



Manufacturing Operations Management

Digitálně orchestrovaná výroba

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ABB

ABB v České republice

ABB ČR

Divize ABB:

- Elektrotechnické výrobky
- Robotika a pohony
- Průmyslová automatizace
- Energetika

7 výrobních závodů

Více než 3 400 zaměstnanců

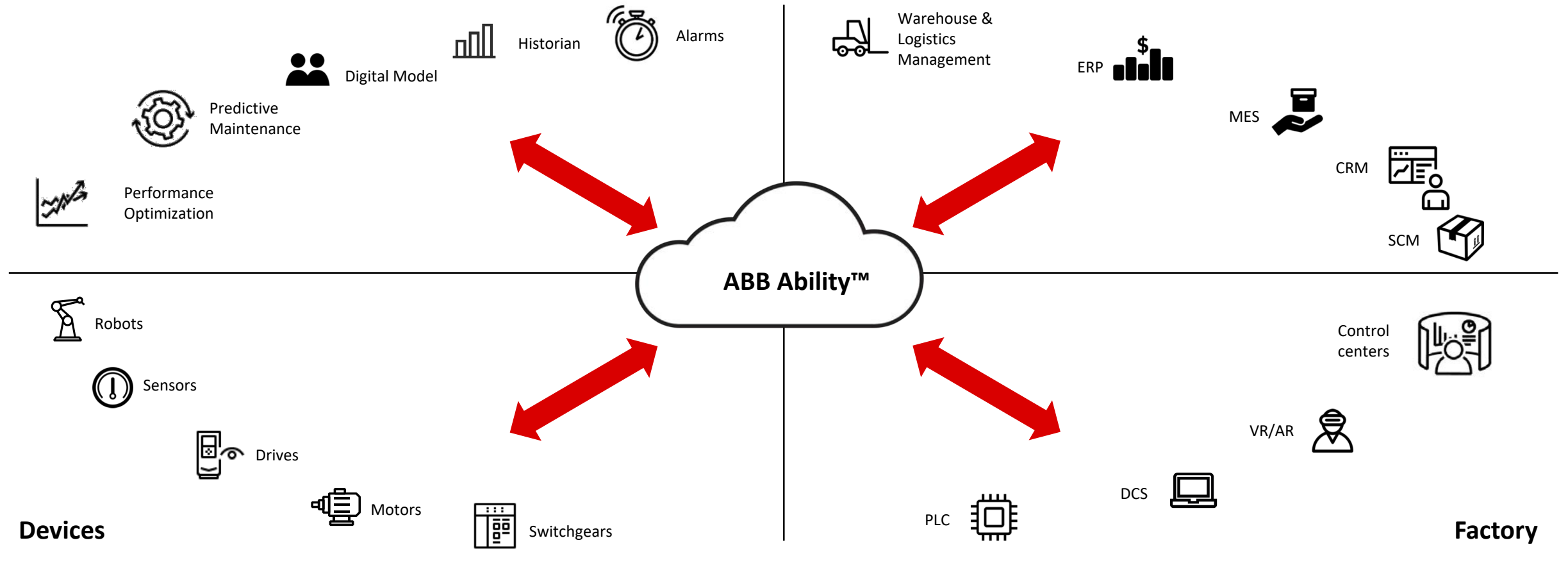
Tržby v roce 2016: 14,4 mld. Kč



Delivering value with IT and OT integration

Industrial Applications (OT)

Business Applications (IT)



Modular solutions on common platform

Collaborative Operations Centers closing the service delivery loop

ABB Collaborative Operations Centers



Customer Operations Centers



ABB Ability™ Platform



Proposed phase-wise Implementation of digital transformation

Business insight

Infrastructure

Predict & Improve

Phase 3: Prescriptive planning & delivery

- Predictive modelling for enterprise needs
- Real-time analytics, prescriptive models
- Continuous learning and optimization

- Big Data
- ML
- Simulation

Analyze & Optimize

Phase 2: Gain insight

- Manufacturing Operations Management
- Model and analyze data for patterns and insight
- Enterprise Asset management

- MOM
- Analytics
- Collaborative Operations

Measure

Phase 1: A 360 degree view

- Gather internal and external data (OEE, process data, energy, material, etc.)
- Create access to all necessary data

- Data platform
- Data visualization

Time

Value

Architektura

Pozice ABB Ability™ MOM

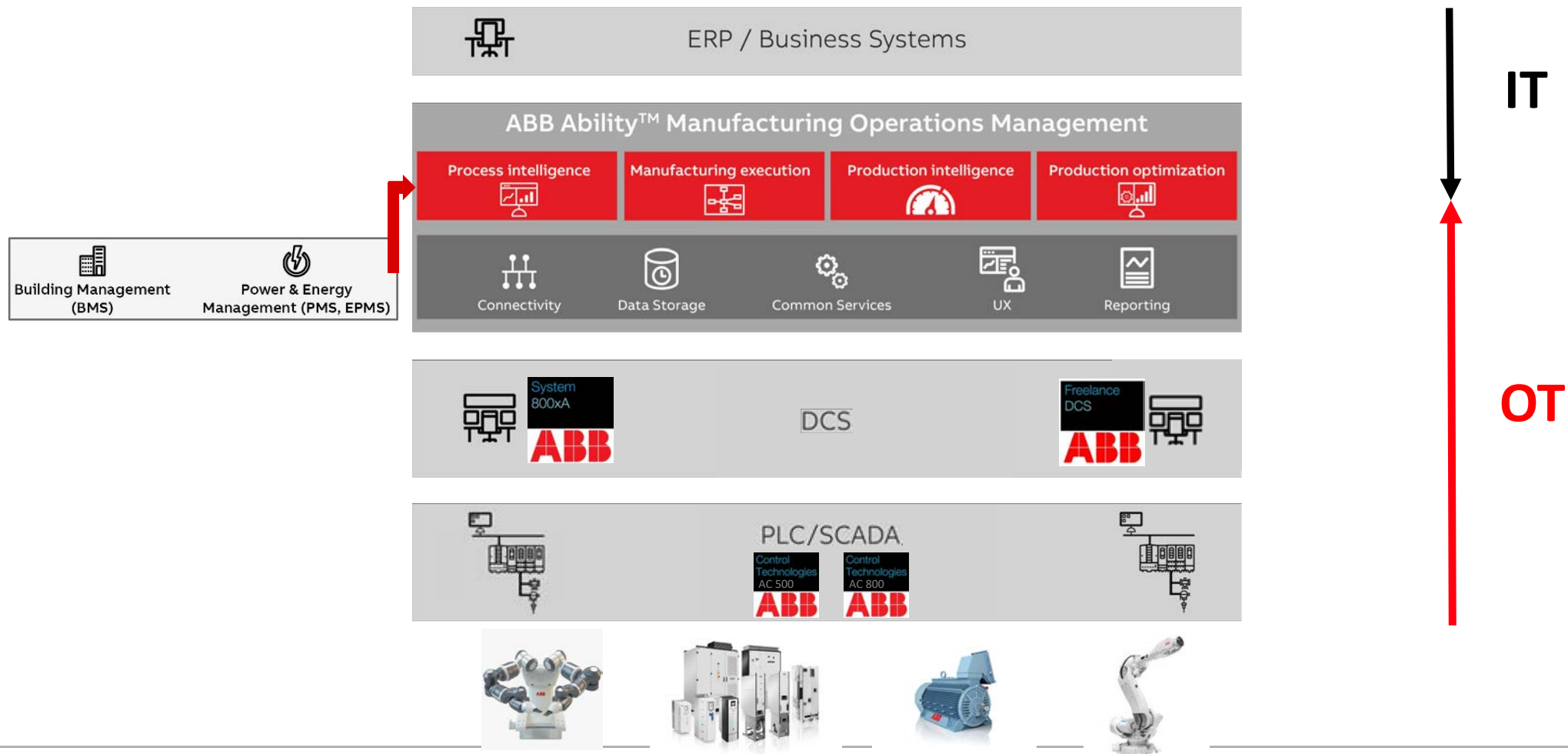


ABB Ability™ Manufacturing Operation Management

Digitalizací směrem ke zvýšení konkurenceschopnosti



ERP / Business Systems

ABB Ability™ Manufacturing Operations Management

Process Intelligence



Manufacturing Execution



Production Intelligence



Production Optimization



Connectivity



Data Storage



Common Services



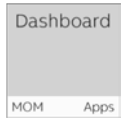
User Experience



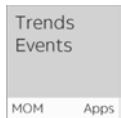
Reporting

ABB Ability™ Manufacturing Operation Management

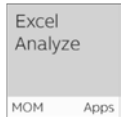
Process Information Management System (PIMS)



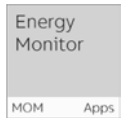
Poskytuje interaktivní reporting a analýzu, mistrům i managementu



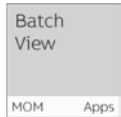
Vizualizuje v reálném čase výkonnostní metriky a propojuje je s KPI top managementu



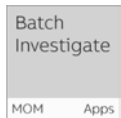
Sleduje procesy napříč odděleními/závody, upozorňuje na kritická omezení a neefektivitu



Identifikuje potenciál pro zlepšení, prioritizuje kroky k zvýšení efektivity výroby



Motivuje výrobní pracovníky k plnění pracovních plánů a maximálnímu využití zdrojů a dosažení kvality produkce



Manufacturing Execution System (MES)

- Správa výrobních příkazů
- Kapacitní plánování
- Řízení materiálových zásob
- Napojení na skladové hospodářství
- Quality Management
- Řízení výroby
- Downtime Management

...

Our factories story

Stepwise approach instead of «Zero to Hero»..

ABB
Praha

ABB Elektro Praga
Jablonec

ABB Instrument Transformers
Brno

Phase 1

Creating digital core



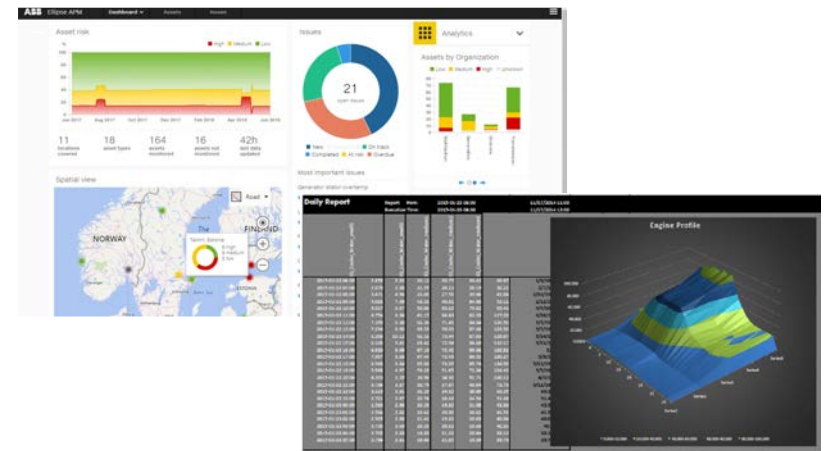
Phase 2

Robotics + ABB Ability™ MOM



Phase 3

ABB Ability™ Ellipse Predictive maintenance



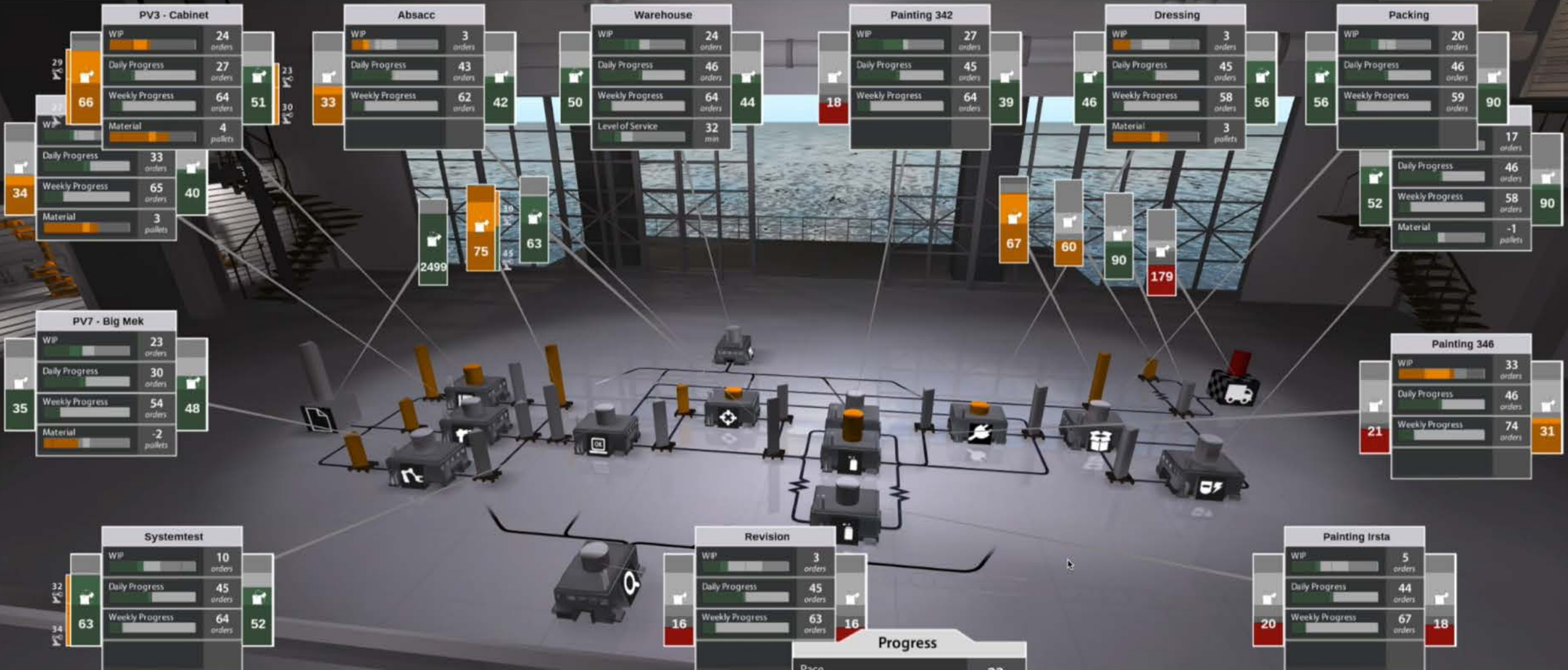
Saturday

Sunday

Monday

Yesterday

Now



Safety	
Last Accident	0 days
# of Accidents	1 times
# of Incidents	2 times
# of Risks	8 times

Quality	
FPY	95 %







Progress	
Pace	23 orders/Week
TPT	6.3 days
WIP	210 orders
# Orders	4134 orders

Plan	
Late Orders	8 orders
Behind Start	2 orders
OTR	91 %
OTD	95 %



Efekty zavedení MOMu – Dosahování konkurenční výhody

Co přináší MOM:

		Konkrétní přínosy
	ZLEPŠENÍ VYUŽITÍ ZDROJŮ, PROPUSTNOSTI A DODACÍ DOBY Využití zařízení, prostoje a přerušení v kontextu umožňuje rychlé zásahy a systematická zlepšení	+10-20% ZLEPŠENÍ OEE -20-40% DOBA VÝROBY
	SNÍŽENÍ SPOTŘEBY MATERIÁLU A ZÁSOB Přesný přehled o využití materiálu a zásob vč. nedokončené výroby s aktualizací v reálném čase eliminuje nutnost neefektivních zásob a snižuje množství nadbytečných zásob	-9% NEDOKONČENÁ VÝROBA
	ZLEPŠENÍ KVALITY A SNÍŽENÍ ODCHYLEK, CHYB A ODPADU Definované workflow, elektronické pracovní postupy & checklisty, dodržování procesů a specifikací	-50% ZMETKŮ/ODPADU
	PLNĚNÍ REGULATORNÍCH PŘEDPISŮ Efektivní vypořádání se se složitými požadavky na sledovatelnost pomocí automatizovaných transakcí	-50% ADMINISTRATIVY
	AGILNÍ VÝROBA Snadné zavedení nových produktů a procesů, integrace s technickými a designovými řešeními, detekce a eliminace limitací ve výrobě	ZAJIŠTĚNO!
	ZAJIŠTĚNÍ KONTINUÁLNÍHO ZLEPŠOVÁNÍ Systematické shromažďování, vizualizace a analýza prostojů, záznamy o kvalitě testů, odchylek a neshod zvyšují znalosti a umožňují inteligentní rozhodování	ZAJIŠTĚNO!

