Siemens Mechatronic Concept Designer (MCD) & intelligent purchased parts from CADENAS

Andreas Brandauer
Agenda 25.10.2017 08:00 (am)

- **Introducing / Motivation**
- Overview Interdisciplinary Development from machine and plant with Mechatronic Concept Designer
- Early mechatronic simulation in the machine design with support from CADENAS SmartPARTS
- Reuse from Simulation object and intelligent purchased parts
- Outlook in the Virtual Commissioning
Digitalization changes everything

The next trillion dollars will be earned with data – for our customers and for our industries.

Michael Dell, founder of Dell Inc.

Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.

Pierre Nanterme, CEO Accenture
Our customers have essential requirements – throughout the manufacturing industry

Speed

Flexibility

Quality

Efficiency

Security
By compressing the innovation lifecycle

1. Product design
2. Production planning
3. Production engineering
4. Production execution
5. Services
Our goal: driving the digital twin
Digital Twin

MindSphere

feed back insights to continuously optimize product and production

Digital Twin of the product

Digital Twin of the production

Digital Twin of the performance
Integrated Engineering (Machine Design)
reduce costs from the first idea to the Commissioning

Today

Systems Engineering

Requirements

Mechanical Concept

Concept Design

Mechanic

Detailed Engineering

Electric / Fluid

Software

Commissioning

Real Machine

Real Commissioning

Service

Future

Systems Engineering

Requirements

Mechatronic Concept

Concept Design

Electric / Fluid

Mechanic

Interdisciplinary Engineering

Software

Commissioning

Digital Machine

Virtual Commissioning

Real Machine

Real Commissioning

Service

Siemens Products supports you today and in the future our Design Method
Interdisciplinary Concept
Catch the interdisciplinary aspect from beginning

How should the machine work?

- operations
- mechanical
- Cam profiles
- Reuse older components
- drives and actuator
- sensoric
Steps of a Simulation in the Concept phase
continuous improvement from the Concepts

Simple Sequence

Detailed Sequence

Detailed Sequence

Complex Sequence

- Mechatronic Simulation at the early design phase
- Validate your ideas
- Presentation from the Design
- Data base for all derivate
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History about the mechanical purchased parts

2D drawings from parts  3D model  3D model parametric  3D model with behavior
Creation from a mechatronic concept with the MCD
Use from CADENAS intelligent purchased catalog parts in the concept Design

Using the CADENAS intelligent Purchase parts

- Direct in the Concept design phase/conceptual software MCD or NX
- The catalog parts can be used direct as a Reuse component. Fully integrated solution

➔ Faster, easy to use, workflow is better supported
Which information are would be used in a simulation
Definition from the mechatronic physics information for the MCD

Example 1 – Conveyer, needs:
• Conveyer Surface
• parameter: Velocity
• Collision Body

Example 2 – Linear module 2 axis, needs:
• 2 x Ridged Bodies
• Optional: Mass und Inertia
• 2 x Sliding joints
• optional: end position
• 2 x Position control or speed control
• Parameter: max. Velocity,
• optional: max. acceleration, jerk, Force etc.
Example for a concept model
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Mechatronic Concept is the base for the Digital twin. Generate Information for the following Engineering Disciplines:

- Machine sequence
- 3D basic geometry
- Electrical / mechanical cams
- Sensor actuator lists
- Path time diagram
- Reference Designator lists
- Control signals
- Force / Load profiles
Siemens Tool-Integration:
NX/MCD – SIZER Interface

Interoperability between the
3D CAD Data with the CAD-Creator

Drive Library

3D-CAD

Dimensioning of the drive systems

Load cycles
MCD Interface into ECAD
same Information in both System ECAD und MCAD

Mechanical

Electric

Interactivity about Reference Designator via XML

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Simulation from the Design with the Sequence Editor

- Simple working with the Sequence Editor
- Export from Sequence of Operation
- Export from SFC (Sequenz Functions Chart)
Virtual Commissioning (VC)
- HiL (Hardware in the Loop)
- SiL (Software in the Loop)

Motivation for the VC
- Real machine is not ready to test the Automation
- Real Commissioning is incalculable
- Mistakes in the Concept comes first up in the real commissioning
- Tests will be possible in a early phase
VC with the Mechatronic Concept Designer

- Visualize from the machine
- Behavior from mass and collision
- Eg. Feedback from sensor or collisions

- Signal linking to the hardware
- Behavior from the components
- Eg. Behavior drive control
- Or hydraulic / pneumatic pneumatic cylinder etc.

- Real sequence from programming code
- Cycle times from the hardware
Interaction in the Virtual Commissioning

Digital Model ➔ Behavior Model ➔ Control Unit

NX / MCD

SIMIT

Profibus / Profinet

Simulation Unit / SIMBA BOX

PLCSimAdvance

Simatic

Sinumerik

Simiton

Diverse ....

Reale Steuerung
Digital Twin

Digital Twin of the product

Digital Twin of the production

Digital Twin of the performance

feed back insights to continuously optimize product and production

MindSphere
MCD Physik Elements
Generate from mechanical Cam

Extend the functionality
Mechanical Cam (Mechanische Kurvenscheibe)

potential:
• The mechanical cam is extend the functionality
• The cam can be used direct at the axis. Also used in the simulation
MCD Physik Elemente
Generate from mechanical Cam

Extend the functionality
Mechanical Cam (Mechanische Kurvenscheibe)

Opportunity:
• Fast creation and editing from mechanical cams
• Reuse from the definition in NX Motion
Development digital twin of the product design and simulation in one model “a holistic view“

Planning | Concept Design | Detailed Engineering | Commissioning

Requirement → Drawing → 1D System- and Logistic simulation → 3D Simulation → Digital Machine → Virtually Commissioning → Real Machine → Real Commissioning

Lifecycle / Detailing → Time reduction

- Electric / Fluid
- Mechanic
- Software
Thank you.

Andreas Brandauer