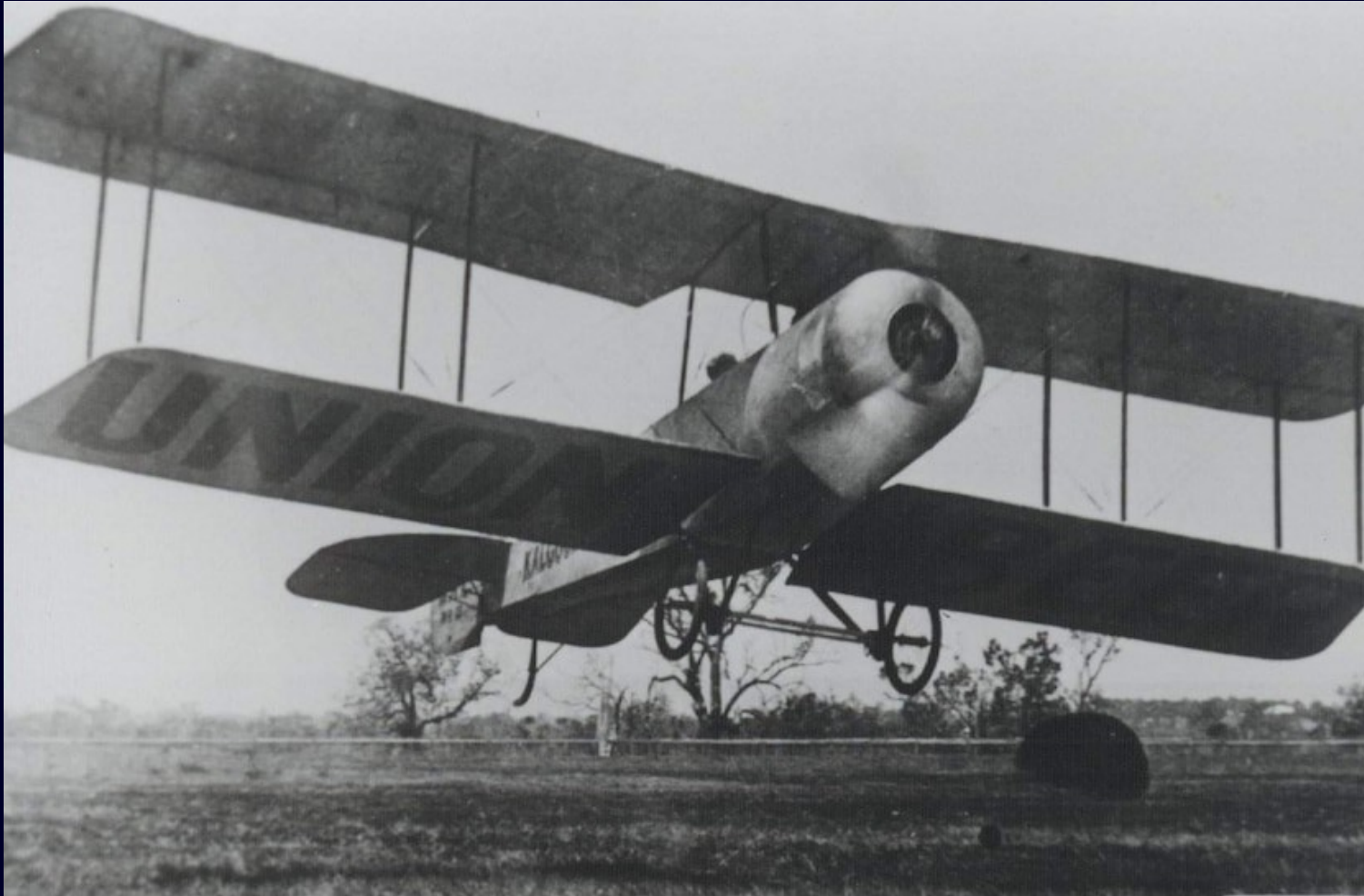# Digital Twin from machine manufacturer to machine user
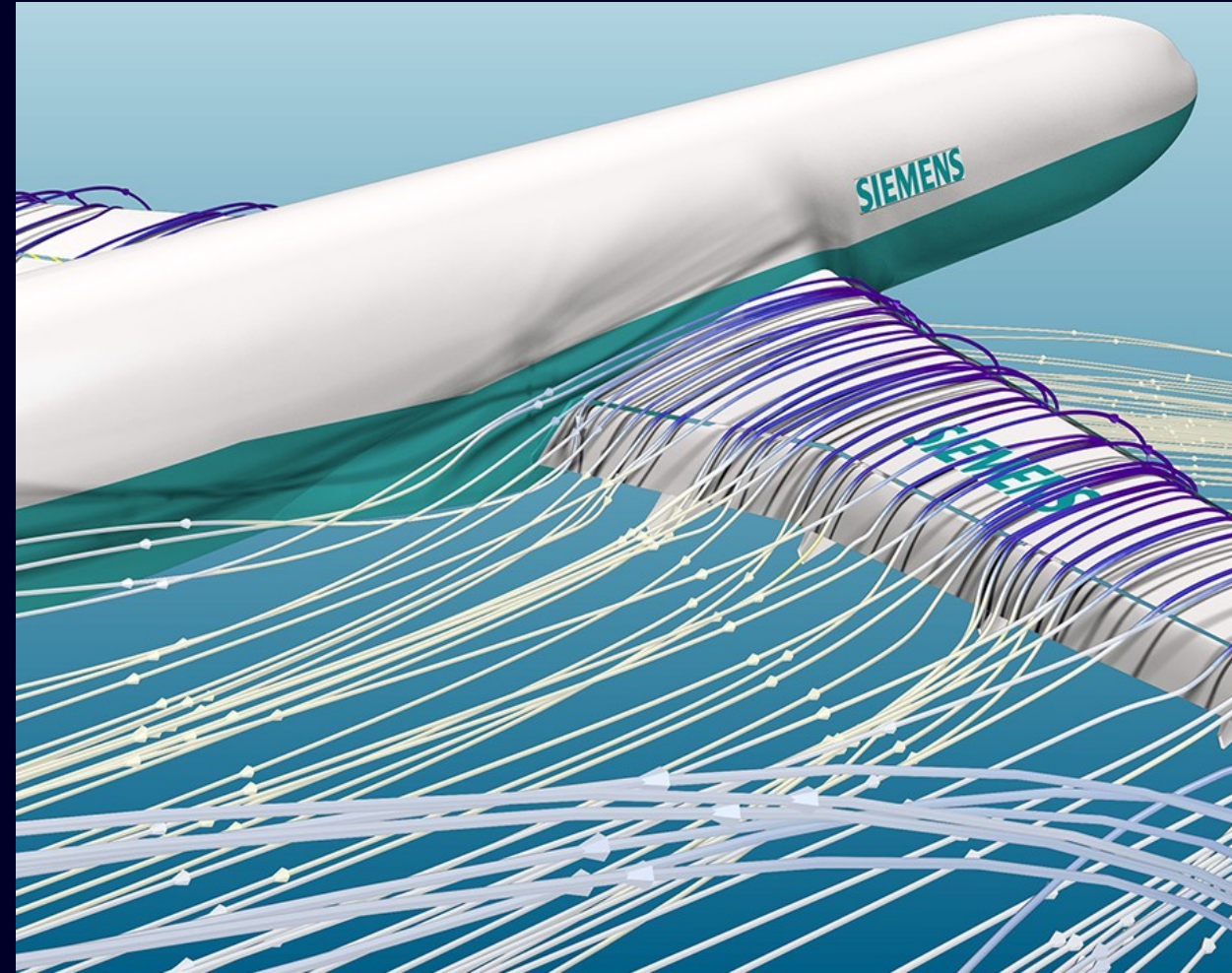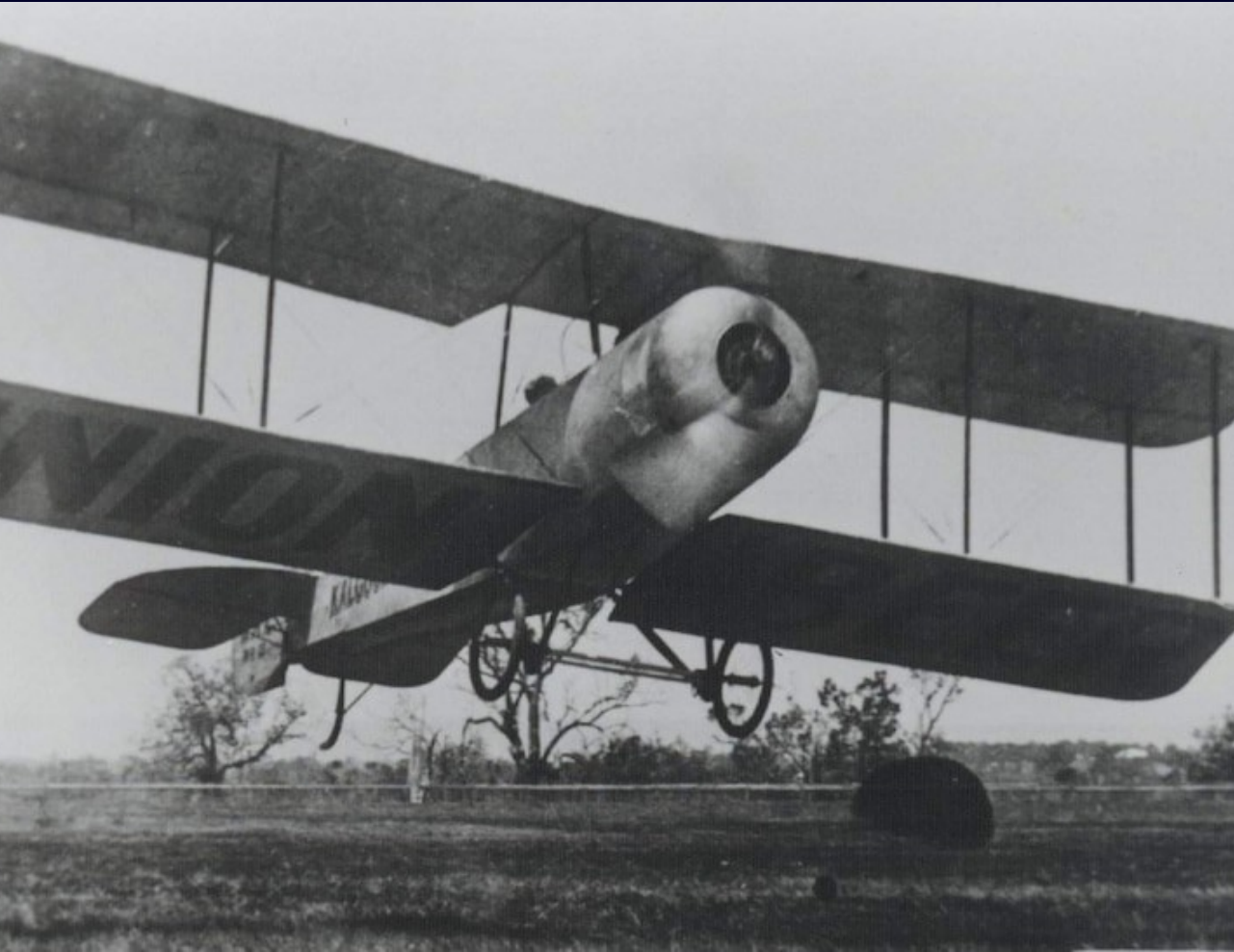
Seamless integration of the digital twin into the machine engineering process and transition of digital engineering into virtual job preparation