Reference





Děkujeme za pozornost 😊

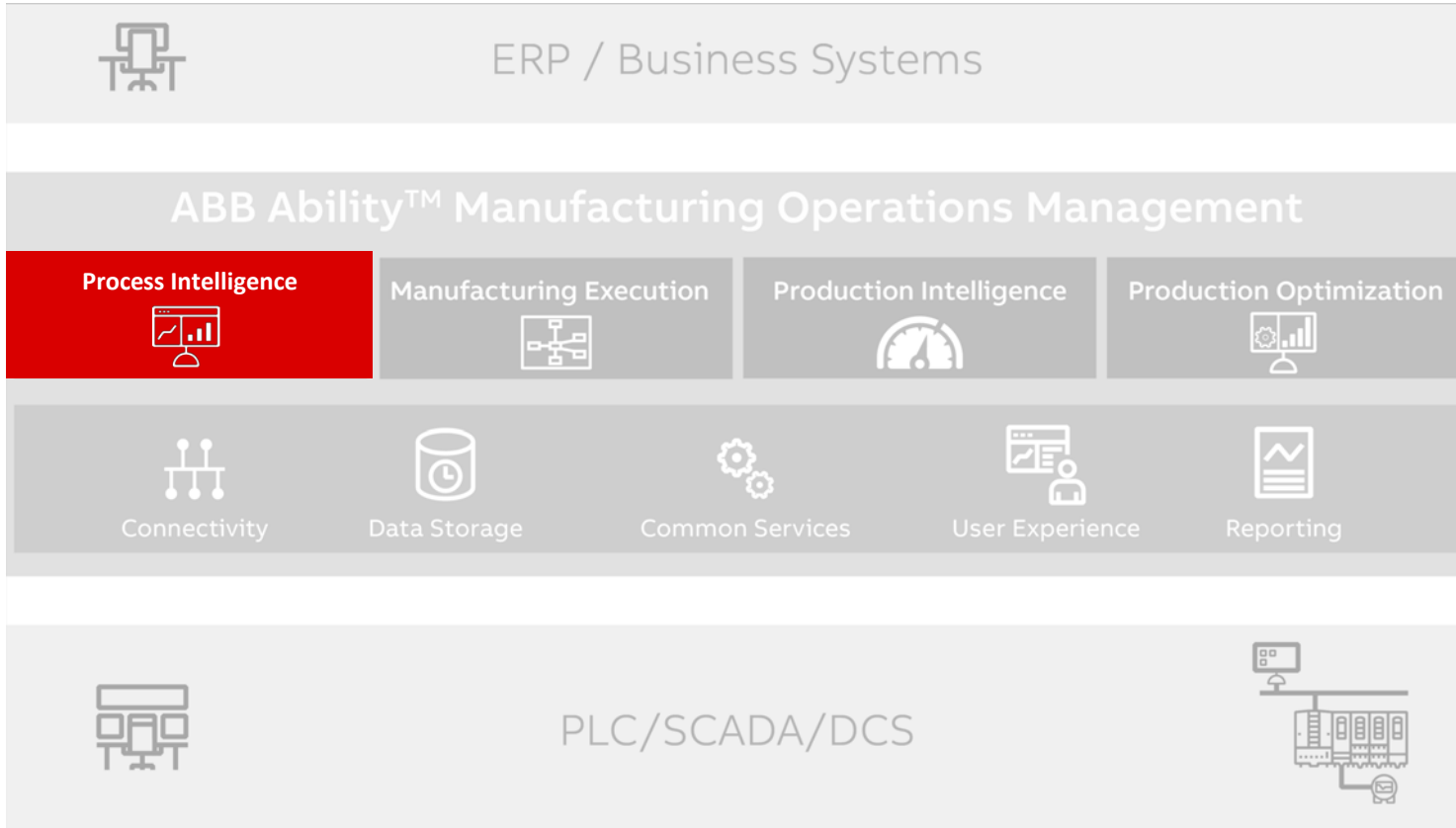


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Process Intelligence

Manufacturing Operations Management

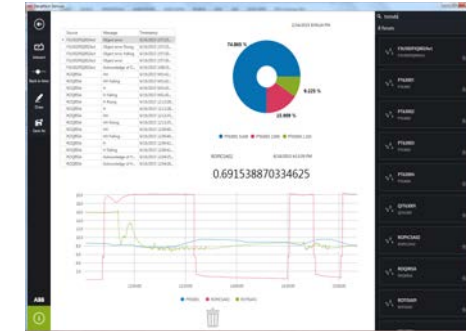
Process Intelligence



ABB's MOM solution

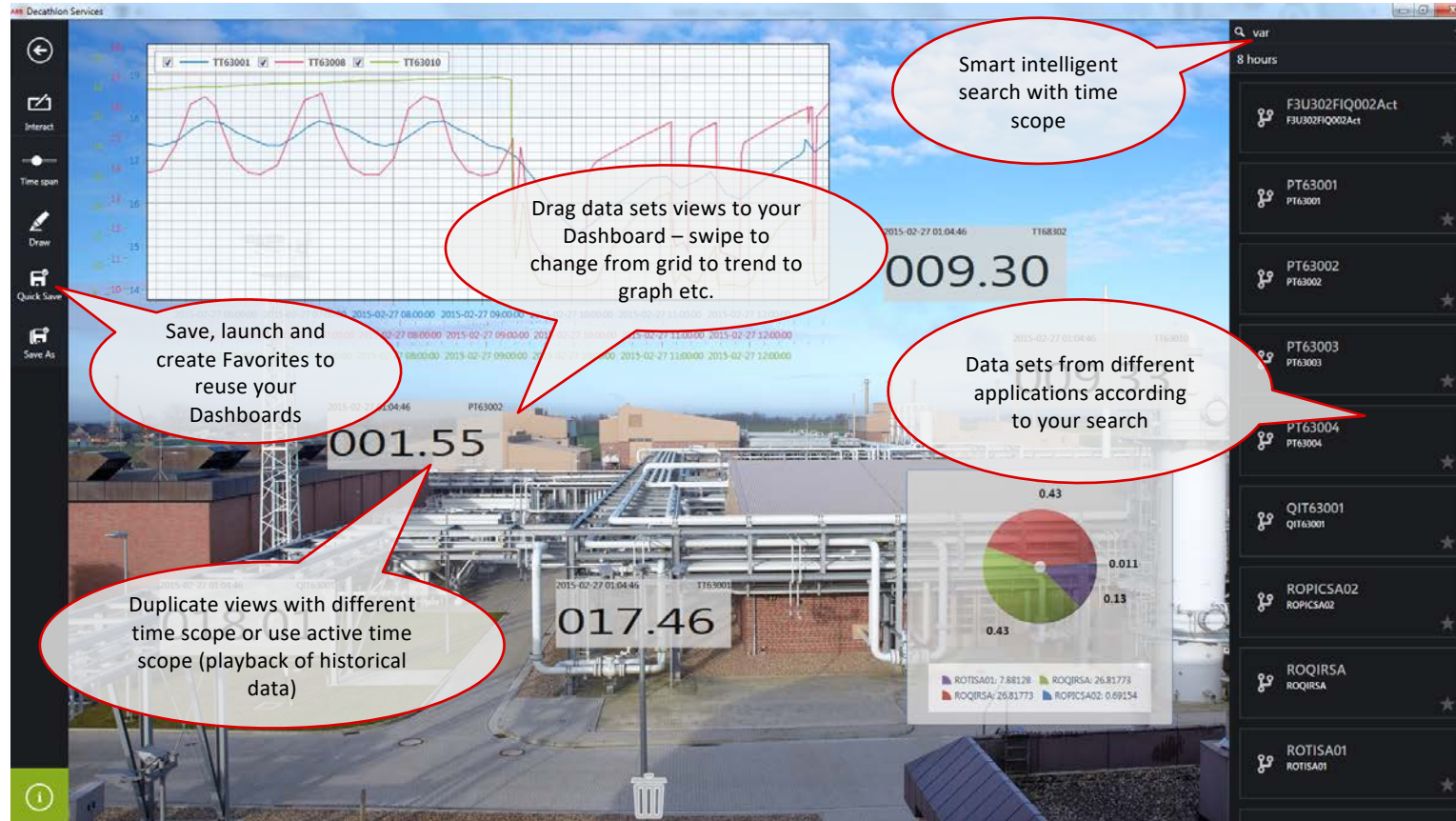
Enabling consistent and efficient manufacturing

- Collaborative interactive dashboards
- Trends and Events
 - Trend displays
 - Event views and analysis
- Excel Analyze
 - MS Excel add-in for calculation, data mining and reporting



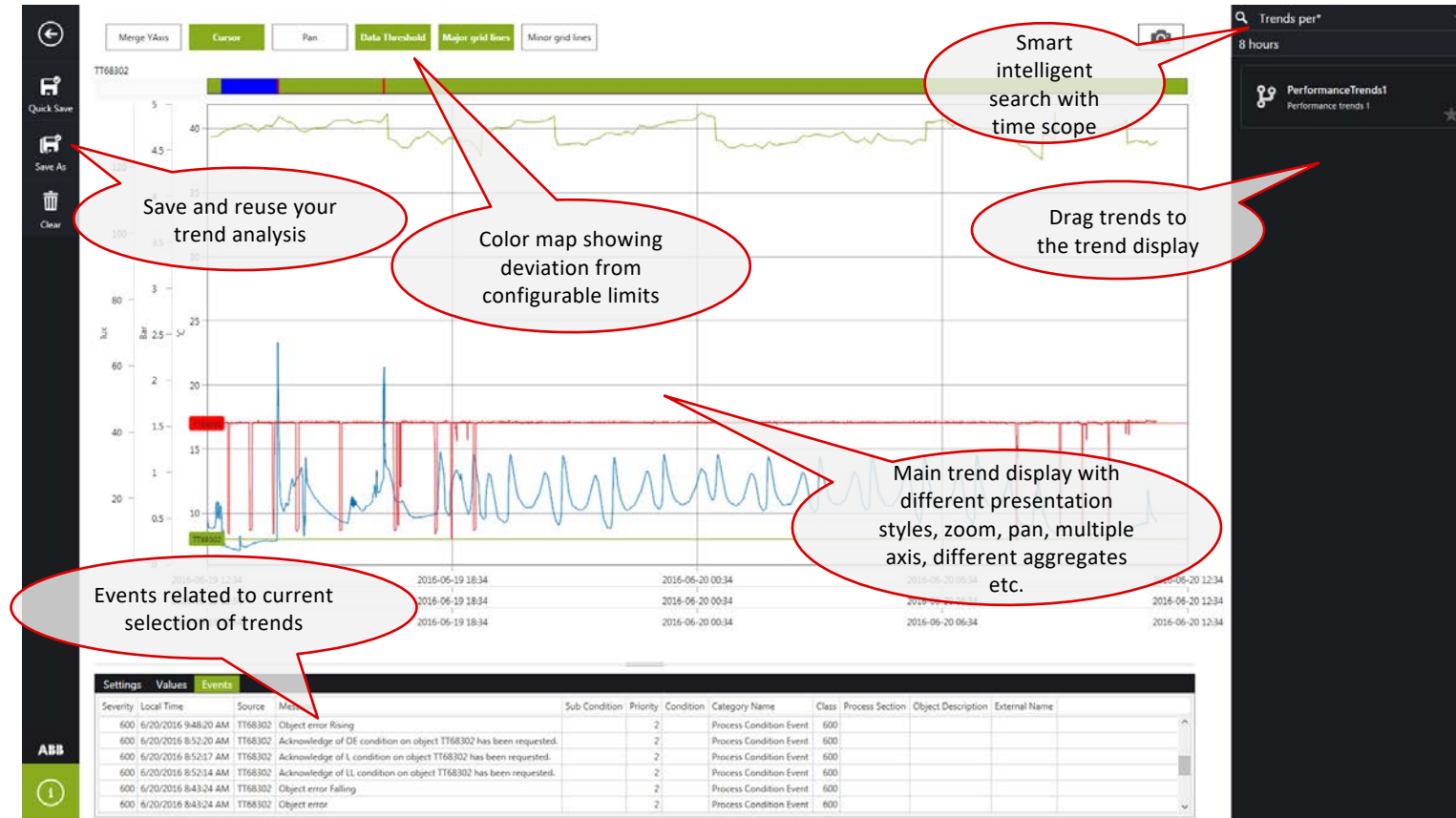
Dashboard App

Interactive instant reports and analysis



Trends and Events App

Trend analysis



Trends and Events App

Events

The screenshot displays the Trends and Events App interface. At the top, there's a navigation bar with 'All' and 'Top 20' tabs. Below it, a chart shows event frequency over time. The main area is a table of event data with columns for Event Time, External Name, Source, Message, Event Category, and Description. A search bar is visible at the top right. On the right side, there's a sidebar with a search bar and a list of event categories. At the bottom, there are two horizontal bar charts showing event statistics for 'Source' and 'Message'. Red callouts highlight specific features: 'Save and reuse your event analysis' points to the 'Save As' and 'Clear' buttons; 'Event statistics - frequency over time' points to the top chart; 'Smart intelligent search with time scope' points to the search bar; 'Event grid with powerful sorting, grouping, search and customization of layout' points to the table; 'Event statistics - Most frequent events sorted by user defined event attribute' points to the bottom charts; and 'Drag one or several event categories to the canvas' points to the sidebar.

