Web-Seminarserie

# INDUSTRY4.

für die Fertigungsindustrie

### Model Once, Configure Anywhere

Wie Modellbasiertes Systems Engineering Prozesse in Sales, Service & Logistik vereinfacht



11111

#### Webseminar-Serie Sondermaschinen- und Anlagenbau





Model Once – Configure Anywhere: Wie Modellbasiertes Systems Engineering Prozesse in Sales, Service & Logistik vereinfacht



Guided Selling mit der SAP MOCA Methodologie für den Maschinenbau im CTO und CTO+



Die Zukunft des Servicegeschäfts im Maschinenbau: Guided Selling und Design and Maintenance for Serviceability



Hochprofitabel und kundenspezifisch produzieren - Integration aller Change Prozesse im Maschinenbau



Das intelligente Manufacturing Execution System für den Anlagen- und Sondermaschinenbau

03.09.2021 10:00 - 11:15 Uhr

10.09.2021 10:00 - 11:15 Uhr

17.09.2021 10:00 - 11:15 Uhr

24.09.2021 10:00 - 11:15 Uhr

01.10.2021 10:00 - 11:15 Uhr

### **End-to-End Scenario**



The "Blue" Process Order Neutral Product Development & Design **The "Red" Process** Order Engineering and Order Management



## What is the challenge?



### How do I want to run my business?





### **Product and Business Model**



#### **Scope and Complexity along a continuum**



### **Product and Business Model**



#### **Scope and Complexity along a continuum**



### **Different** Products – **Different** Value Chains – **Different** Processes for Standard Product Design and Order Engineering



MTS ΜΤΟ/СΤΟ **ETO** CTO+ Type of Customer Process Make-to-Stock Configure-to-Order Engineer-to-Order Configure-to-Order closed open Design<sup>1)</sup> Design<sup>1)</sup> Design<sup>1)</sup> Sell **Design-to-Operate Process** Sell Engineering<sup>2)</sup> Supply Chain Sell Supply Chain Manufacturing Engineering<sup>2)</sup> Supply Chain Manufacturing Sell Supply Chain Manufacturing Aftermarket Service Aftermarket Service Aftermarket Service Manufacturing Aftermarket Service Comments / Remarks:

1) Design in terms of Standard Product Development

2) Engineering in terms of customer specific development (Order Engineering)

### **Different Products force Different Value Chains** Increasing Pain in two dimensions





Digital Product Model Complexity

### **Example – Different parts force different processes**





### **Example – Different Parts force Different Processes**





CTO = Configure to Order CTO+ = Configure to Order Plus MTO = Make to Order MTS = Make to Stock PTO = Purchase to Order

## How to deal with this challenge?



# An architecture and methods are required that simplifies end to end processes for complex products.







### SAP

### **MODEL ONCE CONFIGURE ANYWHERE AND REUSE ANYWHERE**



## How does the IT solution looks like?



### An in-build integration platform in S/4HANA





### **SAP Product and Process Governance enables**

### Model Once – Configure and Reuse Anywhere

by using the iPPE Data Model in S/4HANA



### **Model Once**

### Configure (Products) anywhere

- Logical Structure & Knowledge Management to drive Variant Configuration
- Synchronized handover
  - Engineering BOM
  - Manufacturing BOM
  - Sales Order BOM
  - Project BOM
  - Service BOM



### Reuse (in Process) anywhere

- by Purchasing Integration
- by PP Integration
- by PS Integration
- by SD Integration
- for Sub-Systems
- with Change Number
- in Change Record

### **SAP Enterprise Product Development**



#### Engineering



#### Requirements Acquisition

- **Requirements Management**
- Model-based Systems Engineering
- Impact & Lineage Analysis
- Test Planning & Execution
- Manage Test Artefacts & Results



Collaboration



- 3D Visual Design & Redlining
- Simple Task/Workflow Management
- Collaborate on Structured Product Data incl BoM
  - Supplier Collaboration
  - Collaborate on Changes Comments

### Visualization



Simplified User Experience Import, Browse & Share Visual Data Integration Author, Edit & Enhance Visualizations Role-based Visual Application Templates 3D Visual Work Instructions