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Why a Digital Twin in engineering?

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Engineering more than 100 years ago…

Source: https://www.abc.net.au/news/2017-11-10/outback-daredevils-story-of-first-wa-airplane/9135592

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Engineering more than 100 years ago…

Source: https://www.abc.net.au/news/2017-11-10/outback-daredevils-story-of-first-wa-airplane/9135592

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Engineering more than 50 years ago…

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Engineering more than 50 years ago…

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Machine engineering today…
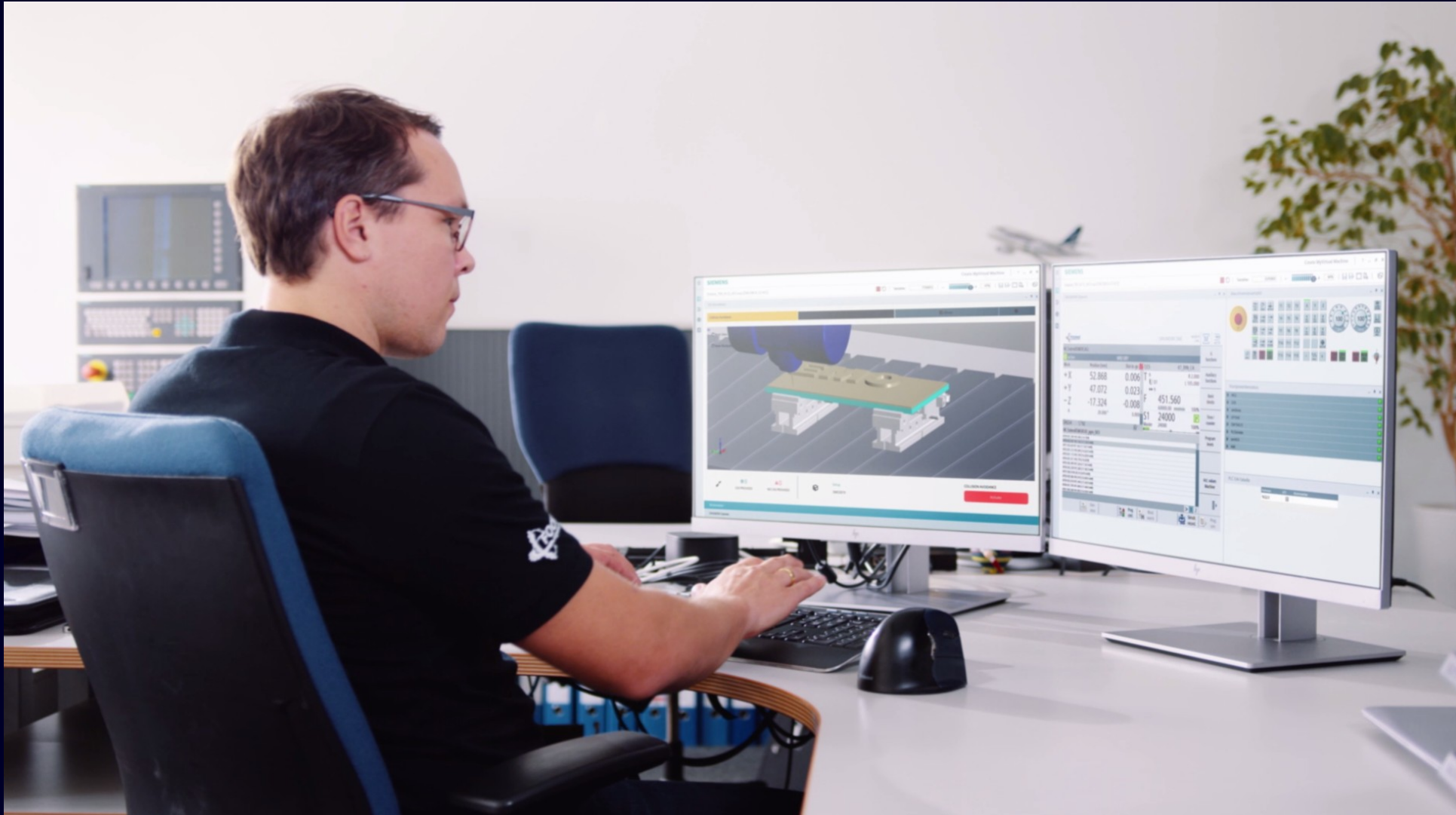
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Machine engineering today…