Save and reuse your event analysis

Event statistics - frequency over time

Smart intelligent search with time scope

Event grid with powerful sorting, grouping, search and customization of layout

Event statistics - Most frequent events sorted by user defined event attribute

Drag one or several event categories to the canvas

Excel Analyze App

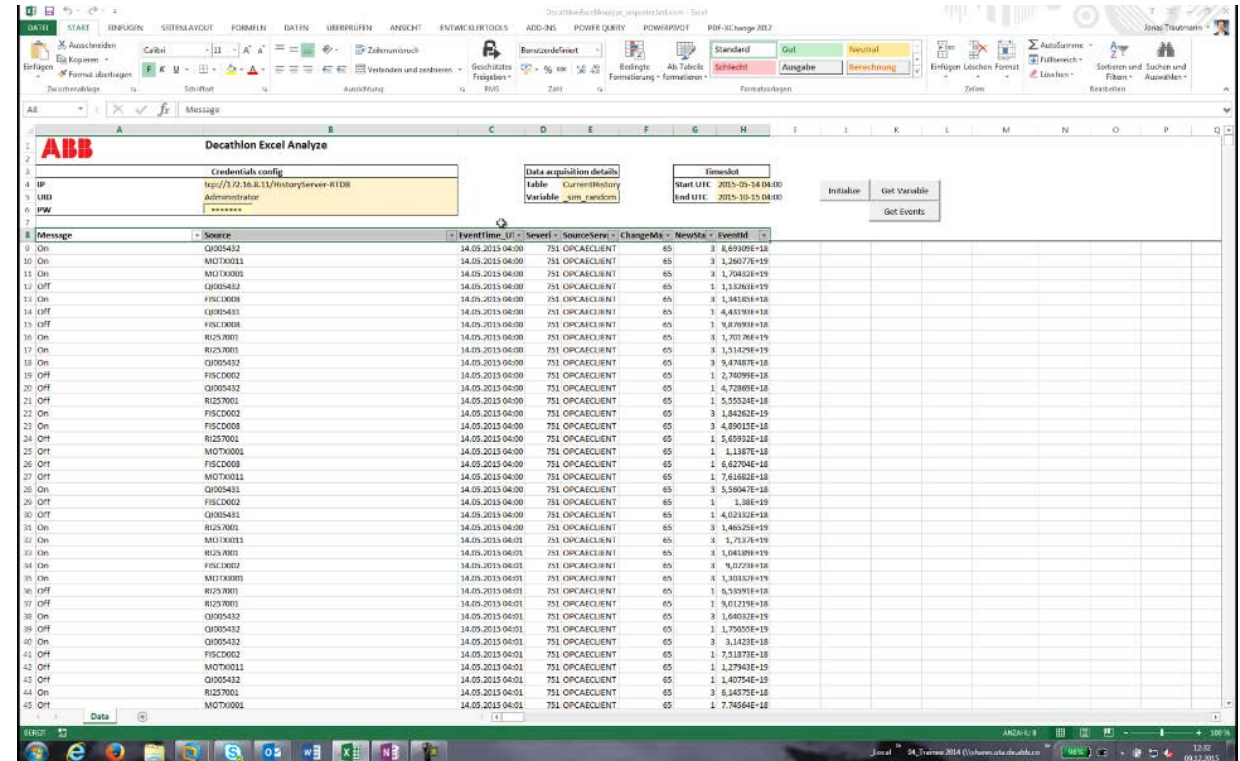
ODBC based data access in MS Excel

Access History data in the well known Excel spreadsheet format for:

- Creating reports
- Perform calculations
- Data analysis

Excel sheet templates using History ODBC to retrieve:

- Variable names
- Variable history values
- Events



Collaboration Table

Share your knowledge and ideas

- Modern and interactive large screen to engage users and unlock the power of your teams
- Collaborate and share your knowledge in an intuitive and user friendly environment
- Takes advantage of any MOM Application to view and analyse data
- Dashboard App optimized for Collaboration Table
- Ergonomic table with height adjustment and 180° angulation
- Designed for industrial use



Collaboration Environment

Data analytics supporting operations

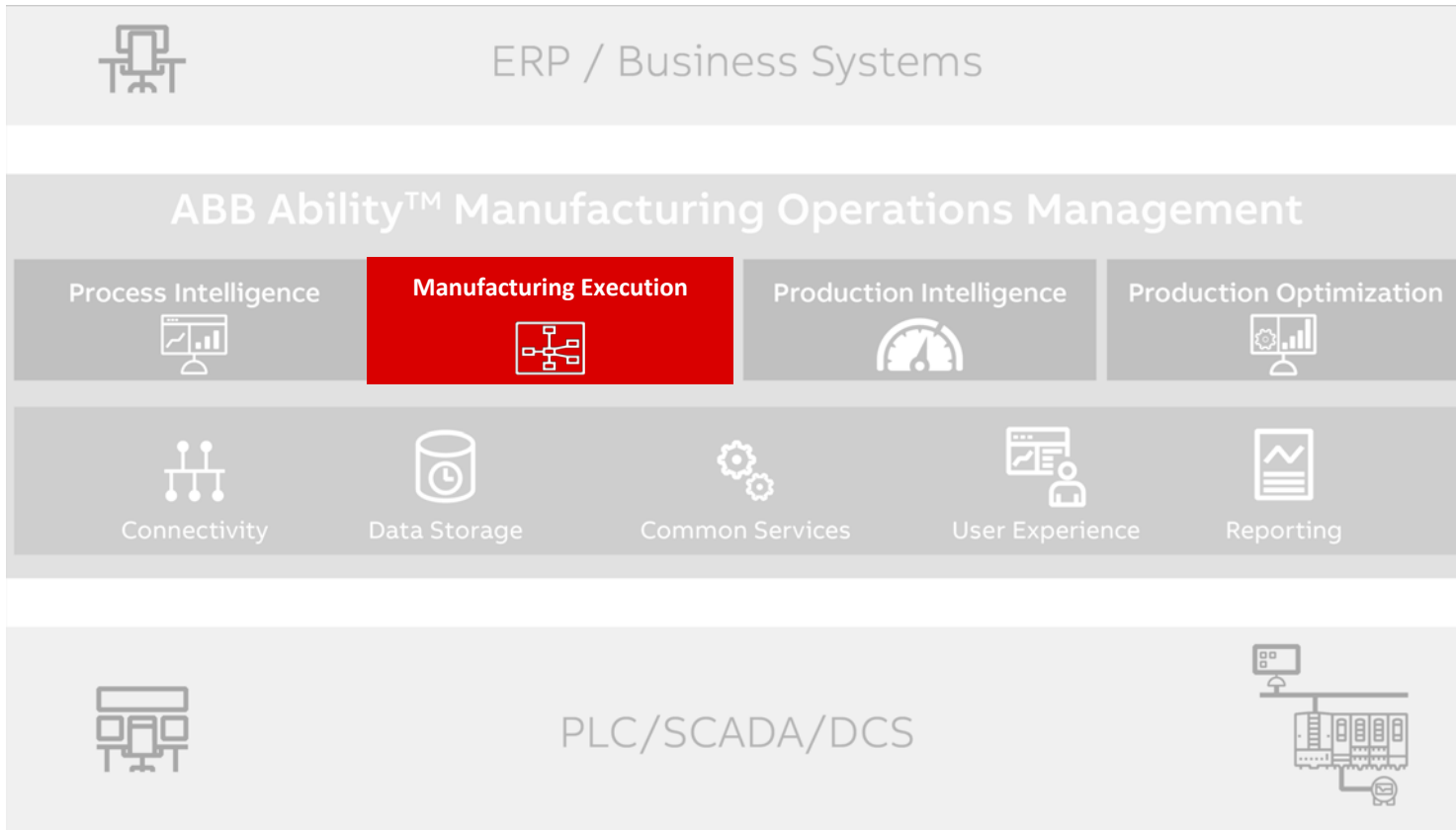


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Manufacturing Execution System

Manufacturing Operations Management

Manufacturing Execution - MES



ABB's MES solution

Enabling consistent and efficient manufacturing

Holistic in design, modular in implementation.

Accommodates existing landscape with highest degree of system integration.

Enables visibility across the value chain.

Proactive enforcement of process and quality procedures.

Seamless manufacturing and business processes integration.



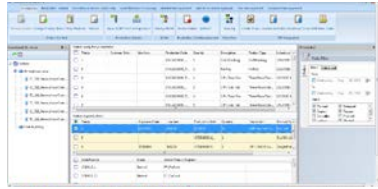
Supporting Lean principles

- ✓ Eliminate waste
- ✓ Paperless production
- ✓ Empower workers
- ✓ Ergonomic work places
- ✓ Do it right first time
- ✓ Design for rapid changeover
- ✓ Minimize inventory
- ✓ Culture of continuous improvements
- ✓ Pull production from customer requirements

Supporting Operators

The right information and the right time and place

Orders, Configuration, BOM



Order relevant data visible in the right context

Checklists, Quality Control



Checklists, In process quality controls, sampling tolerance management and non conformance

Material Management



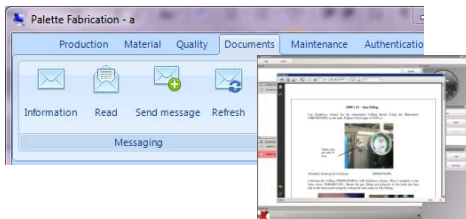
Ensures correct material and quantity is used along the complete process

Notification



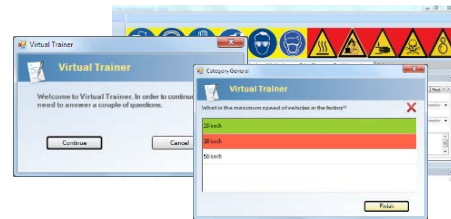
Notification initiated on any event (message)

Electronic Work Instructions



Instructions, drawings etc

Training, Health & Safety



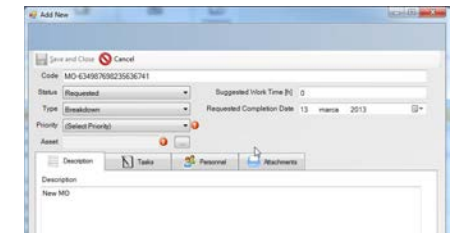
Maintain knowledge about the process, product and safety on the shop-floor

Production Performance



Visibility of production status & performance

Maintenance tasks



Production order management

Effective, flexible and reliable order execution

Production order downloading and creation

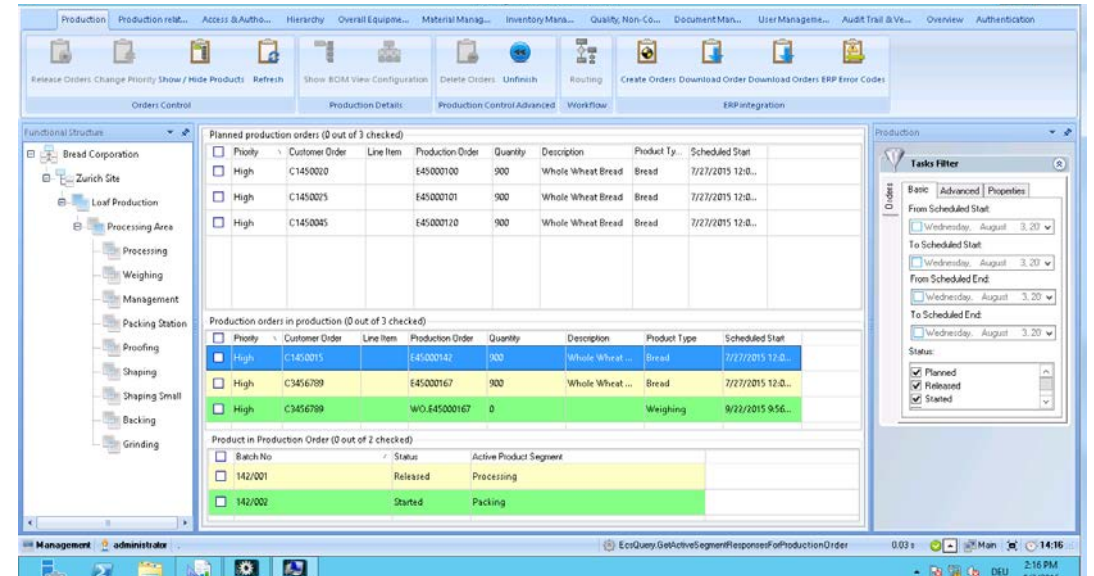
- Bi-directional integration of ERP to plant floor
- Manual or automatic download of order from ERP and dispatch to production
- Creating order based on templates

Order overview, checking and releasing

- Filtering for plant area, line and order status (planned, released etc)
- Different levels of approval and checks before order is released to production
- Priority / Configuration change

Serialization options

- Serial numbers are downloaded from the ERP system.
- Serial numbers are generated in ECS according to deployment-specific rules



Production Management – PO/Product Status, WIP

Transparency, Visibility

- A single report displays information about the batch, production order, and work in progress all in one place.
- The progress is indicated by the color schema applied on the production steps belonging to a selected product workflow.
- For each production step Releasing, Starting production and Finishing production is presented with all relevant details

The screenshot displays the ABB Production Management software interface. The main window is titled "Management - Nicole Steadman" and features a navigation bar with tabs for Production, Production related, Material Management, Quality Management, Maintenance Management, Document Management, Audit Trail and Versioning, and User Management. Below the navigation bar are icons for Product Routing, Configuration Management, Production orders, Process Parameter Variants, Process Parameter categories, Bulk edit, Genealogy, Brief Info, OEE View, and Chronogram View.

