Boost the PI Sheet

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September 2007
Where can I get the Cool Stuff?

BPX Community for Manufacturing

Manufacturing Execution for Process Industries

State of the Art: Maintaining Process Instructions with XSteps - Available Functional Enhancements
Shop Floor Communication with PI Sheets

SAP R/3 Enterprise

Manufacturing Operations

- Material movements
- Batch management
- Plant maintenance
- Quality management
- Alarm server
- Customer functions

PI Sheet

- Automatic process messages

OPC in SAP:
- Data access
- Alarms & Events

Control recipe

Process Messages

Function modules

Planned order

Master data

Process order
Example of a PI Sheet

Process Manufacturing Cockpit PROC-MGR-MES

PI Sheet - Test-Change
Process Order 000070000882 Material Number PH-4100
Change -> Displ. Save Complete Print Create comment

- Phase0000
- Phase0210
- Phase0320
- Phase0410
- Phase0420

Phase Description

Phase 0420: IPC

<table>
<thead>
<tr>
<th>Component Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
</tr>
<tr>
<td>PH-4191</td>
</tr>
<tr>
<td>PH-4192</td>
</tr>
<tr>
<td>PH-4193</td>
</tr>
</tbody>
</table>

Phase Signature

Sign End of "IPC"

Phase0430
Phase9999
1. Newly developed standard functions (ECC 6.03)
2. XSteps SXS Library (ECC 5.0 +)
3. Extensions of XSteps for regulated environment (ECC 6.02)
4. Using productivity tools to speed up implementation
5. Techniques for enhancements
   (XSL stylesheets and function modules)
New Features and Functions

- Show comment icon in table cells
- Set fields mandatory with the help of characteristics (flag 'Entry Required' set)
Enhanced New SAP Style Sheet

- **LED Green**: Signature completed
- **LED Yellow**: Signature in progress with more than one signer
- **LED Grey**: Signature present, not started yet
- **No LED**: No Signature present

**Icon Deactivated**: Phase contains deactivated elements

**Icon Locked**: Phase contains locked elements

**Icon for Signatures already done**: There are signatures present

**Icon for Deviations**: Deviations occurred in the phase

**Icon for Comments**: Comments were created for the phase
New transactions for

- Control Recipe Monitor (CO53XT)
- Process Message Monitor (CO54XT)
- Work List for PI Sheets/Work Instructions (CO60 & CO60XT)

Using configurable ALV_GRID_XT:

- Adding additional columns modification-free (via BAdI implementation and customer-defined append structure)
PDF Print Function
1. Newly developed standard functions (ECC 6.03)
2. XSteps SXS Library (ECC 5.0+)
3. Extensions of XSteps for regulated environment (ECC 6.02)
4. Using productivity tools to speed up implementation
5. Techniques for enhancements
   (XSL stylesheets and function modules)
## Purpose

- Collection of best-practice building blocks
- Speed-up of implementation

## Required Functionality

<table>
<thead>
<tr>
<th>Usage of XStep-based PI Sheets (PP-PI)</th>
<th>Since R/3 4.70 Ext. 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importing of XStep folders</td>
<td>Since ERP 2004</td>
</tr>
<tr>
<td>Usage of XSteps for production orders (work instruction sheets)</td>
<td>ERP 2005 EhP 3</td>
</tr>
</tbody>
</table>
## Content of the SXS Library