SIEMENS
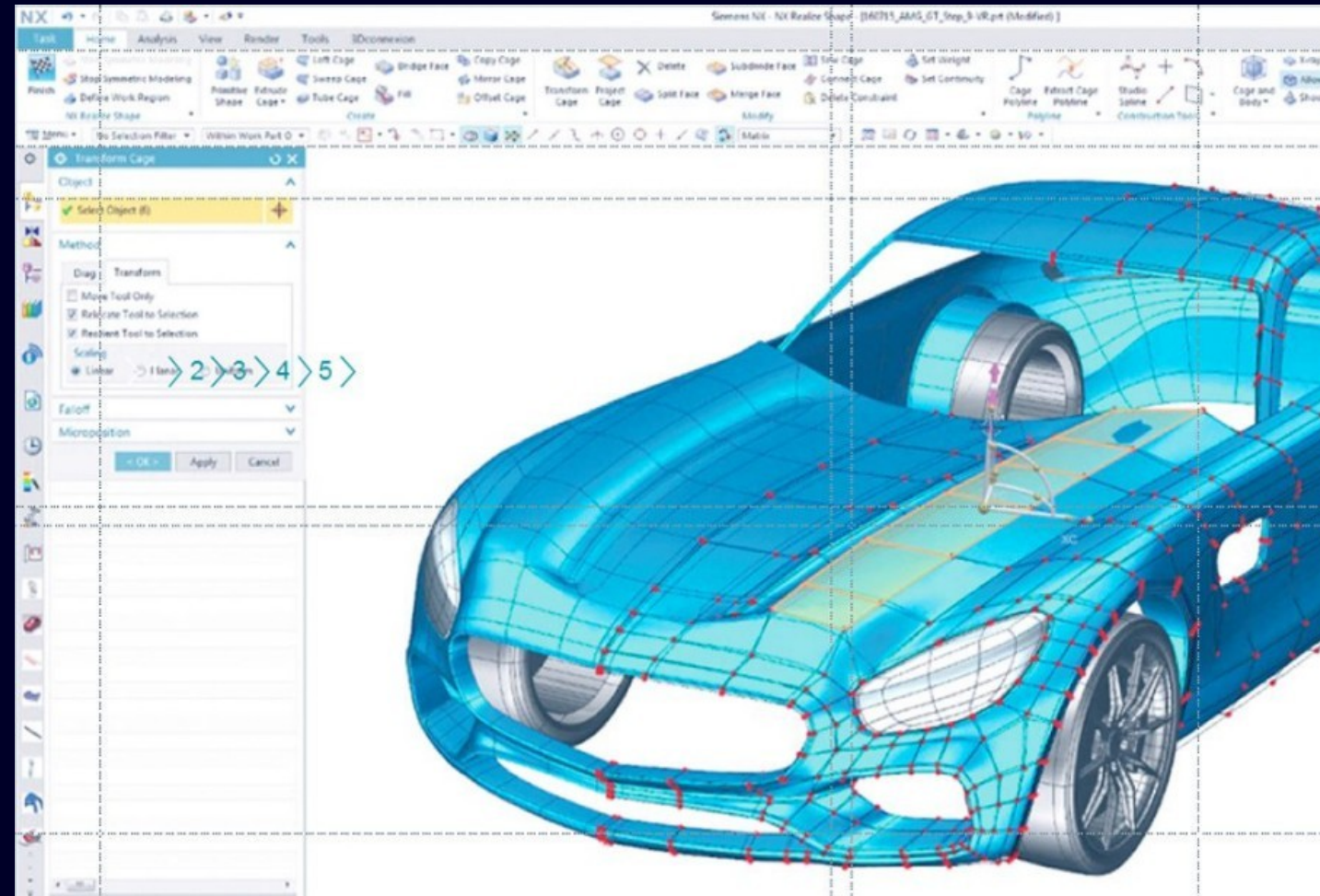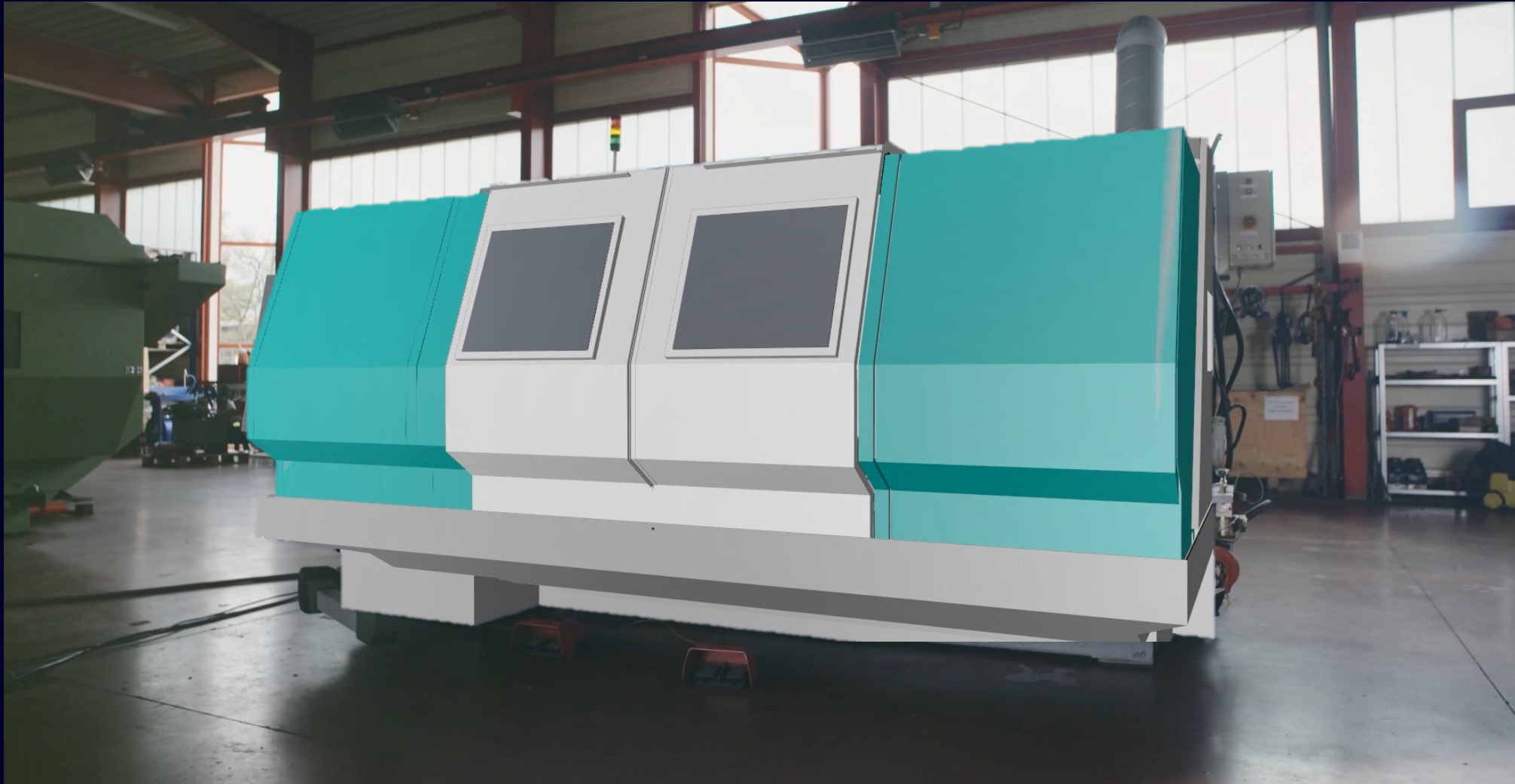
Interaction with the customer before any part of the machine has been built...

