



Digital Twin Software

for virtual commissioning



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Digital Twin software for virtual commissioning

Commissioning is usually a critical part of every plant and machine construction project. It can typically only begin once the mechanical system has been built and all automation components have been installed. This puts enormous pressure on the commissioning engineers, as any further delay quickly leads to the completion date of the entire plant being postponed.

Emulate3D addresses this problem and allows control systems to be virtually commissioned at an early stage and in parallel with other engineering, manufacturing and assembly processes. The real mechanics, actuators and sensors do not have to be available.

Emulate3D uses dynamic digital twins that simulate kinematics, emulate automation components and are coupled with real (hardware in the loop) or simulated controls (software in the loop).



The advantages of the technology are:

- ✓ **Meeting deadlines**, as control system tests can be carried out at an early stage and in parallel with other engineering processes..
- ✓ **Shorter start-up times** and increased machine and system availability (OEE), as control programs can be tested more comprehensively and optimized in advance, resulting in higher maturity/quality.
- ✓ **Cost savings** by transferring commissioning to the office and simulated test operation; no test objects and auxiliary personnel are required.
- ✓ **Risk minimization**, as crash situations are detected in good time and thus avoided. Early detection of errors in the program sequence and in interfaces.
- ✓ **Possibility of testing** the software-side handling of malfunction and error situations without endangering the system.
- ✓ **Preparation** of the commissioning engineers for the actual commissioning.
- ✓ **Changes** to the control code after commissioning of systems can be tested in advance, thus minimizing downtimes.

Photo: Digital twin of a container conveyor system including shuttle warehouse

Typical areas of application

Development of new machine and system concepts: As a rule, physical prototypes are used here, the production and modification of which is time-consuming and very costly. The use of digital twins based on **Emulate3D** reduces the number of physical prototypes required in this application and shortens development times, as concepts can be evaluated and improved more efficiently in the virtual world.

Special machinery and plant engineering: The classic, where virtual commissioning is used at both PLC and control level (MES, MFR). The aim is to save costs by avoiding on-site operations; risk minimization, as a mechanical crash, for example, can lead to dramatic delays, but also the careful use of scarce PLC resources.

Retrofits, machine/plant expansions: The particular challenge in these cases is that machines and systems are already productive. Conversions and recommissioning should take place within the shortest possible time in order to keep production interruptions as short as possible. Comprehensive virtual pre-tests of the control programs based on **Emulate3D** are therefore



Photo: Virtual commissioning of a packaging system

is a good way of achieving this goal and keeping the costs of production downtime to a minimum. Virtual tests are also highly recommended in terms of risk management.

Training in a realistic virtual environment: In many sectors, there is an enormous shortage of skilled workers, coupled with high staff turnover. This leads to a situation where new employees need to be trained on a regular basis. To achieve this as efficiently as possible, digital twins based on **Emulate3D** are the ideal solution. Employees are trained with realistic virtual models and learn how to operate a machine or system in a fun, cost-effective and risk-free way, making them perfectly prepared for the job.

Industries

Emulate3D works across all sectors and can therefore be found in many industries



Engineering



Intralogistics



Process



Robotic

Cost-benefit ratio

The exact cost savings achieved through the use of virtual commissioning are often difficult to determine. Errors are identified at an early stage and eliminated before they occur - in the worst case as a mechanical crash. Points such as employee and customer satisfaction are also difficult to evaluate in monetary terms, but are important arguments for the use of VIBN.

Customer opinion

// MINDA is increasingly using **Emulate3D** to achieve short commissioning times through control software that has already been optimized in advance. Despite increasingly complex tasks, this enables us to meet customer requirements for short downtimes on the one hand, while optimizing overall project costs on the other.

SVEN BUSCHE

Software engineering Simulation

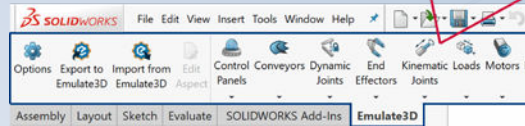


Technology

Emulate3D is a state-of-the-art, physics-based emulation environment for digital twins. The extensive standard functionalities enable a quick introduction to the technology. At the same time, the customizing options allow the application to be adapted to individual requirements. This also includes the automation of activities. In general, the open approach of **Emulate3D** should be emphasized, also with regard to supported CAD formats and automation platforms..