### Repository for Standard XSteps with Versions, Plant 3100

<table>
<thead>
<tr>
<th>Object</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard XSteps</strong></td>
<td>Repository for Standard XSteps with Versions</td>
</tr>
<tr>
<td><strong>SXS-Library</strong></td>
<td>Contains BASIC and ADVANCED SXS Building blocks</td>
</tr>
<tr>
<td><strong>SXS library COMPLETE</strong></td>
<td></td>
</tr>
<tr>
<td>00 General Remarks Concerning Simulation</td>
<td>Limitations for the simulation of PI Sheets</td>
</tr>
<tr>
<td>SXS: Calculations (manual/automatic)</td>
<td>Executes calculations manually/automatically</td>
</tr>
<tr>
<td>SXS: Changing the 'Look and Feel'</td>
<td>Usage of different style sheets or CSS modification</td>
</tr>
<tr>
<td>SXS: Checklists (Customer)</td>
<td>Z characteristics required!</td>
</tr>
<tr>
<td>SXS: Checklists (SAP stand.)</td>
<td>Examples for checklists</td>
</tr>
<tr>
<td>SXS: Defining Tables</td>
<td>Grouped instructions, parameterized tables etc.</td>
</tr>
<tr>
<td>SXS: Dynamic Function Calls (Customer)</td>
<td>Usage of Z-function modules necessary!</td>
</tr>
<tr>
<td>SXS: Dynamic Function Calls (SAP stand.)</td>
<td>Usage of function modules of the SAP standard</td>
</tr>
<tr>
<td>SXS: Execution of Commands via Triggers</td>
<td>Triggers: Formula, functions or events</td>
</tr>
<tr>
<td>SXS: Input and Output of Data</td>
<td>Set and get values of different formats</td>
</tr>
<tr>
<td>SXS: Output of Actual Date/Time</td>
<td>Output of actual date and time</td>
</tr>
<tr>
<td>SXS: SAP Process Messages</td>
<td>Building blocks for SAP process messages</td>
</tr>
<tr>
<td>SXS: Using MDA Data Points</td>
<td>Working with Manufacturing Data Access (MDA)</td>
</tr>
</tbody>
</table>
Structure of the SXS Library

Folders for different categories of SXS

Every SXS has a separate documentary instruction (To be deleted for later use)

Sample instructions demonstrate the usage

Simulation: Displays a preview of the SXS on the right side
Example: Checklist

Show the usage of SXS references inside the SXS repository

Show how parameters can be used to control the behaviour of an SXS reference (e.g. color)
Example: Material List

SXS reference in process order

Process Order: XSteps

Simulated XSteps in process order (including generation)

SXS Repository

Generation Scope

Process Order: Bill of Material

Material List

<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
<th>Material description</th>
<th>Requirement quantity</th>
<th>Unit</th>
<th>Storage Location</th>
<th>Batch</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>N-2110</td>
<td>Acetylsalicylic acid - Grade 0123456789</td>
<td>500</td>
<td>G</td>
<td>0002</td>
<td></td>
</tr>
<tr>
<td>0010</td>
<td>N-2120</td>
<td>Cornstarch</td>
<td>0.748</td>
<td>KG</td>
<td>0002</td>
<td></td>
</tr>
<tr>
<td>0020</td>
<td>N-2130</td>
<td>Cellulose powder</td>
<td>0.748</td>
<td>KG</td>
<td>0002</td>
<td></td>
</tr>
<tr>
<td>0030</td>
<td>N-2140</td>
<td>Aspartam</td>
<td>4</td>
<td>G</td>
<td>0002</td>
<td></td>
</tr>
<tr>
<td>0040</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

40 character material short text

HTML code valuation

<DIV style="font-size: 16pt">&LVA_MT;</DIV>
Example: CSS Adoption

Repository for Standard XSteps with Versions, Plant 3100

Object | Description
--- | ---
SXS-Library | Repository for Standard XSteps
SXS: Change layout via CSS manipulation
SXS: General Information
SXS: Different PI Sheet Layout (XSL)
SXS: Checklists (Customer)

HTML long text with CSS manipulation code

The background colors are defined by evaluation of the corresponding parameters with fixed values (standard colors like RED, BLUE or hexadecimal values for colors)

General Information

Change the background color of the PI Sheet

Parameter Name | Evaluation | Value
--- | --- | ---
LV_BGCOL | Fixed Value | RED
LV_BGPHEL | Fixed Value | BLUE

Change the background color of the phase container
How to get the SXS Library from SDN/BPX

https://www.sdn.sap.com/irj/sdn/bpx-manufacturing → Downloads → Core Manufacturing