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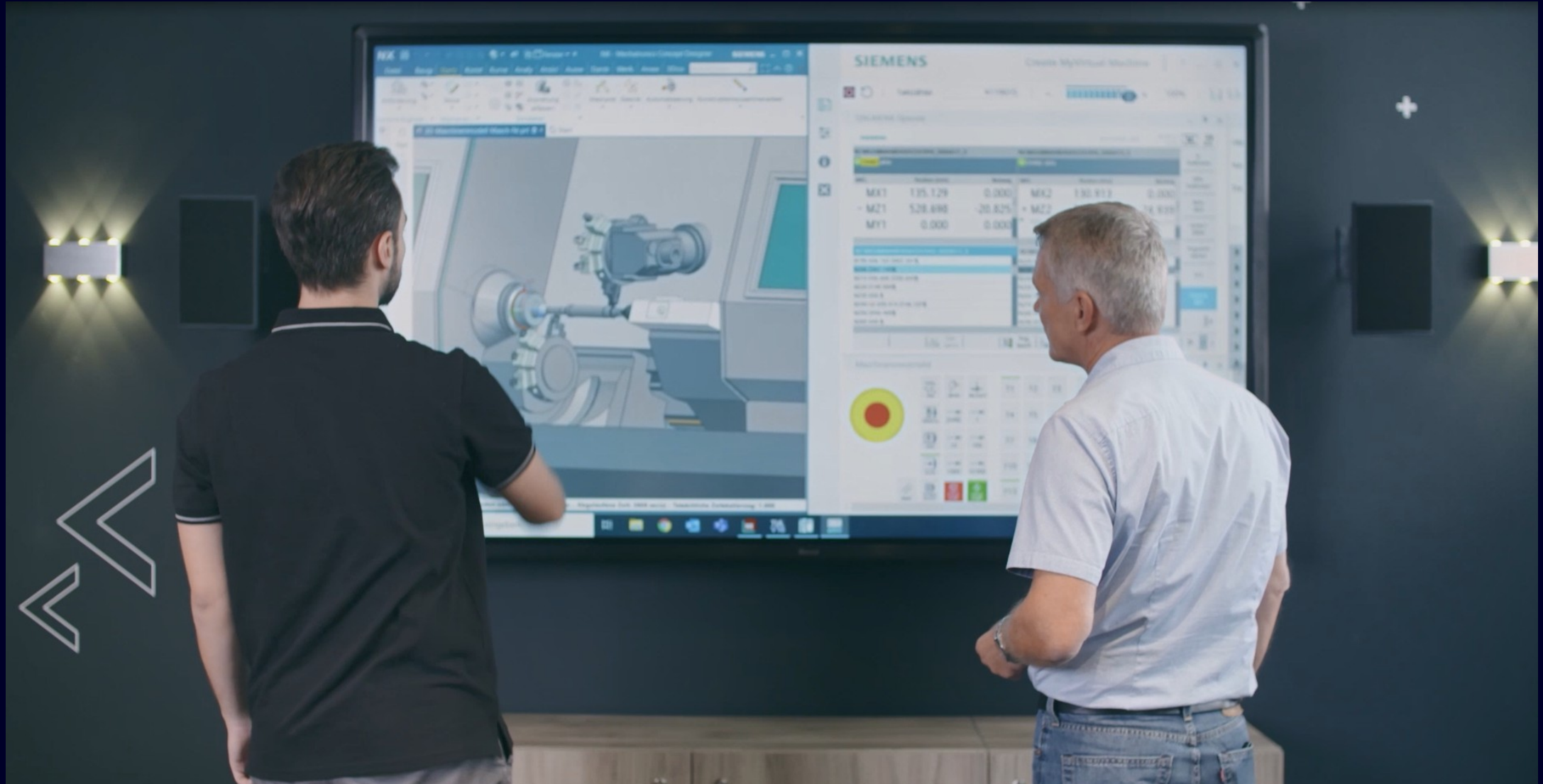
Efficient engineering in a virtual environment independent of time and place...

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Use cases in machine engineering

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Machine operation
The digital twin as the training environment

Machine manufacturer

Machine operator

- ✓ Time & place independent training via Teams, Skype & co.
- ✓ Safe training environment also for self-learning
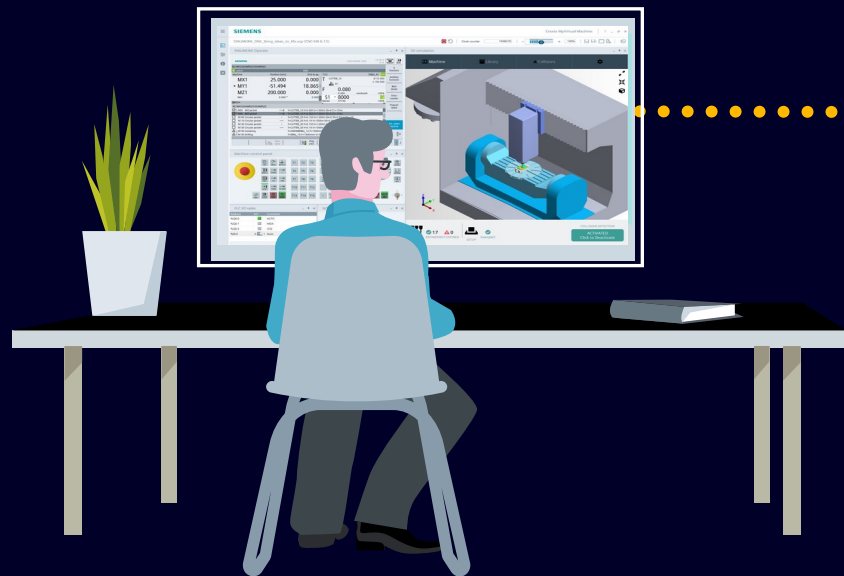- ✓ Learning without real machine or production interruption