Depending on the area of application, emulation models are created either on the basis of parameterizable **Emulate3D** internal standard blocks, customer-specific blocks or 3D CAD data. **Emulate3D** natively supports a large number of CAD formats such as Inventor, Creo Parametric, Onshape, Solidworks. In these cases, the workflow of the model construction can already begin within the design-

programs with the help of the **Emulate3D** add-ins "CAD is the model".



A large number of libraries and modules are available for standardized applications. These include, for example:

- "Smart conveyors" for conveyor technology
- "Robots" for robot applications
- "ICT" for Rockwell
- "Independent Cart Technology"
- "Tanks and Pipes" for process engineering systems and much more.

The standard components can also serve as templates for the development of customer-specific modules, which are then typical stores in separate catalogs.

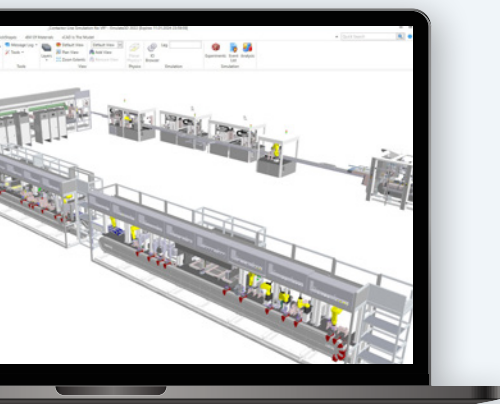
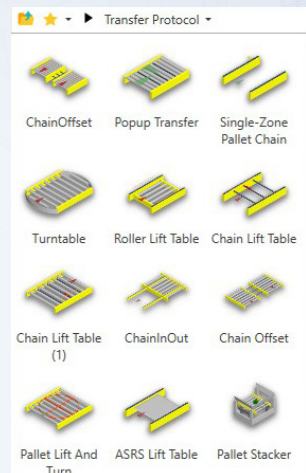


Photo: "Smart Conveyors" standard library for conveyor technology



Emulate3D uses various physics engines for the simulation of kinematics, including industrial real-time multi-body simulation engines. These allow both large systems to be considered in their entirety as well as smaller systems with a high level of detail.

With regard to automation platforms, **Emulate3D** works across manufacturers and provides a variety of interfaces as standard, including Rockwell, Siemens, B&R and Beckhoff. In addition to the specific bus systems and protocols, OPC UA can also be used. In addition to hardware controllers (hardware in the loop),

control emulators such as Logix Echo or PLCSIM Advanced are also supported (software in the loop). These also allow safety signals to be tested and are operated as co-simulators.



Photo: Model of a Rockwell MagneMotion system and associated standard libraries for simulation, emulation and PLC code generation of ICT systems.



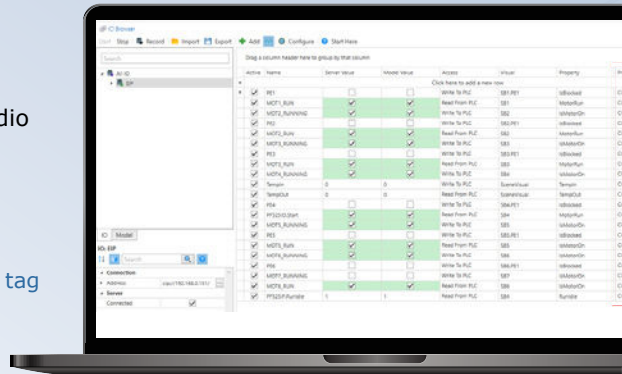
Photo: Emulate3D as an open system supports a variety of automation platforms



Photo: Control Panel within Emulate3D

Interfaces such as OPC UA, TCP/IP, MDP and MQTT are available for (MES, MFR), interfaces such as OPC UA, TCP/IP, UDP and MQTT are available. There are also direct interfaces for various robot simulators such as ABB RobotStudio and Fanuc Roboguide to control robot movements in [Emulate3D](#).

Photo: IO browser for establishing connections with the controllers and tag mapping between the PLC and the digital twin.



Extract from the current references

- ABB
- Andritz
- BSS
- Coloplast
- Dematic
- Gebhardt Fördertechnik
- Groninger
- Jorgensen
- Jungheinrich
- KHS
- Knapp
- Körber Supply Chain
- Optima
- SEW
- Siemens Logistics
- Siempelkamp
- SIT Steuerungstechnik
- Sitlog
- Swisslog
- VDT Automation
- Viastore

Our locations





EMULATE3D



**Do you have any questions about the
Emulate3D software?**

Please feel free to contact us:
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