The interface is divided into several sections:

- Search options:** Includes a dropdown for "Product SN" and a search button.
- Products list:** A list of product serial numbers (SNs) from 1001-001 to 1002-010, with 1002-002 selected.
- Product's production details:** A central panel showing details for product 1002-002, including serial number, product type (VFL), start and end production times, active segment (BatchReleaseSegment), and PO info (Material No. R-002-160, Number 1002, LineItem, Customer order 1, Priority 1, Quantity 10000.000, Released time 4/29/2014 2:16:19 AM, Start pr. time 4/29/2014 4:58:43 PM, End pr. time).
- Production steps:** A grid of 14 production steps, each with a color-coded status:
 - 1 - BatchDispatchSegment: Released (Yellow)
 - 2 - BatchDispatchSegment: Started (Green)
 - 3 - BatchDispatchSegment: Finished (Blue)
 - 4 - CompoundingSegment: Released (Yellow)
 - 5 - CompoundingSegment: Started (Green)
 - 6 - CompoundingSegment: Finished (Blue)
 - 7 - VialsFillingLineSegment: Released (Yellow)
 - 8 - VialsFillingLineSegment: Started (Green)
 - 9 - VialsFillingLineSegment: Finished (Red)
 - 10 - VisualInspectionSegment: Released (Yellow)
 - 11 - VisualInspectionSegment: Started (Green)
 - 12 - VisualInspectionSegment: Finished (Blue)
 - 13 - BatchReleaseSegment: Released (Yellow)
 - 14 - BatchReleaseSegment: Started (Green)

Production Management – PO/Product Status, WIP

Transparency, Visibility

The screenshot displays the 'Management - administrator' software interface. The top menu bar includes options like Production, Production related, Access & Authorization, Hierarchy, Overall Equipment Effectiveness, Material Management, Inventory Management, Quality, Non-Conformity, Downtime..., Document Management, User Management, Audit Trail & Versioning, Overview, and Authentication. Below the menu is a toolbar with icons for Product Routing, Configuration Management, Production orders, Process Parameter Variants, Process Parameter categories, Bulk edit, Order Sequencing, Scheduling, Brief info, Genealogy, and Orders Templates.

The main interface is divided into several sections:

- Search options:** Product 3N, %
- Products list:** Number of products: 24. A list of product IDs is shown, with 142/002 selected.
- Product's production details:** Product properties for 142/002 (Bread). Fields include Serial number, Product type, Start prod. time, End prod. time, Product Status (Started), Active segment, Weighing (WO.E45000142.002), PO info, Material No. (102090), Number (E45000142), Line item, Customer order (C1450015), Priority (1), Quantity (900.000), Released time, Start pr. time, End pr. time, Description (Whole Wheat Bread), NumberOfBatches (2), and DistributionDone (True).
- Production Grid:** A 4x6 grid of 24 production steps, each with a status and operator information:
 - 1-Packing: Paused (Planned break)
 - 2-Processing: Released
 - 3-Processing: Started
 - 4-Processing: Paused (Missing Material)
 - 5-Processing: Started
 - 6-Processing: Paused (Planned maintenance)
 - 7-Processing: Started
 - 8-Processing: Finished
 - 9-Proofing: Started
 - 10-Proofing: Finished
 - 11-Backing: Released
 - 12-Backing: Started
 - 13-Backing: Finished
 - 14-Shaping: Released
 - 15-Shaping: Started
 - 16-Shaping: Finished
 - 17-Packing: Released
 - 18-Packing: Started
 - 19-Packing: Paused (Missing Material)
 - 20-Proofing: Released
 - 21-Packing: Started
 - 22-Packing: Paused (Shift c)
 - 23-Packing: Started
 - 24-Packing: Paused (Machi)

Production order management

Order configuration & BOM

Bill of Material (BOM)

- accessible from any workstation on a button click
- flat bill and multi-level bill of material structure

Position	Item	Description	Actual Quantity	NetQuantity	UnitOfMeasure	Warehouse	Text
Production Order:							
0	03	Yeast	2.600000	2.600000			
0	04	Improver	2.000000	2.000000			
0	06	Enzymes	1.500000	1.500000			

Order configuration

- Extend ERP based characteristics (assigned to material code or other common field coming from ERP)
- Assignment to production step
- Support for option sets (groups of characteristics assigned to subcomponents)
- Edit restrictions set on characteristic level

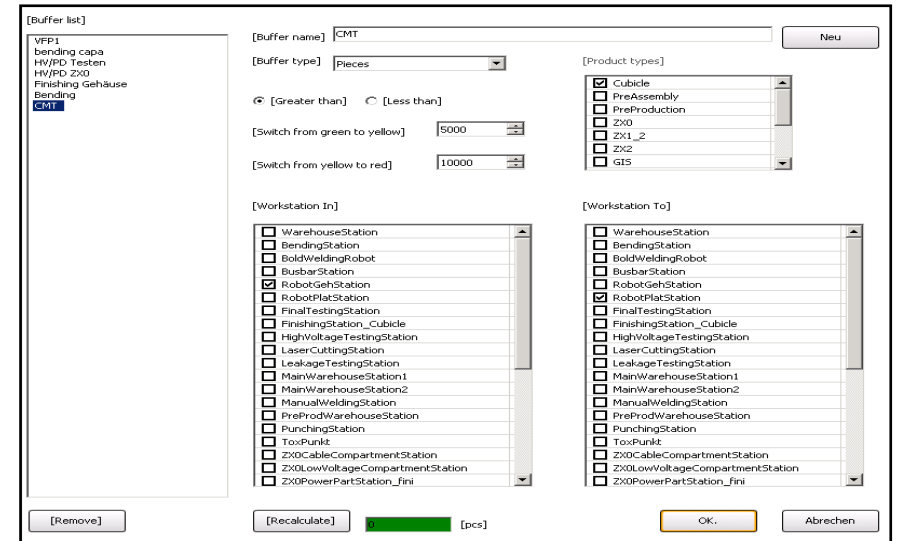
Item Name	Item Value	Description
Contains: Contains: Contains:		
KS	3	Kneader Speed
KT	15	Kneader Time
BTEMP	175	Backing Temperature
BT	55	Backing Time

Production order management

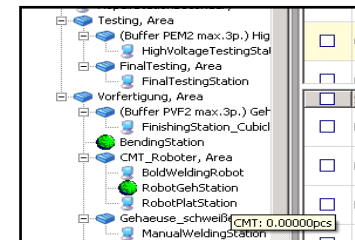
Discover and control bottlenecks

- Buffer management give instant information to the operator and supervisor
- Buffer type – defines, what volume of the buffer should be expressed in
 - Machine time
 - Labor time

Configuration view



Management/Operator view



Quality Management

Enforcement of quality & compliance measures

- In process enforcement of quality and compliance measures
- Collection of measurements and checks required on each production step:
 - required, optional
 - on start, on finish
- Definition of Measurement Groups
- Definition of individual measurements:
 - is required
 - multiple values
 - remarks possible
- Support for sampling and testing requirements
- Tolerance management

Operator view

Parameters

Serial number: 1026845_1

1026845_1

Other measurements

Weight

TextBoxWithRemarks

MultivalueColors

Documentation

Priority

Confirmed

Production date

Monday, December 17, 2011

Colors

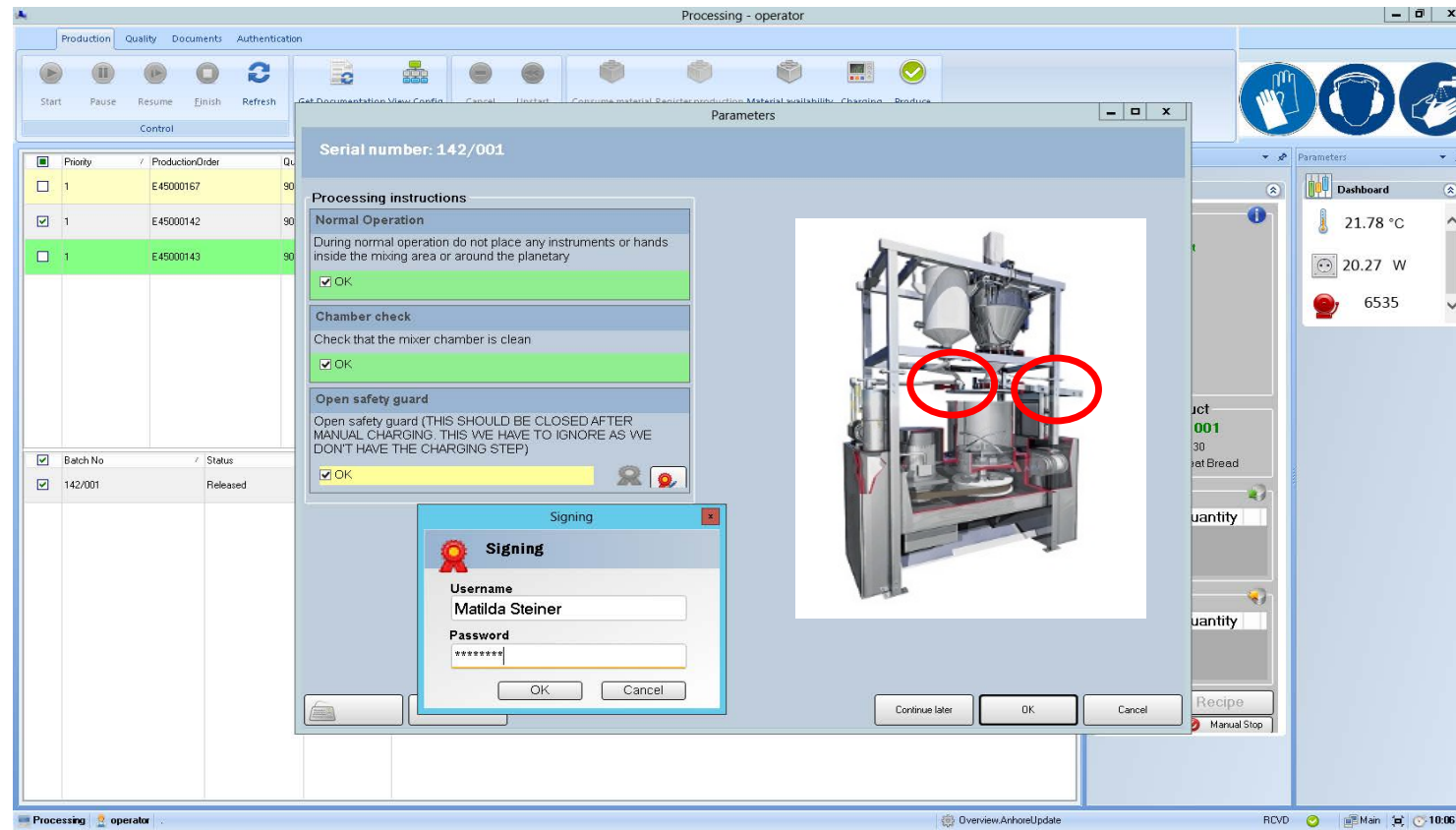
Ready... Close

Clear all fields

Continue later OK Cancel

Quality Management

Checklist and collection of quality parameters



Quality Management

Checklist and collection of quality parameters

The screenshot displays the 'Processing - operator' software interface. A central 'Parameters' dialog box is open for 'Serial number: 142/001'. The dialog contains the following sections:

- Processing instructions:** 'Unload' with the instruction 'Take unit dough piece and load into sample box. Slide onto Texture analyzer.' and an 'OK' button.
- Processing checks:**
 - Dough firmness [8 - 12]:** A green progress bar showing a value of 9.
 - Dough stickyness [4 - 6]:** A green progress bar showing a value of 6.
 - Work of compression [25 - 30]:** A red progress bar showing a value of 24. A warning message states: 'The value [24] is out of defined range min [25] - max [30]'.

The background interface shows a table with columns for Priority, ProductionOrder, and Quantity. The table contains three rows, with the third row (Priority 1, ProductionOrder E45000142, Quantity 90) highlighted in green. A 'Batch No' table below shows '142/001' with a 'Started' status. On the right, a 'Dashboard' panel displays temperature (21.90 °C), power (21.19 W), and a red light indicator (6543). A 'Texture analyzer' image is shown in the center of the dialog box.

Quality Management

Non-conformity reporting

- Deviation from the product, process, procedure, or compliance specifications.
- Submitted
 - on demand by the operator
 - automatically if measurement out of tolerance
- Configurable NCR reasons
- Configurable NCR actions (abort, resume, decide)

Operator view

Non-conformity Report

Relates to: Product 145/001

Status: Raised

Attach message

Resume product Lock product Abort product

Reason:
pH too high
pH too low
Temperature too high
Temperature too low
Invalid package
Generic NCR

Reason description:
Measurement for product 145/001 was out of tolerance. Entered value: 14. Limits: min -8, max -12.

Attachments table:

File name	Created by	Creation date
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Buttons: Add, Remove, Save, Cancel

Management view

Management view

Search options:
Serial Number: Production Order, All
Customer's Name: Material Number
Customer Order: Reason

with string: Search Date from: Monday, February 20, 2012 To: Thursday, April 27, 2012

ID	Reason	Description	Person	Workstation	Location	Status	Changed by	Änderung
0240716213...	Kundenänderun...	Z10 240716213 Pos.80 Spannungswandler verdra...	Dietermann	Z10LowVoltage...	150	New		
30100011707...	Meldabweichung	1316666 20066 verkalt lösen	Bilbay	FinishingStation...	203	New		
02407915870...	Kundenänderun...	340791114 Z10 Pos.30 22.3.11	Leisch	Z10LowVoltage...	50	Final Verified		
02407915870...	Kundenänderun...	340791368 Z10 Pos.120,140,190,200 22.3.11	Leisch	Z10LowVoltage...	250	New		
02407915870...	Kundenänderun...	3407912719	Leisch	Z10LowVoltage...	100	New		
02407915870...	Kundenänderun...	Datenkabel verlegt und angeschlossen	Dorka, Joachim	Z10LowVoltage...	360	New	Dorka, Joachim	2/26/2013
02407915870...	Kundenänderun...	3407917929						
02407915870...	Kundenänderun...	-Zahl 302 bis 307 und 312 bis 318 jeweils Zuleitung...	Pfising, Michael	Z10LowVoltage...	410	New	Pfising, Michael	3/13/2011
02407915870...	Kundenänderun...	-Zahl 310 Spannungswandler verdrahtet						
02407915870...	Kundenänderun...	340791244 Pos.50 Z10 16.3.11	Leisch	Z10LowVoltage...	320	New		
02407915870...	Kundenänderun...	Spannwandler verdrahtet						
02407915870...	Kundenänderun...	340791567 Z10 Pos.40 16.3.11	Leisch	Z10LowVoltage...	100	New		

Quality Management

Non-conformity configuration

The screenshot displays the 'Management - administrator' interface for non-conformity configuration. The main window is titled 'Management - administrator' and has a menu bar with options like Production, Access & Authorization, and Quality. The interface is divided into several sections:

- Reasons assignment:** A section with a 'Segments' dropdown set to 'Processing'. It contains two lists: 'Available reasons' (Negative Consumption, Overconsumption) and 'Assigned reasons' (Generic NCR, Invalid package, pH too high, pH too low, Temperature too high, Temperature too low). Navigation arrows (>> and <<) are between the lists.
- Reasons:** A section with 'Add', 'Edit', and 'Remove' buttons. It shows a list of reasons with their types: Ncr (Temperature too low, Temperature too high, pH too low, pH too high, Overconsumption, Invalid package, Generic NCR, Negative Consumption) and Sot.
- Statuses Definition:** A section with 'Add', 'Edit', 'Remove', and 'Refresh' buttons. Below it is a table with the instruction 'Drag a column here to group by this column.' The table has columns for 'Status', 'Responsible', and 'Sequence'. One row is visible: 'Raised' status, 'Responsible' column, and 'Sequence' value '1'.