<table>
<thead>
<tr>
<th>Name of Download Item (ZIP file)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flexible Building Blocks for Shop Floor Instruction Sheets - Basic Standard XStep Templates</strong></td>
<td>Library of SXS which do not use any custom characteristics or function modules</td>
</tr>
<tr>
<td><strong>Flexible Building Blocks for Shop Floor Instruction Sheets - Advanced Standard XStep Templates</strong></td>
<td>Library of SXS which use custom characteristics or function modules. (To be created before importing the library)</td>
</tr>
<tr>
<td><strong>Flexible Building Blocks for Shop Floor Instruction Sheets - Standard XStep Library</strong></td>
<td>Both basic and advanced libraries</td>
</tr>
</tbody>
</table>

Repository for Standard XSteps with Versions, Plant 1200

- Import SXS Folder
- Import Standard XStep
- Change
- Display
- Export SXS Folder
- Create
- Delete
- Cut
- Copy
- Paste
- Expand
- Find
- Properties

File structure:
- Installation_files_COMPLETE
  - Documentation
  - XML_files_V_1_0
    - Main_file
    - Single_folder_files
- SXS Library COMPLETE V1_0.XML
1. Newly developed standard functions (ECC 6.03)
2. XSteps SXS Library (ECC 5.0 +)
3. Extensions of XSteps for regulated environment (ECC 6.02)
4. Using productivity tools to speed up implementation
5. Techniques for enhancements
   (XSL stylesheets and function modules)
Usage of Standard XSteps in a Regulated Environment

Standard XSteps as Building Blocks for PI Sheets require additional features (regulated environment):

**Main features:**

- Approval procedure for SXS versions using digital signatures
- Where-used list for SXS
- XML export and import of folders, SXS and SXS versions

**“Nice to have“:**

- Checksum test during XML import
- Automatic numbering of SXS version
- Automatic calculation of the valid to-date for released SXS version
Approval status scheme for SXS versions

Standard scheme for an SXS version

- In process (follow-up versions)
  - Set in process
  - Reject
- Released for test
  - Release for test
- Released
  - Set as obsolete
  - Release
  - Archive
- Obsolete
  - Delete
  - Archive
  - Delete
- Rejected
  - Delete
- Archived
  - Delete
Approval status scheme for SXS versions

Standard scheme for an SXS version with approval (pharma)
1. Newly developed standard functions (ECC 6.03)
2. XSteps SXS Library (ECC 5.0 +)
3. Extensions of XSteps for regulated environment (ECC 6.02)
4. **Using productivity tools to speed up implementation**
5. Techniques for enhancements
   (XSL stylesheets and function modules)
### PI Sheet Productivity Tools: Facts

#### Purpose
- Quick design of PI sheet content for discussion during blueprint
- Gives a good impression on the look & feel of a PI Sheet
- Templates of common elements

<table>
<thead>
<tr>
<th>Tool</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Design</td>
<td>PPT</td>
<td>Creation of draft Powerpoint presentations</td>
</tr>
<tr>
<td>Quick Design &amp; Table Layout</td>
<td>XLS</td>
<td>PI Sheet design in Excel, check of table layout (width)</td>
</tr>
<tr>
<td>Process Instructions Templates</td>
<td>XLS</td>
<td>PI Sheet design in Excel. Copy of process instructions into ERP (Pre-XStep)</td>
</tr>
</tbody>
</table>

#### Required Functionality
- MS Office: Powerpoint & Excel

<table>
<thead>
<tr>
<th>Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
</tbody>
</table>
Quick Design (Powerpoint)
### Quick Design & Table Layout (Excel)

#### Header Information

<table>
<thead>
<tr>
<th>Enter raw data</th>
<th>Include Offset?</th>
<th>Result</th>
<th>Close Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>8</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

#### Phase 0010: Calculation

First enter the base factor and calculate the potential offset. Then enter all raw data in the table below and decide whether to apply the offset. Close each line after input.