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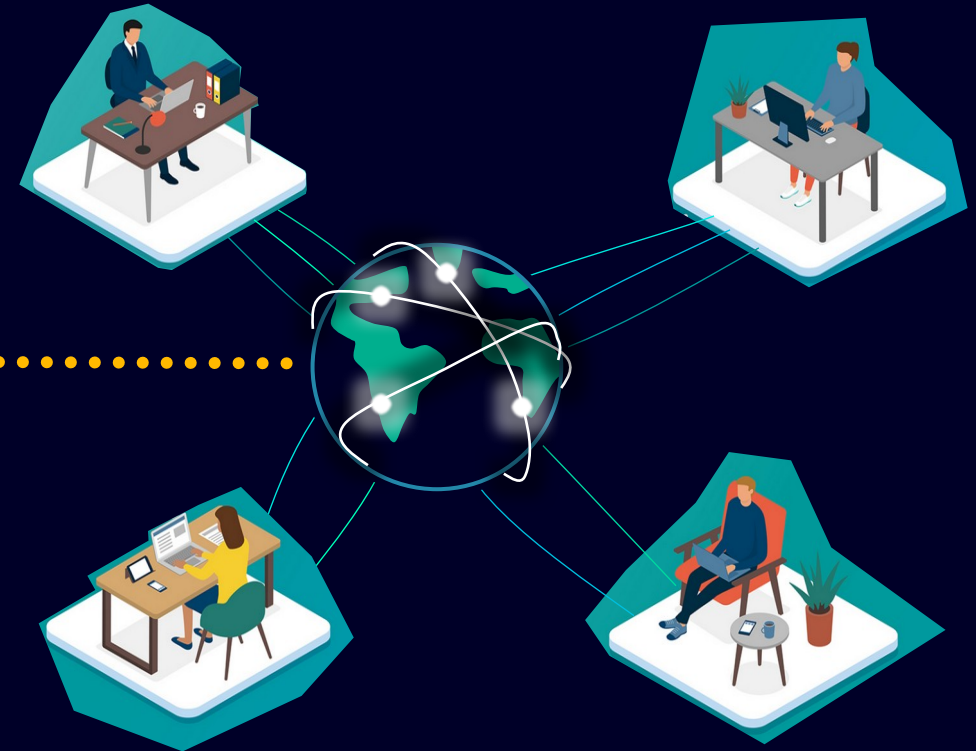
Machine services
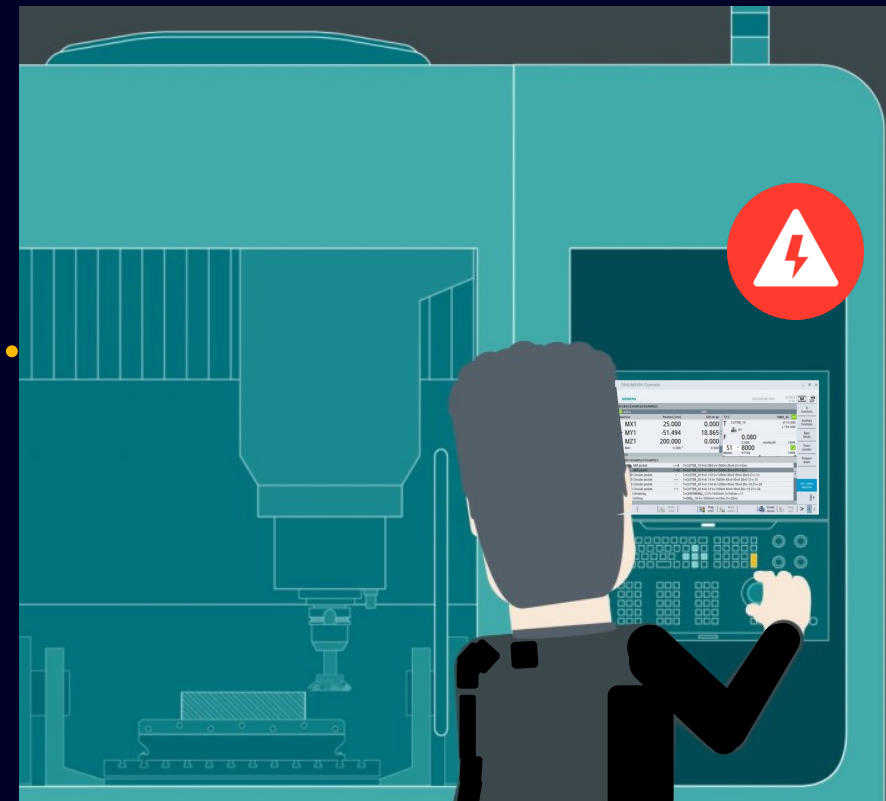## The digital twin for servicing

Machine manufacturer

Machine operator

✓ Reuse existing machine model to reproduce customer's problem

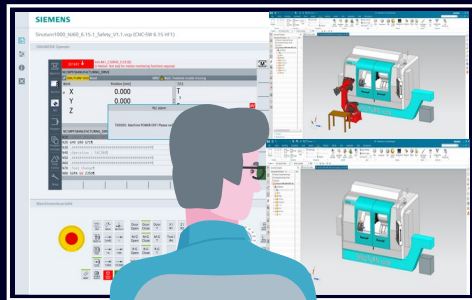✓ Aftersales: Evaluating the implementation of customer requests with the help of digital twin

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The digital twin in presales
Collaborative and transparent project meeting with digital prototypes

Machine manufacturer

Machine buyer

✓ Reuse existing machine model
✓ Evaluation of the implementation of subsequent customer requests with the help of the digital twin

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How the Digital Twin can be utilized at the Machine User?