An 'Add new reason' dialog box is open, titled 'ECS'. It contains the following fields and options:

- Code [Uniqueid]: Text input field.
- Name: Text input field with a green checkmark icon.
- Description: Text area.
- Language: 'English' dropdown.
- Effect: 'Choice' dropdown.
- External ID: Text input field.
- Type: 'Ncr' dropdown.
- Force information sending: checkbox.
- Buttons: 'Save' and 'Cancel'.

The bottom status bar shows 'Management administrator', 'NcrReason.GetByProductSegmentId', '0.22 s', and '10:23'.

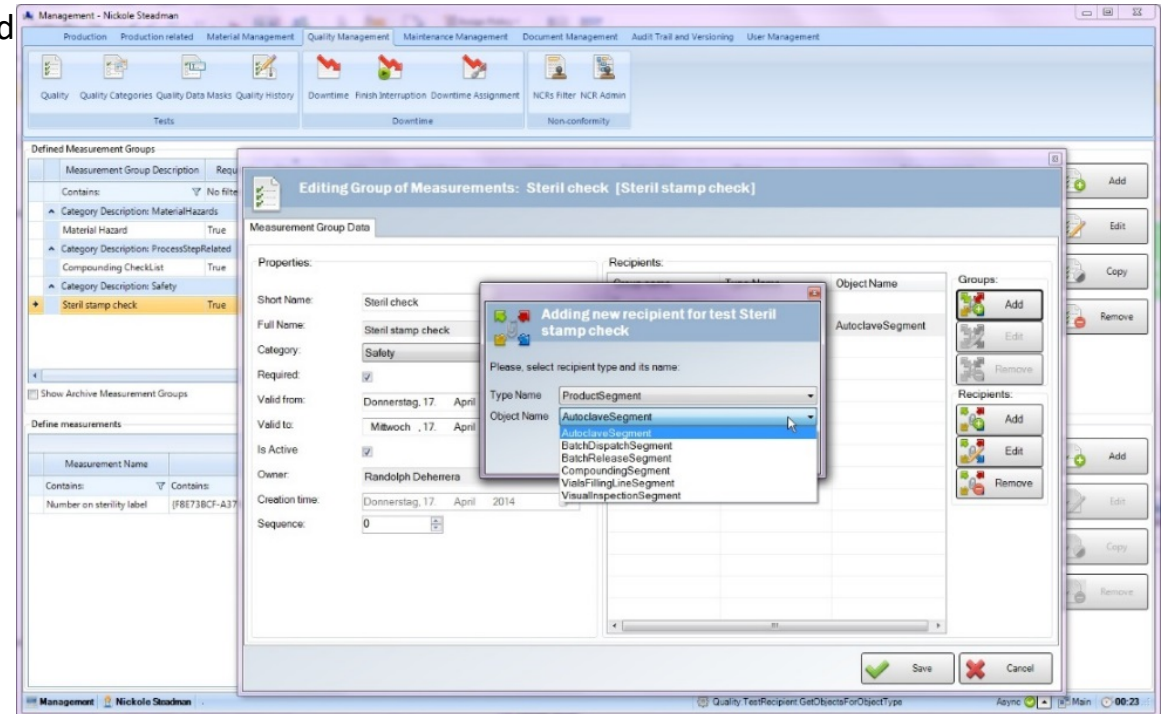
Quality Management

Configuration - Recipient concept

– A set of recipients must be defined to specify the conditions that must be fulfilled for measurement/check collection.

- Equipment Instances,
- Equipment Definitions,
- Persons,
- Person Types,
- Roles,
- Production Orders,
- Product Types,
- Product Segments,
- Products,
- Material Types,
- Characteristic

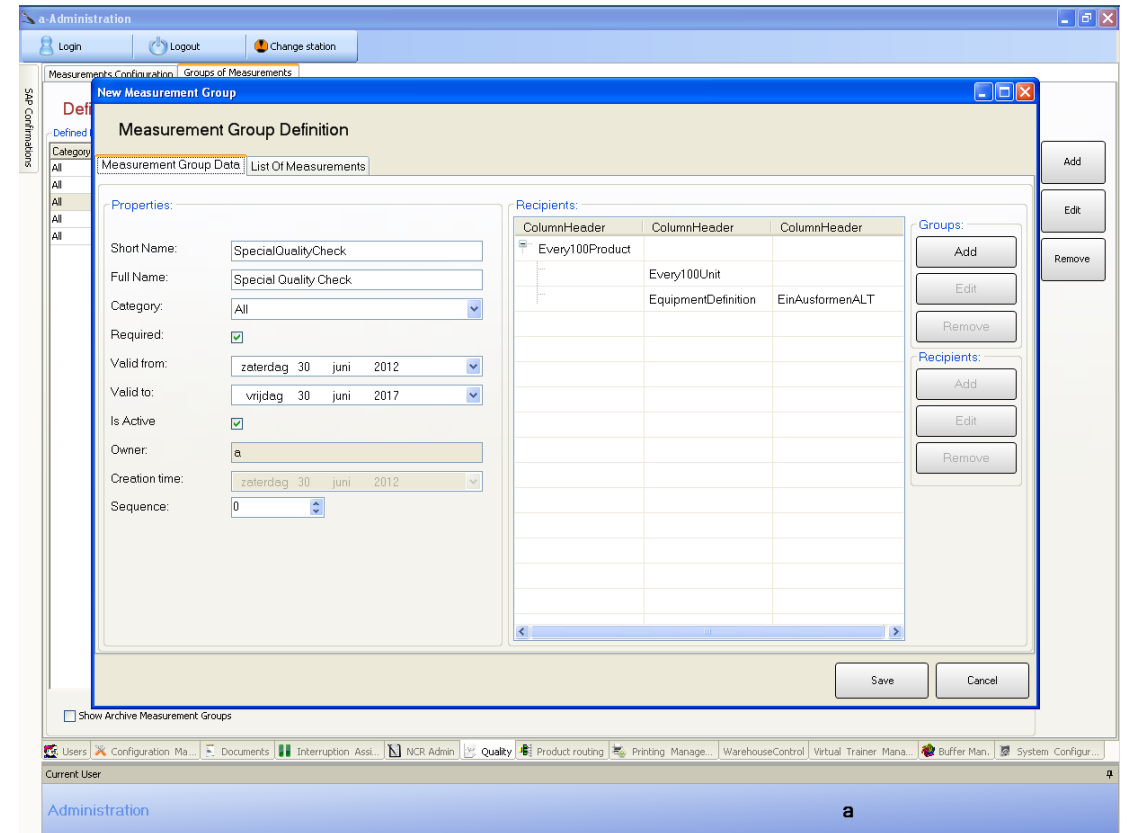
- Recipients can also be grouped together in recipient groups
- Between two different groups, there is an OR condition.
- Between recipients in one group, there is an AND condition.



Quality Management

Configuration - Quality plan and sampling

- Attaching the rule to a particular quality measurements (when to be taken, on which event etc.).
- Special quality check e.g. after each 100 products are produced.
- Quality checks configuration for:
 - production step
 - user permissions
 - Test type – e.g.
 - 1st 5, 5in1, 5in2
- Sampling Cycles



Quality Management

Quality History

- Quality overview for specified period of time
- Filtering per production order and times interval
- Grouping per production order, user, production step, etc.
- Possibility to set final quality confirmation mark

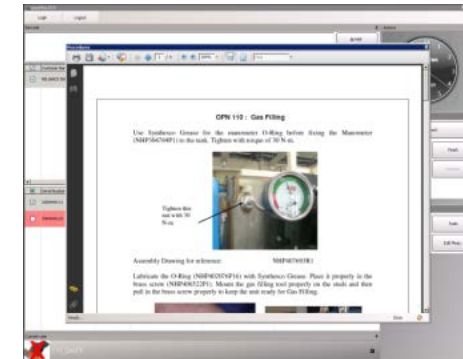
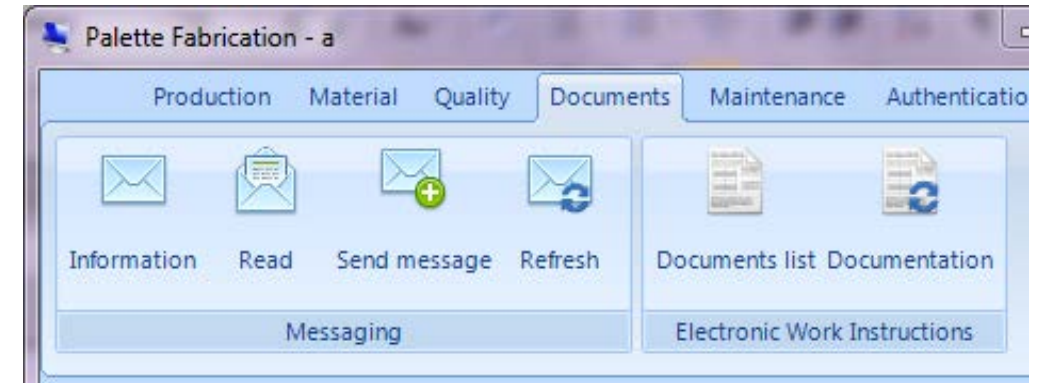
Management view

The screenshot displays the 'x-Management' software interface. At the top, there is a navigation bar with various modules: Production, Production related, Downtime and Non-conformity, Audit Trail and Versioning, Material Management, User Management, and Document Management. Below this, there are several toolbars with icons for actions like 'Create Orders', 'Download Order', 'Download Orders', 'Product Finding', 'Genealogy', 'BriefInfo', 'Brief Summary', 'Product History', 'Quality', 'Quality History', 'Buffer Management', and 'OEE View'. The main area shows a table with columns for 'Production order', 'Serial number', and 'Product segment'. The 'Production order' column shows '1020845', the 'Serial number' column shows '1020845.1', and the 'Product segment' column shows 'APT1'. Below the table, there is a detailed view of the 'Documentation' section, which includes a tree view with 'Confirmed' and 'Priority' items. The 'Confirmed' item is expanded, showing a table with columns for 'Name', 'Value', 'Remarks', 'Current', 'User', 'Date of measure', 'Production order', 'Serial number', and 'Product segment'. The table contains one row with the following data: 'Confirmed', 'True', 'True', 'a', '12/17/2012 4:0...', '1020845', '1020845.1', and 'APT1'. The interface also includes a search bar, a refresh button, and an archive button. The status bar at the bottom shows the user 'Quality Tester GetByProductionProductSegments/WinQuery' and the time '16:40'.

Electronic Work Instructions / SOPs

Brings consistency in manual operations

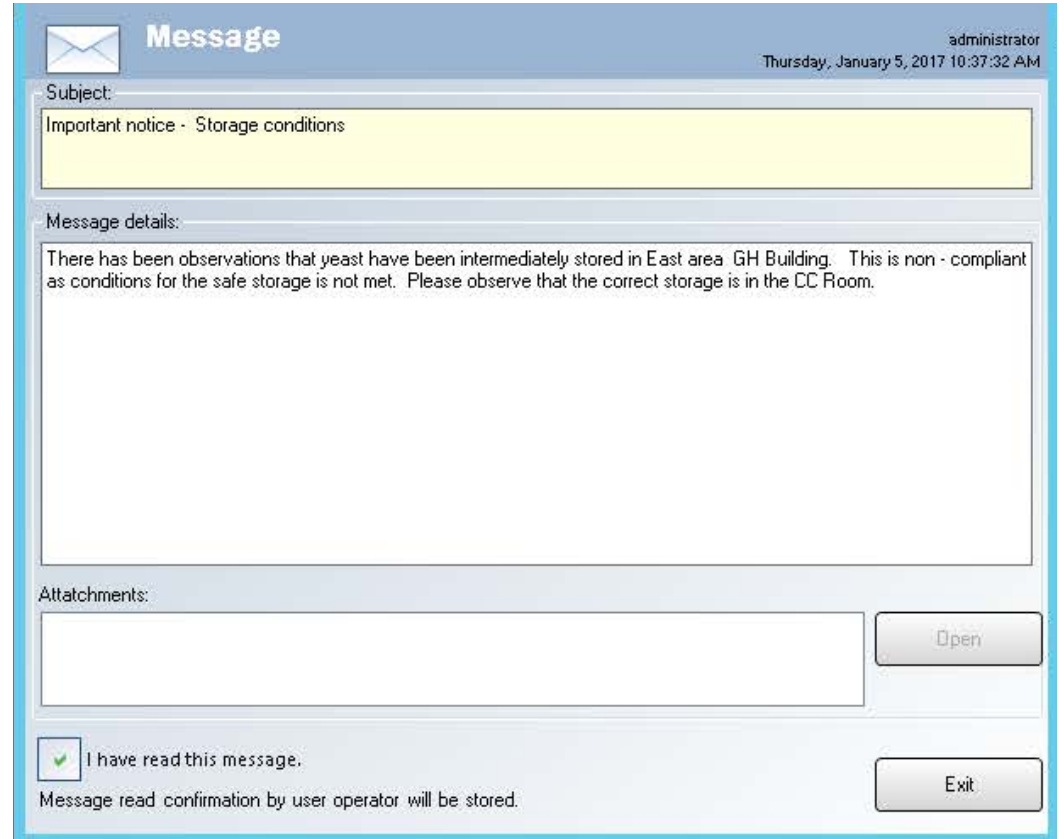
- Guides the operator through each step with the required production and safety instructions and checks
- Different categories of documents (safety, procedures, equipment etc.)
- Displayed based on defined recipient
- Accessed from multiple sources:
 - shared folders
 - ERP (e.g. SAP DVS)
 - PLM systems
 - PDM system
 - Engineering Tools
 - SharePoint / web etc.



Electronic Work Instructions / SOPs

Mandatory reading

- On production start, the operator is prompted and asked to read mandatory documents. The production start can be defined on order or equipment level.
- The operator must confirm that he read the document(s).
- «Cancel» on this action is not allowed.



Message administrator
Thursday, January 5, 2017 10:37:32 AM

Subject:
Important notice - Storage conditions

Message details:
There has been observations that yeast have been intermediately stored in East area GH Building. This is non-compliant as conditions for the safe storage is not met. Please observe that the correct storage is in the CC Room.