Simulation Based Digital Twin Virtual Sensors Health Prediction What-If Simulation Dynamic 3D Visualization Collaboration with OEMs



## Connected Products



# SAP continues its open strategy towards direct CAD and PDM Integration





# The Story









Product manager

As product manager Paula is responsible to fullfill these requriements:

**IIOT** Conveyer sends technical issue



More power is needed

Sustainablity Engergy saving



Stop conveyer when not in use

Voice of Customer Customer centricity



New dimensions required

## The demo flow



### **Demo Flow for this Web-Seminar**



The "Blue" Process Order Neutral Product Development & Design **The "Red" Process** Order Engineering and Order Management





#### Prepare for work in MBSE





Create repository folder structure from template



Generate overview diagram from template (pkg)



Define product requirements and break them down into components



Visualize parameters graphically in the assigned parameter model (bdd)

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1 Werkstoffanforderunger

1.4 Auswahl Technologiepaket

Rahmenbedingunge

Nichtfunktionale Anforderunger

Korrosionsschutz



Structure data artifacts clearly, collect and structure requirements



### SAP Enterprise Product Development - Engineering Requirement Engineering and MBSE, Roller Conveyor

SAP September 2021



PUBLIC

### **Closed-loop engineering**



Ensuring the product meets the expectations of customers and stakeholders



## Identify market and stakeholder needs

Listen to the voice of customer and stakeholders

### **Collection of feedback from customers and stakeholders**



Feedback is collected internally and externally via various channels

< SAP Manage Feedback Plans -					۹ 🞩
Roller conveyor feedback collection					Complete Analysis
status: Analyzing	Feedback 4		Needs 1	Requirements 1	
Overview Collection Tasks Analysis Tasks					
Plan Information					Edit
Basic Information	Plan Details		Adminstration Information		
Description: Collect feedback for the new intelligent roller conveyor	Product: Roller conveyor		Created By: jens.erb@sap.com	Changed By: jens.erb@sap.com	
	Start Date: Jul 7, 2021		Created At: Jul 7, 2021, 8:17:14 AM	Changed At: Jul 7, 2021, 9:28:57 AM	
	End Date: Jul 31, 2021				
Collection Tasks					
					۵
Name	Channel	Assigned to	Status		Feedback
Internal stakeholder feedback	Manual	Jens	Completed		2 >
Collect feedback from internal stakeholders	Pick-up feedback	Jens	Completed		2 >
Analysis Tasks					
					Create Assign Delete 🔞
Name	Assigned to	Status		Needs	Requirements
Analyze feedback on roller conveyor	Jens	Completed		1	$1 \rightarrow$

### Identify stakeholder and market needs



Feedback is analyzed and used to identify needs

< SAP Manage Needs -			a JE
NEED-000000015			Open Requirement
Product: Roller conveyor Category: Energy	Status: Requirement created	Priority: Highest	
Information Selected Feedback Requirements Information			
Basic Information Name: Automatic detection of goods to stop roller conveyor Description: The system should detect when no goods arrive to stop from unnecessary energy consumption and to prevent goods from dropping on the floor when no container is placed at the end of the conveyor. Selected Feedback	Administration Information Created By: Jens.erb@sap.com Created At: Jul 7, 2021 Changed By: Jens.erb@sap.com Changed At: Jul 7, 2021		
ID	Description	Category	
FB-000000117	Energy could be saved by stopping the conveyor when no goods arrive.	Energy	>
FB-000000116	The roller conveyor shall prevent the goods from falling on the floor.	Energy	>
FB-000000119	Slowing down the speed of the roller conveyor and stopping after a defined time frame could save energy.	Energy	>
Requirements Information			
Requirements Model Name: Smart_Warehouse			

### Generate a new requirement based on the prioritized need



Needs become the basis for new/changed requirements, traces are maintained

= SAP			Requirements Management and Systems Modeling						Q Jens Erb ~
		Smart_Warehouse ×							
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		1.2.4.3	COTS HW Components	U	ndefined	0	Undefi		
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		1.2.4.5	5G Cellular Network Environment	U	ndefined	0	Undefi		
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		2.	The system shall automatically detect goods arriving on and leaving the conveyor	0		0			