**Table**

<table>
<thead>
<tr>
<th>Enter raw data</th>
<th>Include Offset?</th>
<th>Result</th>
<th>Close Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>1</td>
<td>44</td>
<td>Close Line</td>
</tr>
<tr>
<td>60</td>
<td>0</td>
<td>60</td>
<td>Close Line</td>
</tr>
<tr>
<td>80</td>
<td>1</td>
<td>80</td>
<td>Close Line</td>
</tr>
</tbody>
</table>

**Enter Factor**

Enter Factor: 2

**Offset**

Offset: 4
Process Instructions Templates (Excel)
How to get the PI Sheet Productivity Tools

https://www.sdn.sap.com/irj/sdn/bpx-manufacturing  ➔ Downloads ➔ Core Manufacturing

<table>
<thead>
<tr>
<th>Name of Download Item (ZIP file)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PI Sheet Productivity Tools</strong></td>
<td>In the blueprint phase of a PP-PI project it is often difficult to discuss the possibilities and the look &amp; feel of PI sheets with non-IT members of the project team. During implementation of PI sheets it is helpful to have some templates available for common objects. This documentation describes some very useful tools to support the blueprint and implementation of PI sheets.</td>
</tr>
</tbody>
</table>
1. Newly developed standard functions (ECC 6.03)
2. XSteps SXS Library (ECC 5.0 +)
3. Extensions of XSteps for regulated environment (ECC 6.02)
4. Using productivity tools to speed up implementation
5. Techniques for enhancements
   (XSL stylesheets and function modules)
# Custom Function Modules for PI Sheets: Facts

## Purpose

- Enhancing the PI Sheet with simple or complex custom functionality
- Synchronous communication with ERP functionality
- ‘Glue’ for building PI Sheets with MES-like functionality

## Required Functionality

<table>
<thead>
<tr>
<th>Required Functionality</th>
<th>Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger function modules from PI Sheet manually</td>
<td>R/3 3.1i +</td>
</tr>
<tr>
<td>Trigger functions modules by events (Parameter changed, Document logged in, …)</td>
<td>R/3 Enterprise +</td>
</tr>
</tbody>
</table>

Not new, but the knowledge on the possibilities is not widely spread!
Synchronous communication with ERP functions

Event: PARAMETER_CHANGED

Function Module

**FUNCTION Z_MX_EQUI_STAT.**

***Local Interface:***

**IMPORTING**

**REFERENCE(I_EQUNR) TYPE EQUNR**

**EXPORTING**

**REFERENCE(E_STAT_TXT) TYPE CHAR30**

**REFERENCE(E_STAT) TYPE CHAR30**

**CHANGING**

**REFERENCE(C_STAT_CODE) TYPE CHAR4**

**REFERENCE(C_STAT) TYPE CHAR30 OPTIONAL**

**EXCEPTIONS**

**ERROR**

**OPTIONAL**

**REFERENCE(C_STAT) TYPE CHAR30 OPTIONAL**

DATA : it_status TYPE TABLE OF jstat,

is_status TYPE jstat,

ls_tj30 TYPE tj30.

DATA : w_object LIKE jest-objnr,

w_stsma LIKE jsto-stsma,

w_num TYPE n.