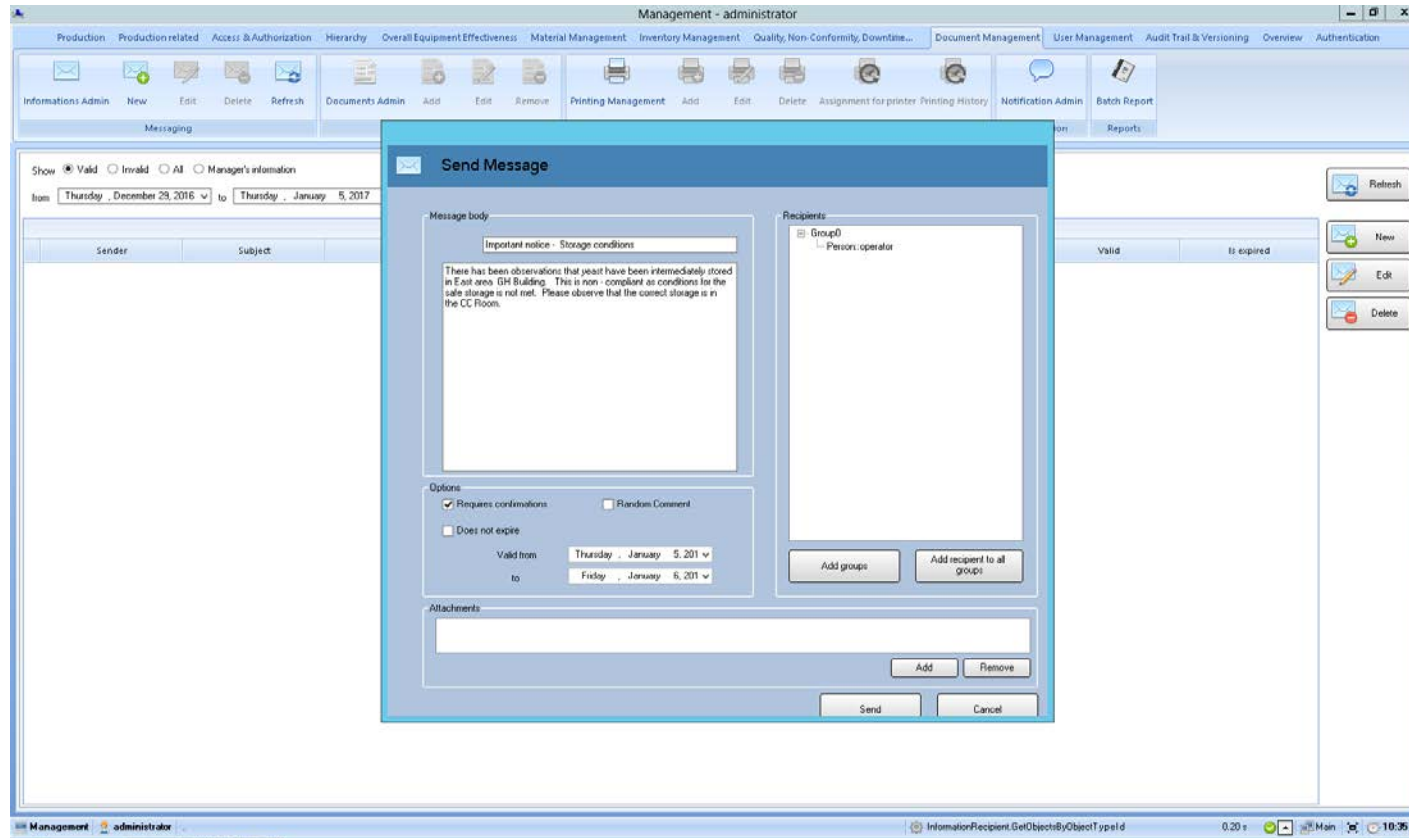
Attachments:

I have read this message.

Message read confirmation by user operator will be stored.

Electronic Work Instructions / SOPs

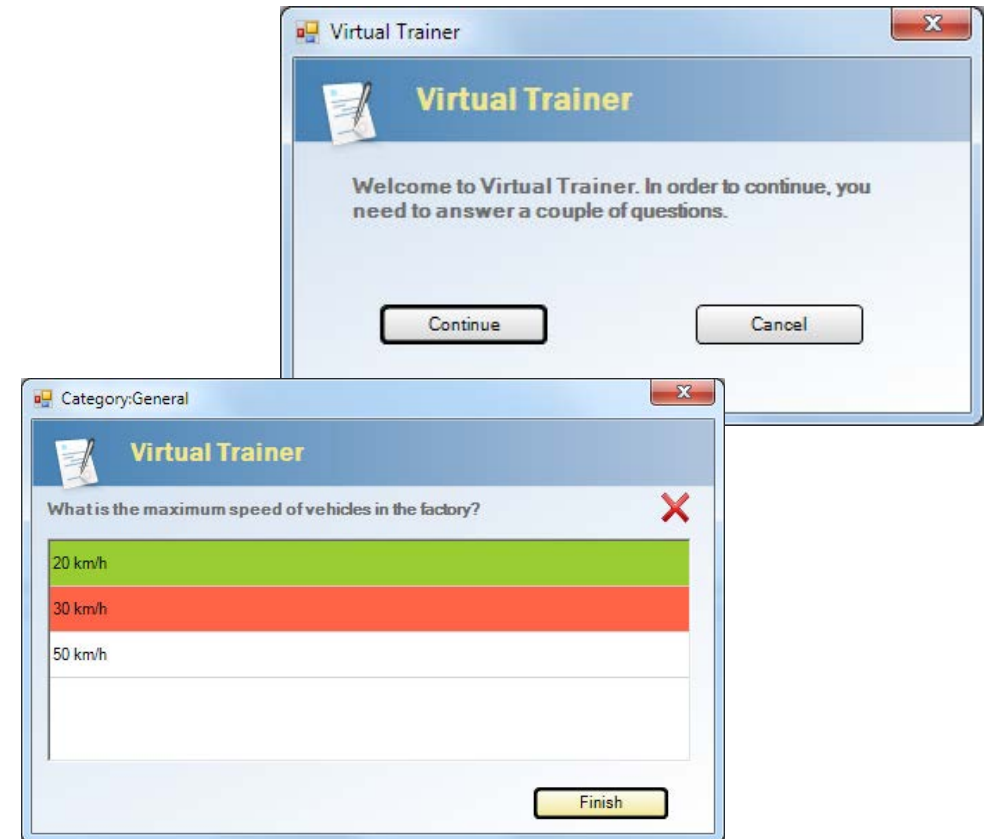
Mandatory reading



The Virtual Trainer

Continuously learning – work safe and correct

- Virtual Trainer helps maintain knowledge about the process, product and safety on the shop-floor:
- Possibility to define questions related to the task or work environment of the operator. Example:
- Part of a safety procedure
- Test for the operator that checks his knowledge of the working process.
- Questions can be adjusted to appear only for a certain person type or equipment instance
- Optionally be blocking – preventing work to continue in case of wrong answers

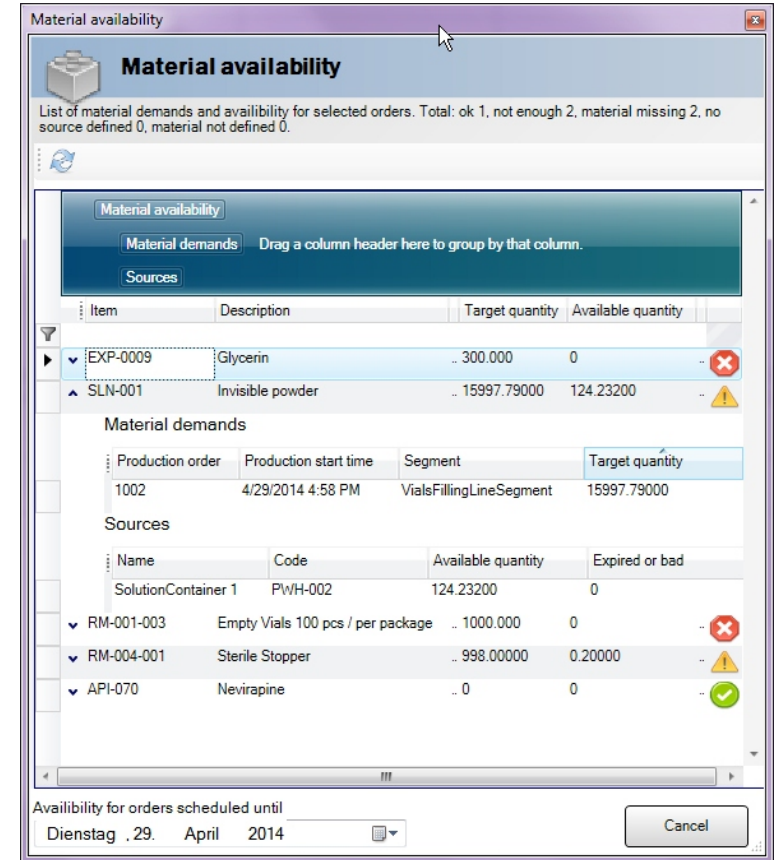


Material Management

Material availability and consumption

Key functional components

- identification of material
- checking material availability
- tracking of consumed material
- tracking of produced material,
- prioritization and control of source and destinations for material
- material compatibility
- weighing & dispensing
- picking and packing.
- product genealogy reporting.



The screenshot displays the 'Material availability' window. At the top, it shows a summary: 'List of material demands and availability for selected orders. Total: ok 1, not enough 2, material missing 2, no source defined 0, material not defined 0.' Below this, there are tabs for 'Material availability', 'Material demands', and 'Sources'. The main area contains a table with columns for Item, Description, Target quantity, and Available quantity. The table lists several items, including Glycerin, Invisible powder, Empty Vials, Sterile Stopper, and Nevirapine. A 'Material demands' section shows a production order for 15997.79000 units of Invisible powder. A 'Sources' section shows the available quantity for each source, such as SolutionContainer 1 (124.23200) and RM-001-003 (1000.000). The interface also includes a date selector for 'Availability for orders scheduled until' set to 'Dienstag, 29. April 2014' and a 'Cancel' button.

Item	Description	Target quantity	Available quantity
EXP-0009	Glycerin	.. 300.000	0
SLN-001	Invisible powder	.. 15997.79000	124.23200

Production order	Production start time	Segment	Target quantity
1002	4/29/2014 4:58 PM	VialsFillingLineSegment	15997.79000

Name	Code	Available quantity	Expired or bad
SolutionContainer 1	PV/H-002	124.23200	0
RM-001-003	Empty Vials 100 pcs / per package	.. 1000.000	0
RM-004-001	Sterile Stopper	.. 998.00000	0.20000
API-070	Nevirapine	.. 0	0

Material Management

Material master data and material substitution

Material Master

- detailed overview of material
- definitions as well as complete management for units of measure
- Example: Properties (acidity, hazardous, storage requirements etc.)

Material Substitution

- indicating need for material substitution and providing substitution proposal
- Original material, Alternative material , Substitution factor
- Original material can be replaced either partially or totally with one of alternative materials with updated quantities
- Substitution of material can be done automatically or manually (on demand)

Material Code	Description	Unit of Measure	Weight
RAA0111	REP62W-37-1-7-1 EPSA	FP	m mass
UBE0083	TR20W011231103 REFRIEL	FP	m mass
UBF0056	TR02W015030603 ARVILL	FP	m mass

Weigh and dispense

Improved productivity & accuracy of weighing

- Ensures correct material and quantity is dispensed by verification checks on materials, containers and scales through barcode identification
- Normal and group optimized weighing support
- Scale integration, bar code scanning and generation of bar codes labels for destination containers, bags or boxes

Weighing

Material: 2708113
Zu fein Silo (Z)

Source container: ZS2

Select material source

Tolerances: Tolerance 1%, Max. tolerance 2%

Target amount: 4718.00000

Scale: Current amount 4670

Buttons: Tare, Zero, Reset, Manual entry

Container	Weighed	Remaining	Starting amo...
ZS2	1670	118238.398...	119908.398...
ZS1	3000	982768	985768
NR Test Package 1	0	2000	2000

Weighing

Material: 2708113
Zu fein Silo (Z)

Source container: ZS2

Select material source

Tolerances: Tolerance 1%, Max. tolerance 2%

Target amount: 4718.00000

Scale: Current amount 4700

Buttons: Tare, Zero, Reset, Manual entry

Container	Weighed	Remaining	Starting amo...
ZS2	1700	118208.398...	119908.398...
ZS1	3000	982768	985768
NR Test Package 1	0	2000	2000

Material Track & Trace

Genealogy

- Providing comprehensive track and traced capabilities from raw material, intermediates to finished goods
- Product genealogy allows searching and analysis of production data
- Downstream and upstream
 - by equipment instance
 - person name
 - production period
 - produced and consumed lot

The screenshot displays the SAP Material Genealogy interface. The top section shows a search filter for 'Product Genealogy' with a search time of 'consumed'. Below this is a hierarchical tree of production lots, starting from 'Lot 1575790-20110822' and branching into various intermediate and final lots. The bottom section shows a detailed view of a specific lot, 'Consumed Lot 1575790-20110822', with a search filter for 'Person Name' and 'Equipment Name'. The detailed view includes a flow diagram showing the lot's history and a table of production data.

Subst	Defintion	Location	Quantity	Booking Time
1575790	1575790	Sto7	90.00000	
1575790	1575790	Sto7	90.00000	
1575790	1575790	Sto8	90.00000	
1575790	1575790	Sto7	90.00000	
1575790	1575790	Sto8	90.00000	
1575790	1575790	Sto7	90.00000	
1575790	1575790	Sto8	90.00000	
1575790	1575790	Sto7	90.00000	
1575790	1575790	Sto8	90.00000	
1575790	1575790	Sto8	100.00000	
1575790	1575790	Sto8	100.00000	
1575790	1575790	Sto8	100.00000	8.06.2014 14:48:00

Paperless Production

Bar code scanners integration

Barcode scanners integration

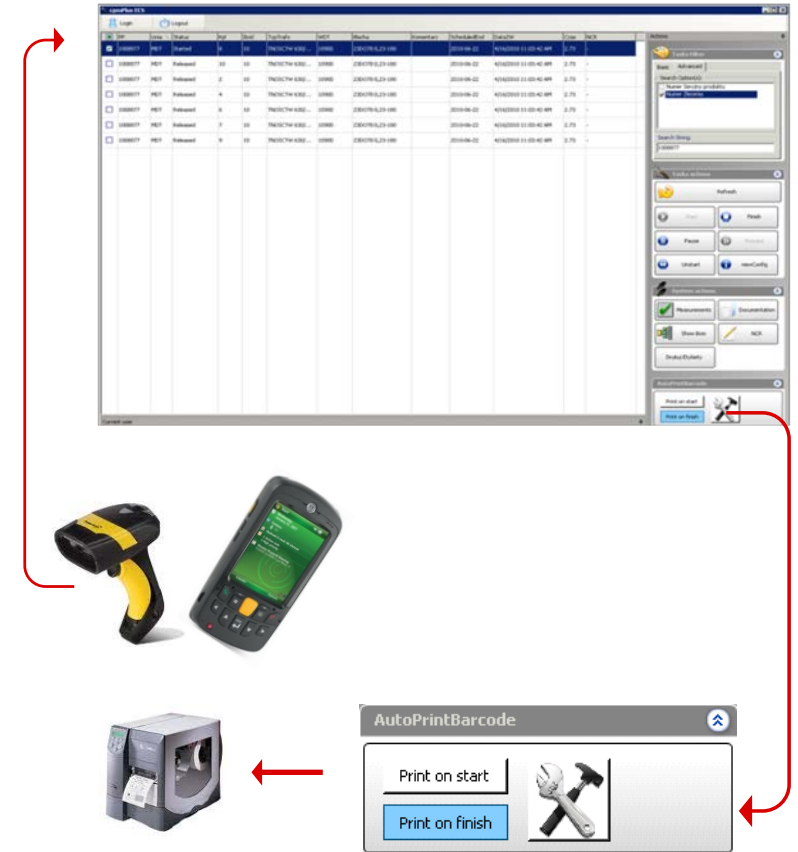
- Simple
- Smart
- PocketPC

Barcode commands support

- start / finish by scanning
- identify equipment / workplace
- selecting products on the task list
- handling standard task execution

Barcode printers integration

- event-driven printing
- configurable label print trigger (on product start/ stop)
- 1D and 2D barcodes support



Material Management

Goods received

- Efficient way for receiving purchased materials
 - Printing labels
 - Entering user defined information (palett nr. locations, expiry dates etc)
 - Quality checks
- Registering and booking to internal warehouse.
- Overview on purchase orders and received goods.