### **Capture feedback from users via Qualtrics**

Qualtrics survey can be used to capture the voice of customer





# **Requirement Engineering**

Specify and manage requirements

### **Requirement model example**



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**Comparison of versions** 

### **Collaboration with partners based on requirements**



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## **MBSE** Definition of system behaviour and architecture

### **MBSE example diagrams**

Modeling of all 9 SysML diagram types is supported



### Impact analysis



The impact analysis provides transparency on traces and navigation to requirements, MBSE objects and external object, like S/4Hana business objects



### Detailed design process based on requirements and logical objects defined? in MBSE

- Integration with various business objects in S/4Hana, like material, BOM, document, characteristic
- Integration framework to define arbitrary external objects



## **Product Verification and Validation** Ensure the product fulfills the defined requirements and expectations

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### **Verification & Validation**

- Test cases are defined to ensure the requirements are met
- Test plans define the sequence of test cases that shall be performed
- Test executions are performed for a test object
- Results are maintained



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eScooter functional tests round 2	Completed			Apr 9, 2021 6	
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Detail the position in the technical portfolio structure



Define parameters for configuration & dependencies

Provide basic data and parameters for 3D Design in TC

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						STV	P_02_AA	D2202	Operating voltage	$\checkmark$	$\checkmark$
						STV	P_02_AA	F442	Motor power	$\checkmark$	
			1			STV	P_02_AA	P026	coating material description	n 🗸	
						STV	P_02_AA	P097	Material of supports		
						STV	P_02_BA	H926	Segment width	1	
						STV	P_02_BA	1020	Ground clearance	~	
						STV	P_02_BA	J021	conveying length		
						STV	P 02 BA	1022	conveying height		

### Prepare for work in TC 3D Design with NX



#### **PDMI Integration of TC with SAP**

### SAP integration with PDMI and the SAP interface to Teamcenter





## Product and Process Governance in S/4HANA Product Definition Customer Order



Variance maintenance is maintained in the portfolio structure via the KCC (ConfigurationControlCenter).



The KCC enables maintenance, inheritance (top down or bottom up), restriction and generation of variance data via maintenance at the various structural levels.



For example, the machine type is inherited by the and at the same time limited to the only relevant machine type value.

The feature information is directly linked to the EPD.