...
Calculations on complex PI Sheet tables

**Function Module**

FUNCTION Z_MX_WEIGH_COMP_UPDATE.

```
**Local Interface:
** IMPORTING
**  REFERENCE(I_RESITEM) TYPE CHAR4 OPTIONAL
**  REFERENCE(I_POSNR) TYPE APOSN OPTIONAL
**  REFERENCE(I_WEIGHT_TYPE) TYPE CHAR30 OPTIONAL
**  REFERENCE(I_SUM_AI) TYPE BDMNG OPTIONAL
**  REFERENCE(I_SUM_CM) TYPE BDMNG OPTIONAL
**  REFERENCE(I_TOL) TYPE BDMNG OPTIONAL
**  REFERENCE(I_STAT) TYPE C OPTIONAL
**  REFERENCE(I_UOM) TYPE CHAR30 OPTIONAL
** EXPORTING
**  REFERENCE(E_STAT) TYPE C
**  REFERENCE(E_SUM_CM) TYPE BDMNG
** TABLES
**  ET_NET STRUCTURE ZMX_PI_TABLE_NUM OPTIONAL
**  ET_NET_AI STRUCTURE ZMX_PI_TABLE_NUM OPTIONAL
**  ET_NET_CM STRUCTURE ZMX_PI_TABLE_NUM OPTIONAL
**  ET_POSNR STRUCTURE ZMX_PI_TABLE_CHAR OPTIONAL
**  ET_RESITEM STRUCTURE ZMX_PI_TABLE_CHAR OPTIONAL
**  ET_S_WEIGHT STRUCTURE ZMX_PI_TABLE_CHAR OPTIONAL
**  ET_SORTF STRUCTURE ZMX_PI_TABLE_CHAR OPTIONAL
**  ET_UOM STRUCTURE ZMX_PI_TABLE_CHAR OPTIONAL
**  LT_SCALE STRUCTURE ZMX_PI_TABLE_CHAR OPTIONAL
```

**Event: DOCUMENT_SAVED**

<table>
<thead>
<tr>
<th>Event</th>
<th>DOCUMENT_SAVED</th>
</tr>
</thead>
</table>

**Weighing Table**

<table>
<thead>
<tr>
<th>Action</th>
<th>Date</th>
<th>Time</th>
<th>User</th>
<th>Room</th>
<th>Scale</th>
<th>Bin</th>
<th>Batch</th>
<th>Target Qty</th>
<th>Zero</th>
<th>Tare Wgt</th>
<th>Net Wgt</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>07.09.2007</td>
<td>18:10:03</td>
<td>MANTHEY</td>
<td>10006386</td>
<td>10006388</td>
<td>10006404</td>
<td>0050</td>
<td>(50,0 %)</td>
<td>200,00 g</td>
<td>Y</td>
<td>1,00 g</td>
</tr>
<tr>
<td>OK</td>
<td>07.09.2007</td>
<td>18:10:46</td>
<td>MANTHEY</td>
<td>10006386</td>
<td>10006388</td>
<td>10006404</td>
<td>0075</td>
<td>(75,0 %)</td>
<td>67,00 g</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>OK</td>
<td>07.09.2007</td>
<td>18:11:19</td>
<td>MANTHEY</td>
<td>10006386</td>
<td>10006388</td>
<td>10006404</td>
<td>0100</td>
<td>(100,0 %)</td>
<td>20,00 g</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Net</th>
<th>UoM</th>
<th>Potency</th>
<th>Al [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>g</td>
<td>50 %</td>
<td>0.050</td>
</tr>
<tr>
<td>40</td>
<td>g</td>
<td>75 %</td>
<td>0.030</td>
</tr>
<tr>
<td>20</td>
<td>g</td>
<td>100 %</td>
<td>0.020</td>
</tr>
</tbody>
</table>

**Sum** 0.100
Building Complex Processes

1. Check the weighing table for the component MX_RAW_01.
2. Enter the material/batch code MX_RAW_010001.
3. Verify the scale reading and equipment release for product.
4. Record the tare weight.
5. Confirm the weigh operation with the date, time, and user.

Current Scale Reading: 10006388
Status: Equipment releas. for product.
Target Bin: 10006401
Status: Equipment releas. for product.

Weighing of MX_RAW_01
Weigh 1,000 KG (+1,0%) of component MX_RAW_01 (Raw 01).
# Custom XSL Stylesheet: Facts

## Purpose
- Enhancing the look & feel of the PI Sheet
- Add functionality

## Remarks
- In-house knowledge is highly recommended for: XML, XSLT, HTML, Javascript

## Required Functionality | Release
---|---
Browser-based PI Sheet (HTML) | R/3 4.6c +
Example: Material Text in PI Sheet Header