Machine manufacturer

Machine User

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Operating at the real machine

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Verification on the digital twin

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Machine protection

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Use cases in job preparation

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Machine in delivery
Faster start of production

Machine Tool Manufacturer

Machine Tool User

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Machine in delivery
Faster start of production

Machine Tool Manufacturer

Delivery

Machine Tool User

Waiting delivery time

✔ Commissioning

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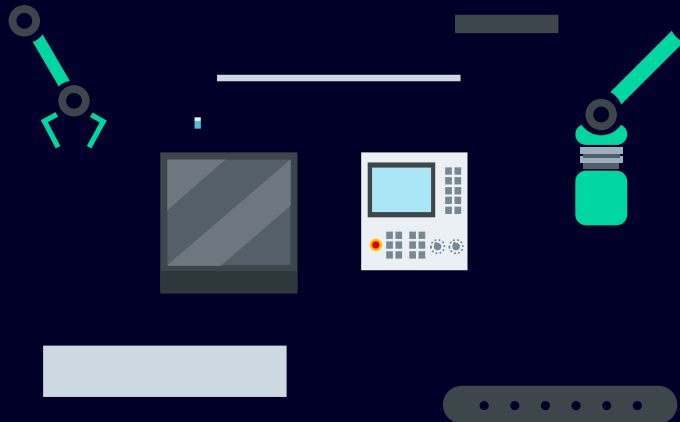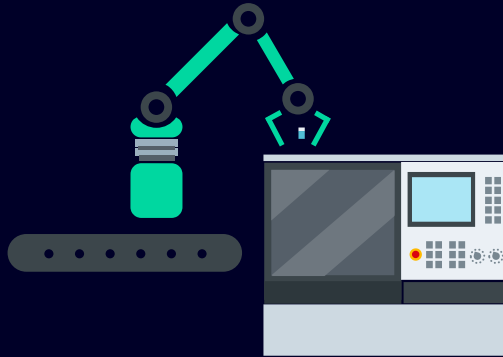
Machine in delivery
Faster start of production

Machine Tool Manufacturer	Delivery	Machine Tool User
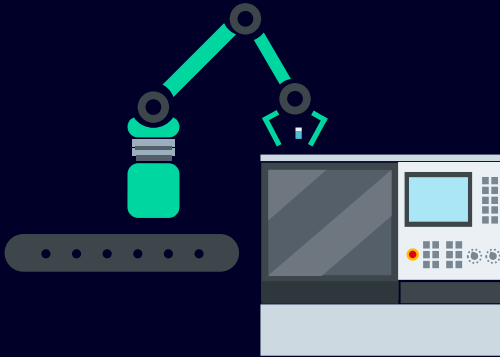
Waiting delivery time

Ramp-up time

weeks
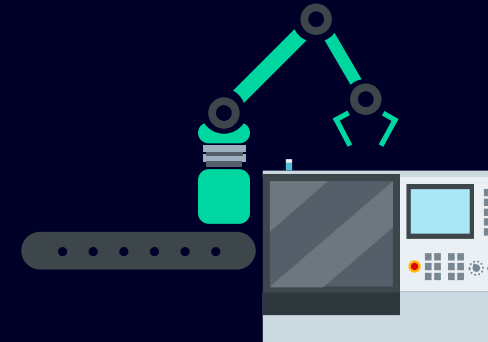
✔ Commissioning

✖ Machine ramp-up takes a lot of time before the value add production can be started
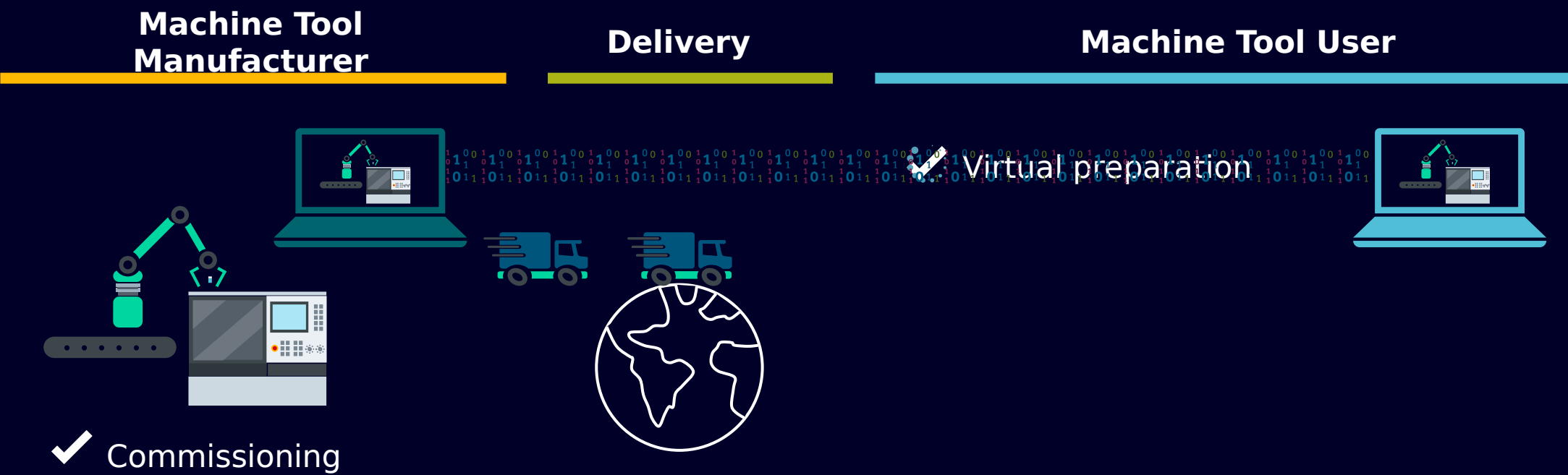
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Machine in delivery
Faster start of production

Machine Tool Manufacturer

Delivery

Machine Tool User

Virtual preparation

✔ Commissioning

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Machine in delivery
Faster start of production