The screenshot displays the ECA Support Management software interface, specifically the Material Management section. The top navigation bar includes tabs for Production, Production related, Downtime and Non-conformity, Audit Trail and versioning, Material Management, User Management, and Document Management. The Material Management section contains sub-tabs for Material Master, Units and Measures, Material Substitution, Warehouse Management, and Goods. The main window shows the 'Enter Goods Received' and 'Goods Received Overview' tabs. A 'Filter by' section allows filtering by 'None', 'Purchase Order External Id', or 'Material Code', with a 'Load' button. Below this is a table of 'Purchase Order Lines' with columns for External Id, Remarks, Order Status, Site, Order Date, Due Date, Tolerance, and Supplier External Id. The table lists several open orders from suppliers like IN4028 and ND48R. Below the table are three panels: 'Suppliers' (listing companies like GEORG MFG SYSTEMS, INC and GLOBAL ENGLISH CORP), 'Material Items' (listing items like MCB-13 and ME ADICIONALES_2), and 'Supplier Materials' (listing materials like Ctl and ProtPanelsCabinEmpty). A 'Material For Supplier' dialog box is open, showing details for 'GLOBAL ENGLISH' and 'ME ADICIONALES_2', including price and currency (EUR).

Material inventory management

Full transparency of material movement and WIP

- Modeling material storage structure and support material move processes within warehouses and its elements
- Assignment of WH elements to the specific process segments.
- Modeling warehouse element examples
 - Cells
 - Packages
 - Containers / Tray
 - Silo
 - Material layers
- Manage concrete material instances.
- Attaching cell to a production segment makes logical connection of a type source, destination or buffer.
- Material compatibility and cleaning rules
- Various cleaning levels are defined based on material before and after in a target equipment (wet , dry, sterilization , disinfection).

The screenshot displays the 'Ecs Support-Management' application window. The main menu includes 'Production', 'Production related', 'Downtime and Non...', 'Audit Trail and Versi...', 'Material Management', 'User Management', and 'Document Manage...'. The 'Material Management' menu is expanded, showing options like 'Material Master', 'New material item', 'Edit material item', 'Units and Measures', 'Material Substitution', 'Warehouse', 'Goods Receive', and 'Goods Issue'. Below this, there are icons for 'Material Master Data', 'Unit of Measurements', 'Material Substitution', 'Warehouse', 'Goods Receive', and 'Goods Issue'. The main content area is titled 'List of warehouses' and has tabs for 'Warehouses', 'Cells', 'Silos', 'Packages', and 'Containers'. A table lists warehouse data with columns for 'Last updated timest...', 'Code', 'Name', 'Type', and 'Description'. A context menu is open over the first row, showing options: 'Detailed view', 'Copy', 'Add', 'Edit', and 'Delete'. The status bar at the bottom shows 'Management', 'Ecs Support', 'Module: Warehouse.GetDataObjectForClient', '0.002 s', and '17:24'.

Last updated timest...	Code	Name	Type	Description
3/12/2012 8:35 AM	119	2405-PTP -META		2405-PTP -METALM...
3/14/2012 12:05 PM	110	2405-PTPT (TPT)		405-PTPT (TPT) M.P...
3/14/2012 12:07 PM	111	2450-PTPT (DDT)		450-PTPT (DDT) M....
3/14/2012 12:08 PM	112	2450-PTDT (DDT)		450-PTDT (DDT) M....
3/14/2012 12:08 PM	113	2405-PTPT (TPT)		405-PTPT (TPT)-M....
3/14/2012 12:26 PM	311	Producto Termin		producto Terminado...
3/19/2012 6:31 AM	PackingDestination	Packing destination	Normal	
3/23/2012 8:26 AM	999	Indirect material	Indirect material	Indirect material Tra...
3/26/2012 8:04 AM	512	Proyectos SPT	Normal	Proyectos SPT
3/26/2012 8:10 AM	511	Proyectos DTR	virtual	Proyectos DTR

Silo and container management

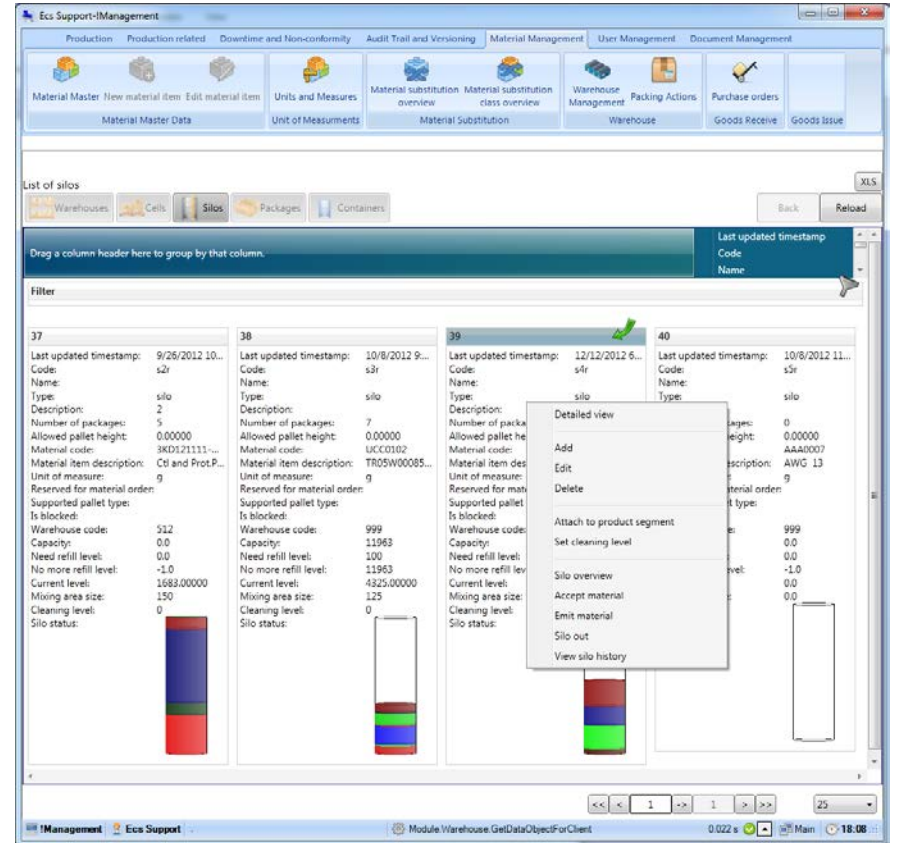
Material and inventory management

Silo management

- Information regarding process order , lot, amount, fill date/time, need for refill, expiration date handling is available at all time.
- Management of mixing layers, material compatibility and cleaning support.

Container (tray) management

- Containers used for raw material, intermediates or finished material are managed
- Information regarding production order, lot, amount, fill date/time, cleaning is available at all time
- Material compatibility is instantly checked
- Cleaning levels are defined based on material before and after in a target equipment (wet , dry, sterilization, disinfection)



Equipment Maintenance Management

Plan and execute maintenance activities

- Plan and create maintenance requests
 - Maintenance requests can be issued by operator from an observation or based on a preventive maintenance plan
- Execute maintenance tasks
 - Operators is presented with relevant maintenance requests including reason, priority
 - maintenance documentation and instructions
 - spare parts numbers and quantity,
 - machine service checklist
- Track
 - system keeps track of time when the request was created, started and completed
 - overview of active report with list of active maintenance requests

Management view

The screenshot shows a software window titled 'Add New' for creating a maintenance order. The form includes the following fields and options:

- Code:** MO-634987698235636741
- Status:** Requested (dropdown menu)
- Type:** Breakdown (dropdown menu)
- Priority:** (Select Priority) (dropdown menu)
- Asset:** (input field)
- Suggested Work Time [h]:** 0 (input field)
- Requested Completion Date:** 13 marca 2013 (calendar icon)

Below the form are four tabs: Description, Tasks, Personnel, and Attachments. The 'Description' tab is active, showing the text 'New MO'.

At the bottom, there is a 'Schedule Type' section with two radio buttons: 'Generate Maintenance Order By Time Schedule' (selected) and 'Generate Maintenance Order By Event'. Below this are 'How Often' options (Hourly, Daily, Weekly, Monthly) and 'Days of Week' checkboxes (Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday). The 'When and How Long' section includes 'Start On' (2013-02-21), 'Finish' (No End Date), 'Number of occurrences' (0), and 'End By' (2013-03-15).

Downtime & Interruption management

Manually by operator or automatically from equipment

- Configurable downtime reasons
- Pausing and aborting product
- Idle time tracking
- Indirect tasks tracking
- Automatic or manual logging of equipment and/or personnel downtime
- Information about the downtime of product, selected interruption reason, description, the user and workstation which reported the downtime, and the timestamp when the downtime started

The screenshot shows a 'Pause' dialog box with a blue header bar containing a red stop icon and the word 'Pause' in orange. Below the header, there is a 'Reason type' section with two radio buttons: 'Productive' (selected) and 'Non-productive'. To the right of these buttons is a checkbox labeled 'Abort product'. Below this is a section titled '#gbxPauseDetails' which contains a table with two columns: 'Reason' and 'Description'. The 'Reason' column has a dropdown menu currently set to 'Production'. Under 'Production', there is a list of reasons: 'Machine downtime', 'Machine jammed', 'Material Scrapped', 'Missing Material', 'Paint Defects Found', 'Poor Quality', and 'Transport'. The 'Description' column is empty. At the bottom of the dialog, there are three buttons: a printer icon, a 'Save' button, and a 'Cancel' button.

Downtime & Interruption management

Configuration



Navigation tabs: Downtime and Non-conformity | Bad quality | Calendars | User Management | Equipment Management | Connectivity | Authentication

Sub-navigation: OEEView | ChronogramView | Downtime | Downtime Assignment | NCRs Filter | NCR Admin | TheoreticalProductionRateView | TheoreticalProductionRateAnalysis

Overall Equipment Effectiveness | Downtime | Non-conformity | Theoretical Production Rate

Reasons assignment

Segments: Daytona

Available reasons	Assigned reasons
I03	I01
I07	I02
I09	I04
I10	I05
I12	I06
I16	I08
I18	I11
I19	I13
I20	I14
I21	I15
I22	IK
I25	IP
I31	NON PROD.
	I17
	I30

Interruption reasons

Buttons: Add | Edit | Remove | Refresh

- I01(Nicht klassifiziert) - Resume
- I02(Störung der Maschine technisch) - Resume
- I03(Störung Nebenaggregate / Infrastruktur) - Resume
- I04(Werkzeugproblem) - Resume
- I05(Rüsten) - Resume
- I06(Q-Probleme) - Resume
- I07(Werkzeugwechsel / Plattenwechsel) - Resume
- I08(kein Personal) - Resume
- I09(Instandhaltung durch Operator) - Resume
- I10(Maschinenreinigung) - Resume
- I11(Einfahren) - Resume
- I12(keine Aufträge) - Resume
- I13(Pause) - Resume
- I14(manueller Prozesseingriff) - Resume
- I15(Messen) - Resume
- IK(Kurzunterbruch) - Resume
- IP(Geplanter Unterbruch) - NonProductive
- I16(Nacharbeit) - Resume
- I17(Werkstück Handling) - Resume
- I18(Einfahren Jumbo) - Resume
- I19(Umrüsten) - Resume
- I20(Programmkorrektur) - Resume
- I21(Nachtschicht / Unterbruch) - Resume
- I22(Server-Patches) - Resume
- I25(PAS Reparatur) - Resume
- I30(Unterbruch Verursacher AVOR) - Resume
- I31(Rüsten (Index)) - Resume



Downtime Management

How to collect downtimes and downtime reasons?

Downtime data collection

- Manually by operator
- Automatic registration by equipment integration
- OPC
- DDE
- MTConnect
- PackML

Downtime reason assignment

- Manually by operator
 - Automatic assignment by equipment integration
 - Machine code
 - Sequence
 - Manual interventions
- In MES Client, 800xA, HMI or tablet
- Directly (pop-up) or afterwards

Workforce Management

- Collecting efficient time spent per task through Join/Leave actions
- Configuration of production shifts, working hours, exceptional days and mode of operation

Configuration view

The screenshot displays the software interface for Workforce Management, divided into three main sections: Planning / Dictionaries, Registration, and Scheduling.

Planning / Dictionaries: This section contains four configuration buttons: "Calendars definition", "Shifts planning (schedule)", "Shift Type definition", and "Sets of Equipments definition".

Registration: This section contains one button: "Work registration".

Scheduling: This section shows a detailed schedule view. It includes a "Schedule:" header, a "Date:" field, a "Period:" dropdown set to "Current week", and date range selectors for "From:" (2011-06-13) and "To:" (2011-06-19). A "Refresh" button and a "Shifts generator" button are also present. Below this is a table with columns for Date, Start Time, Duration, and a grid of shift indicators (represented by numbers 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, +0, +4, +6). The table also includes columns for Shift type, Planned hours, and Reported hours. The data shows a repeating pattern of shifts over the week.