**Modified XSL Stylesheet**

```xml
<xsl:template match="DOCUMENT">
<-- #W_001: Replace Delete ------------------------------------------
<TABLE CLASS="PRINTBOXBORDER" COLS="5" ALIGN="LEFT" BORDER="0" CELLPADDING="0" CELLSIZING="3" WIDTH="100%">
#W_001: Replace Insert ------------------------------------------ -->
<TABLE CLASS="PRINTBOXBORDER" COLS="5" ALIGN="LEFT" BORDER="0" CELLPADDING="0" CELLSIZING="3" WIDTH="50%">
|-- #W_001: Replace End ------------------------------------------ -->
</TABLE>

<-- #W_001: Insert Start ------------------------------------------ -->
<TABLE CLASS="PRINTBOXBORDER" ALIGN="RIGHT" BORDER="0" CELLPADDING="0" CELLSIZING="15" WIDTH="50%">
<TR><TD style="color: #000000; font-size: 20%">
| <br>
| <xsl:value-of select="/HEADER/META[./@domain='PPPI_MATERIAL_SHORT_TEXT']/VALUE" disable-output-escaping="yes"/>
| <xsl:value-of select="/HEADER/META[./@domain='2_KO_MAT_TEXT_91B1340']/VALUE" disable-output-escaping="yes"/>
| </TD></TR>
</TABLE>
|-- #W_001: Insert End ------------------------------------------ -->
</xsl:template>

<xsl:template match="'HEADER\d+'CONTENT'">

```
Examples: Long Text at various Positions

Wide header

Table title

Footer text below table
Complex Example: Active Icons

- Stylesheet modification
- Javascript
- Custom function modules

**Phase Relationships**

Phase completed (Status CNF)

Phase open for work (Predecessor phase 110 has status ‘CNF’)

Phase not open (Predecessors not yet completed)

**Phase Status**

**Operation Overview**

<table>
<thead>
<tr>
<th>Op</th>
<th>Ph</th>
<th>Supe</th>
<th>Resource</th>
<th>Short text</th>
<th>Lo</th>
<th>System Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0100</td>
<td></td>
<td></td>
<td>PH-4120</td>
<td>=== PREPARATION ===</td>
<td>CNF REL</td>
<td></td>
</tr>
<tr>
<td>0110</td>
<td>0100</td>
<td></td>
<td>PH-4120</td>
<td>Preparation</td>
<td>CNF PRFN REL XSpr</td>
<td></td>
</tr>
<tr>
<td>0121</td>
<td>0100</td>
<td></td>
<td>PH-4120</td>
<td>=== WEIGHING ===</td>
<td>PCNF REL</td>
<td></td>
</tr>
<tr>
<td>0300</td>
<td>0200</td>
<td></td>
<td>PH-4120</td>
<td>Weighing</td>
<td>PCNF PRST REL XSpr</td>
<td></td>
</tr>
<tr>
<td>0310</td>
<td>0200</td>
<td></td>
<td>PH-4120</td>
<td>=== MIXING &amp; MILLING ===</td>
<td>REL XSpr</td>
<td></td>
</tr>
<tr>
<td>0320</td>
<td>0300</td>
<td></td>
<td>PH-4120</td>
<td>Granulation</td>
<td>REL XSpr</td>
<td></td>
</tr>
<tr>
<td>0410</td>
<td>0300</td>
<td></td>
<td>PH-4120</td>
<td>Sieving</td>
<td>RFI XSpr</td>
<td></td>
</tr>
</tbody>
</table>

**Qualification Requirement**

- Mechanical Engineering: Good
- Average
- Masters Degree: Yes

**User Qualification**

- Potential: Average
- Preferences:
  - Likes: Average
  - Dislikes: Average
  - Appraisals where applied: Average
- Basic data: Average
- Capacities: Average

**PI Sheet Change**

Process Order: 000070000805  Material Number: MX_BULK_01  Batch: 0000000390

- Phase 0110: Preparation
- Phase 0210: Weighing
- Phase 0310: Granulation
- Phase 0320: Sieving
- Phase 0330: Blending
- Phase 0410: Compression & Goods receipt
Thank you!

Dr. Arne Manthey
Solution Manager
Solution Management Manufacturing

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