		neater Data
Profile: EBOM Administration	D Description	eBOM component: E00001528
✓ ♣ E00001524	Roller Conveyor	Description: support
> 🔂 10	Roller Conveyor	
✓ ♣ E00001525	drive cpl.	Component varianti: 10 support
> 🕞 10	drive cpl.	Change State:
V 👗 E00001526	drive	Material: 208664 support
> 🗊 10	drive 380V	
> 🕞 20	drive 110V	
Cap		
> 🔂 30	drive 220V	< 🎸 Status (PCC) 😝 Material 👗 BOM header 👗 BOM position 🗖 Classification 🍡 Document Drag&Drop Geometric Instanc
> 🔂 30 > 🛱 E00001527	drive 220V support cpl.	< 🎸 Status (PCC) 🔒 Material 👗 BOM header 👗 BOM position 🗖 Classification 🍡 Document Drag&Drop Geometric Instance
> 🗊 30 > 🖉 600001527 > 🛐 10	drive 220V support cpl. support cpl.	✓ Status (PCC) <u> <u> <u> </u><u> </u></u></u>
> 🕞 30 ~ 🖧 E00001527 > 🕞 10 ~ 🗸 E00001528	drive 220V support cpL support cpL support	<ul> <li>Status (PCC) <a>         Material         BOM header         BOM position         Classification         Document Drag&amp;Drop         Geometric Instance         Geometric Instance</a></li></ul>
> 5 30 > 5 30 > 7 E00001527 > 5 10 - 8 E00001528 > 5 10	drive 220V support cpl. support cpl. support support	<ul> <li>Status (PCC)</li> <li>Material</li> <li>BOM header</li> <li>BOM position</li> <li>Classification</li> <li>Document Drag&amp;Drop</li> <li>Geometric Instance</li> <li>Material:</li> <li>208664</li> <li>208664</li> <li>Configurable</li> </ul>
> ;; 30 > ;; 400001527 > ;; 10 > ;; 10 > ;; 10 > ;; 10 > ;; 10 > ;; 10 > ;; 10	drive 220V support cpl. support cpl. support support rolling plattform	<ul> <li>Status (PCC)</li> <li>Material</li> <li>BOM header</li> <li>BOM position</li> <li>Classification</li> <li>Document Drag&amp;Drop</li> <li>Geometric Instance</li> <li>Material:</li> <li>208664</li> <li>Support</li> <li>Material:</li> <li>Configurable materials</li> <li>Industry Sector:</li> <li>Mechanical engineering</li> </ul>
> ;; 30 > ;; 400001527 > ;; 10 > ;; 10 > ;; 60001528 > ;; 10 > ;; 10	drive 220V support cpl. support cpl. support support rolling plattform	<ul> <li>Status (PCC)</li> <li>Material</li> <li>BOM header</li> <li>BOM position</li> <li>Classification</li> <li>Document Drag&amp;Drop</li> <li>Geometric Instance</li> <li>Material:</li> <li>Material:</li> <li>Wether Configurable materials</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Configurable materials</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Configurable materials</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Configurable materials</li> <li>Material:</li> <li>Material:</li></ul>
> ;; 30 > ;; E00001527 > ;; 10 > ;; £00001528 > ;; 10 > ;; £00001529	drive 220V support cpl. support cpl. support support rolling plattform	<ul> <li>Status (PCC)</li> <li>Material</li> <li>BOM header</li> <li>BOM position</li> <li>Classification</li> <li>Document Drag&amp;Drop</li> <li>Geometric Instance</li> <li>Material:</li> <li>208664</li> <li>Configurable materials</li> <li>Industry Sector</li> <li>Material:</li> <li>Material:</li> <li>Material:</li> <li>Product Catalog</li> </ul>
> ⇒ 30 > ₹ 60001527 > ⇒ 10 > ⇒ 10 > ₹ 60001528 > ⇒ 10 > ₹ 60001529	drive 220V support cpL support cpL support support rolling platform	<ul> <li>Status (PCC)</li> <li>Material</li> <li>BOM header</li> <li>BOM position</li> <li>Classification</li> <li>Document Drag&amp;Drop</li> <li>Geometric Instance</li> <li>Material: 208664</li> <li>Support</li> <li>Material: Tope:</li> <li>Material: Configurable materials</li> <li>Material: Tope:</li> <li>Material: Configurable materials</li> <li>Industry Sector:</li> <li>Material: Be_MATERIALTYPE_P2</li> <li>Class:</li> </ul>
<ul> <li>&gt; □ 30</li> <li>&gt; □ 50</li> <li>&gt; □ 10</li> <li>&gt; □ 10</li> <li>&gt; □ 500001528</li> <li>&gt; □ 10</li> <li>&gt; □ 10</li> </ul>	drive 220V support cpL support cpL support support rolling platform	<ul> <li>Status (PCC)</li> <li>Material</li> <li>BOM header</li> <li>BOM position</li> <li>Classification</li> <li>Document Drag&amp;Drop</li> <li>Geometric Instance</li> <li>Material: 208664</li> <li>Material: 208</li></ul>
> 20     30       < ₹ E00001527	drive 220V support cpL support cpL support rolling platform	<ul> <li>Status (PCC)</li> <li>Material</li> <li>BOM header</li> <li>BOM position</li> <li>Classification</li> <li>Document Drag&amp;Drop</li> <li>Geometric Instance</li> <li>Materiat: 20864</li> <li>Materiat: 20864</li> <li>Materiat: 20864</li> <li>Materiat: 20864</li> <li>Configurable materiats</li> <li>Industry Sector</li> <li>Materiat: product Catalog</li> <li>Class:</li> <li>General data</li> </ul>

Maintain product data and variants Generate material master & Production Bill of Material



Generate Equipments Generate Spareparts

# Summary – SAP Product and Process Governance is an in-build integration platform in S/4HANA











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