Machine Tool Manufacturer

Delivery

Machine Tool User

✔ Virtual preparation

⚙ Ramp-up time
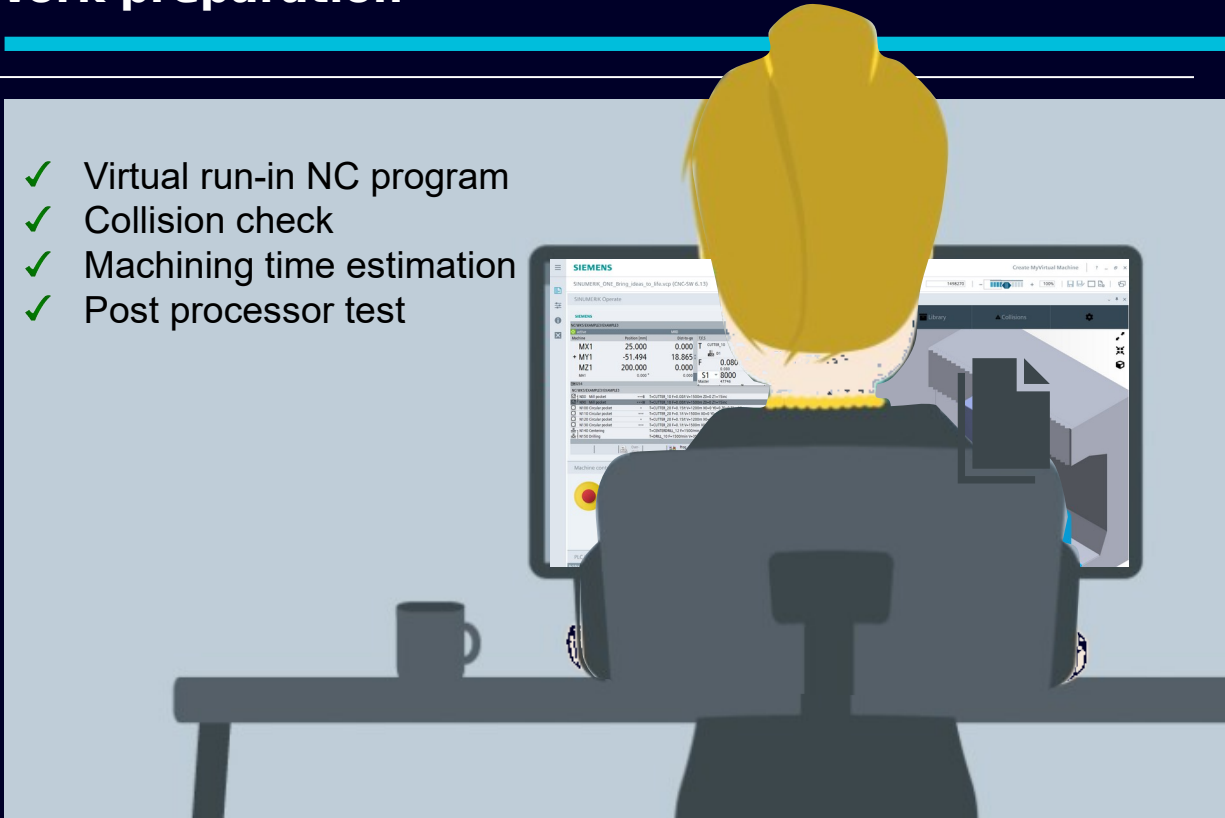
✔ Commissioning

2 weeks
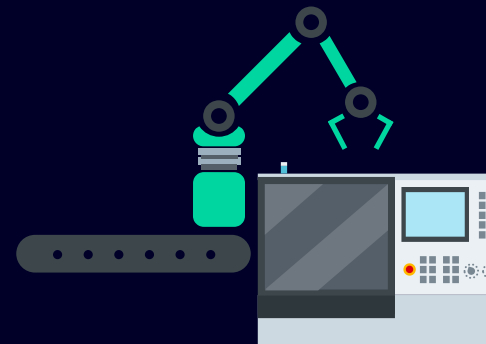
✔ Essentially shorten the commissioning time at the final destination based on preparation on a virtual model

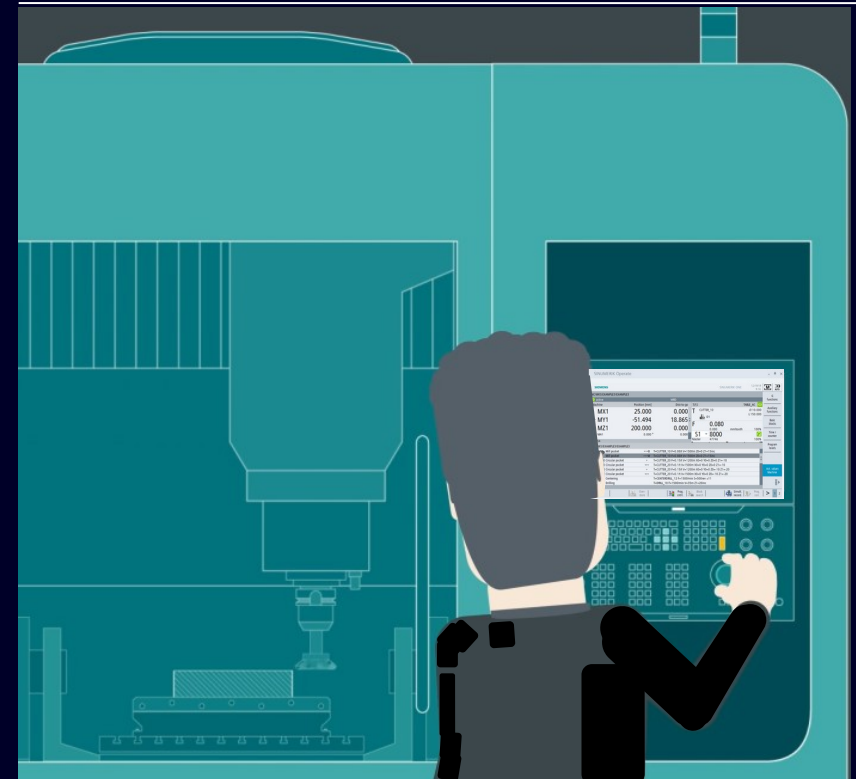**SIEMENS**

Machine operation
Export of a digital twin for work preparation

Work preparation

- ✓ Virtual run-in NC program
- ✓ Collision check
- ✓ Machining time estimation
- ✓ Post processor test

Work execution

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References

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Digital Twin
from machine manufacturer to machine user!

OEM: MAKA; 9 axis gantry milling centers PM270

OEM: Tongtai; 5 axis turn-mill machine

End User: National Cheng Kung University; protyping for racing team

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