Date	Start Time	Duration	2	4	6	8	10	12	14	16	18	20	22	+0	+4	+6	Shift type	Planned...	Reporte...
2011-06-13	06:00	08:00															8 hours	50	0
2011-06-13	14:00	08:00															8 hours	50	0
2011-06-13	22:00	08:00															8 hours	50	0
2011-06-13	22:00	08:00															8 hours	50	0
2011-06-14	06:00	08:00															8 hours	50	0
2011-06-14	14:00	08:00															8 hours	50	0
2011-06-14	22:00	08:00															8 hours	50	0
2011-06-14	22:00	08:00															8 hours	50	0
2011-06-15	06:00	08:00															8 hours	50	0
2011-06-15	14:00	08:00															8 hours	50	0
2011-06-15	22:00	08:00															8 hours	50	0
2011-06-15	22:00	08:00															8 hours	50	0
2011-06-16	06:00	08:00															8 hours	50	0
2011-06-16	14:00	08:00															8 hours	50	0

Notification

- Notification initiated on any event (message)
- Defined Notification message templates
- Mail/SMS to defined recipients

Notification Event

Add Edit Remove Refresh

Drag a column here to group by this column.

Event	Description	Message
Contains: ▼	Contains: ▼	Contains: ▼
ECS Service redundancy...	ECS Service status is changed. Servi...	System.Server.Status.Changed
ECS Service started	ECS Service is started	?
ECS Service shutting do...	ECS Service is shutting down	?
ECS Client connected	ECS Client is connected to ECS Serv...	System.Client.Connected
ECS Client disconnected	ECS Client is disconnected from ECS...	System.Client.Disconnected
User logged in	User is logged in ECS System	?
User logged out	User is logged out ECS System	?
User blocked	User is blocked due to wrong passwo...	?
		Timer.Hours.Full
		Timer.Minutes.Full

Notification Rule

Edit Notification Rule

Notification Event: User password reset

Subject: User password reset notification

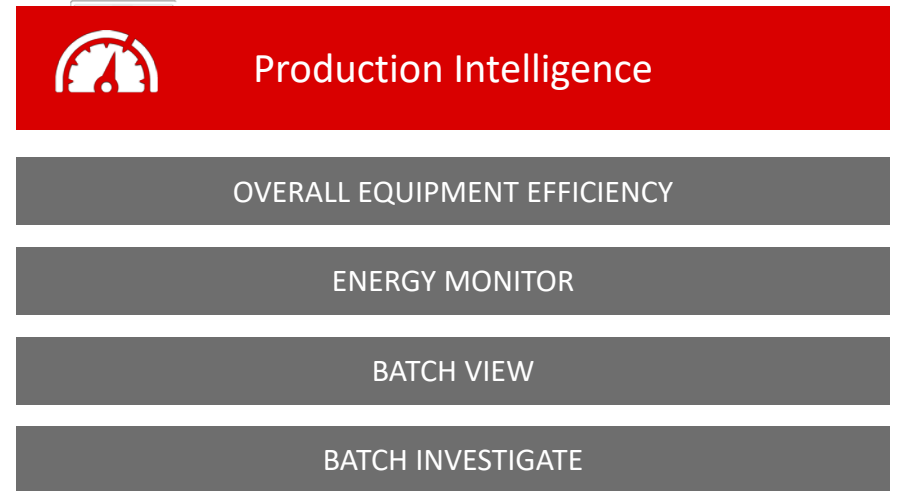
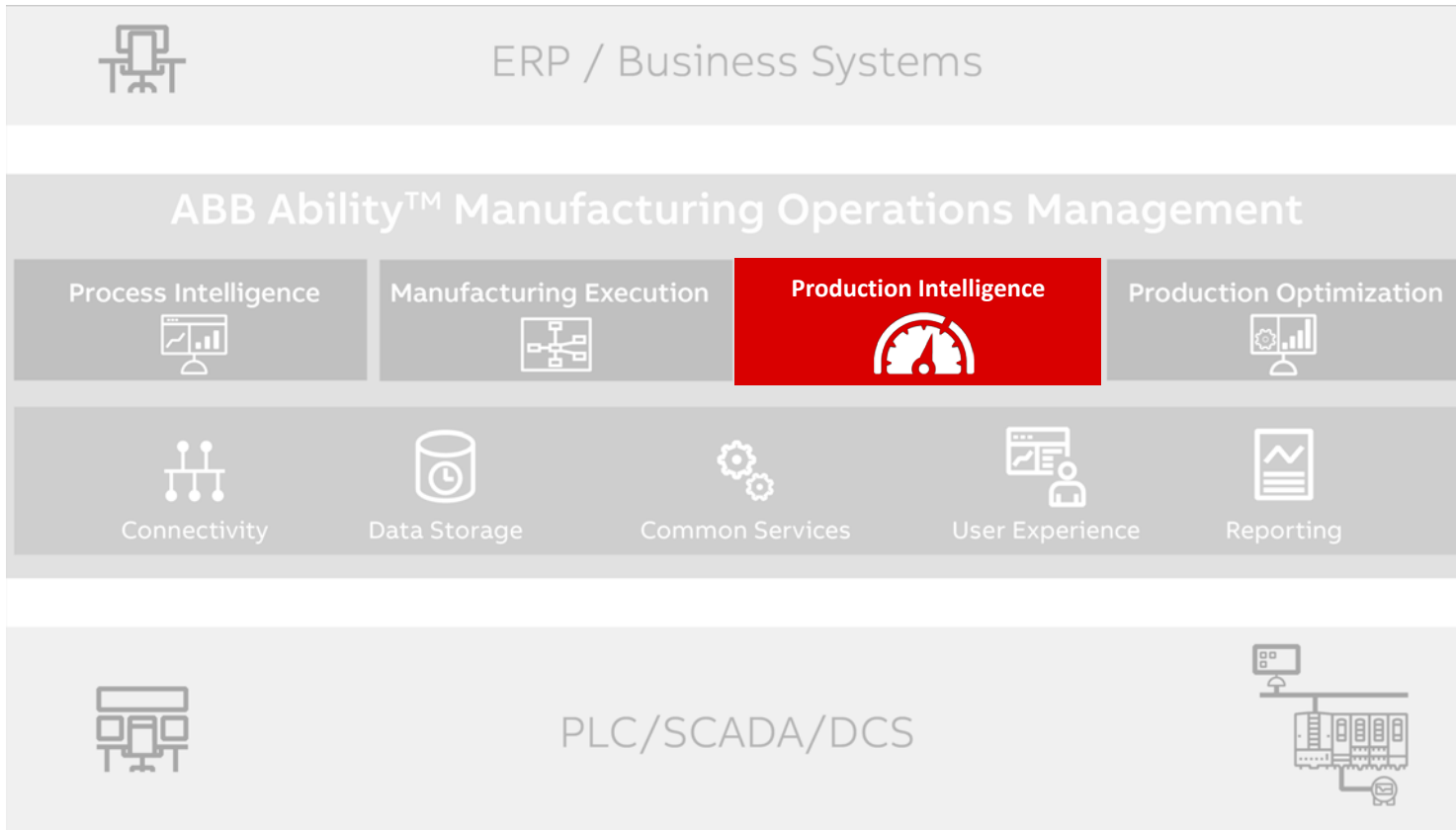
Type: Mail

(1) - ECS System
 (2) - Giuliano Cardano
 (3) - William Hamilton
 (4) - Sam I Leed



Manufacturing Operations Management

Production Intelligence



Powering intelligent plant decisions in real time

OEE captures and visualize

Visualize real-time performance metrics.

Compare processes across departments and plants.

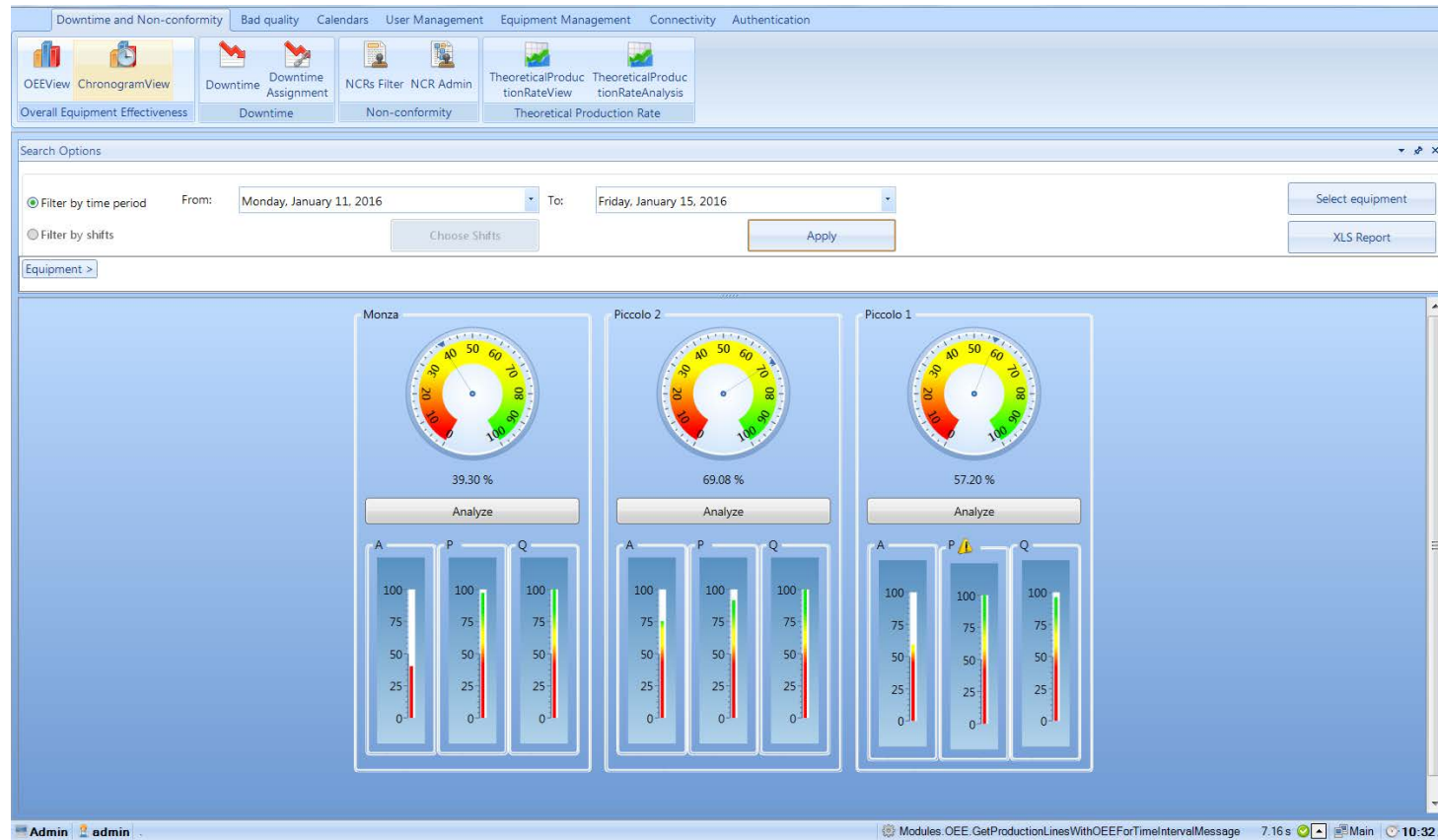
Finds potential for improvement and prioritize actions to improve production efficiency and increase capacity.

Motivates production teams to exceed targets and maximize utilization, uptime and quality.



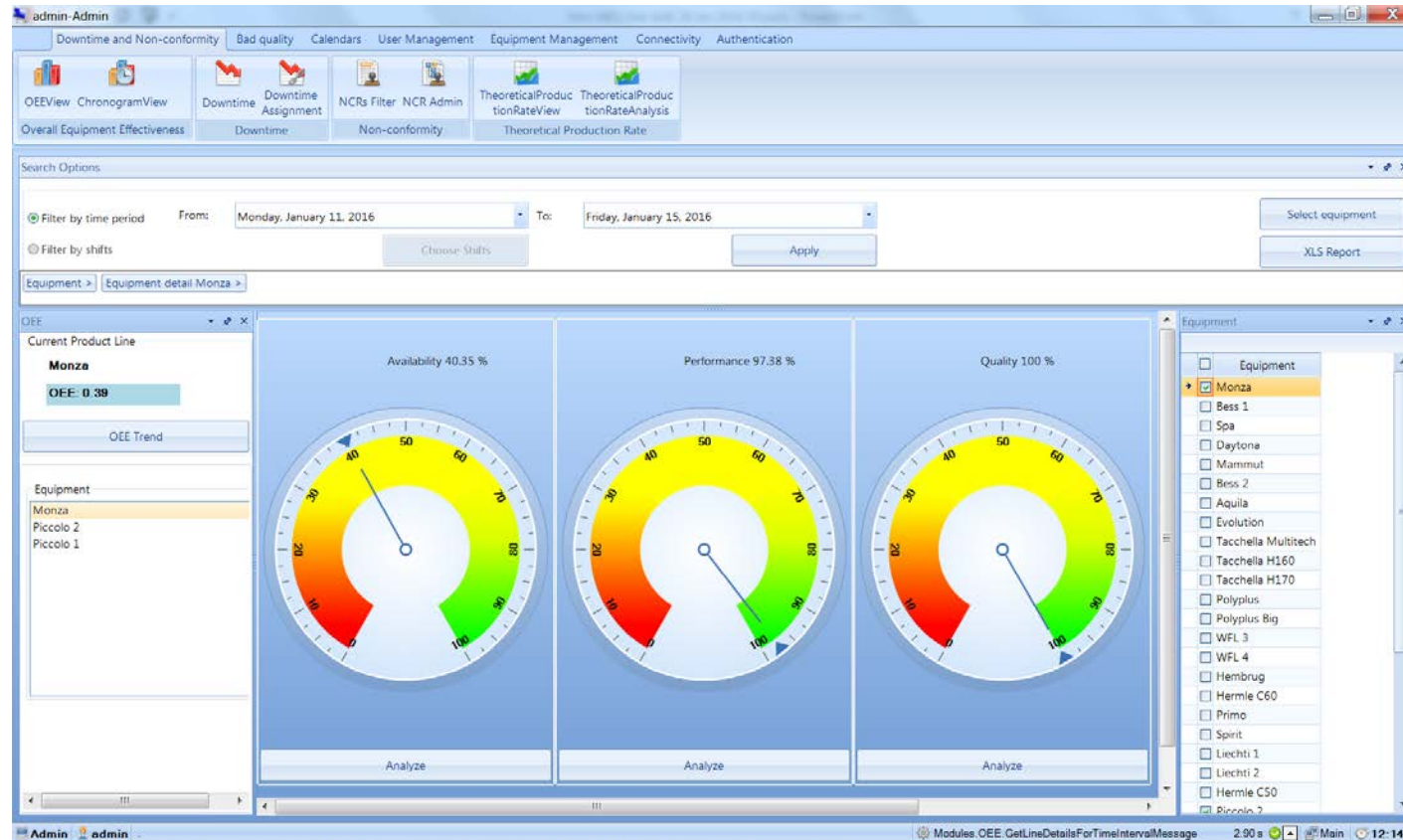
Current status overview

and drill down to analyse underlying information



Current status overview

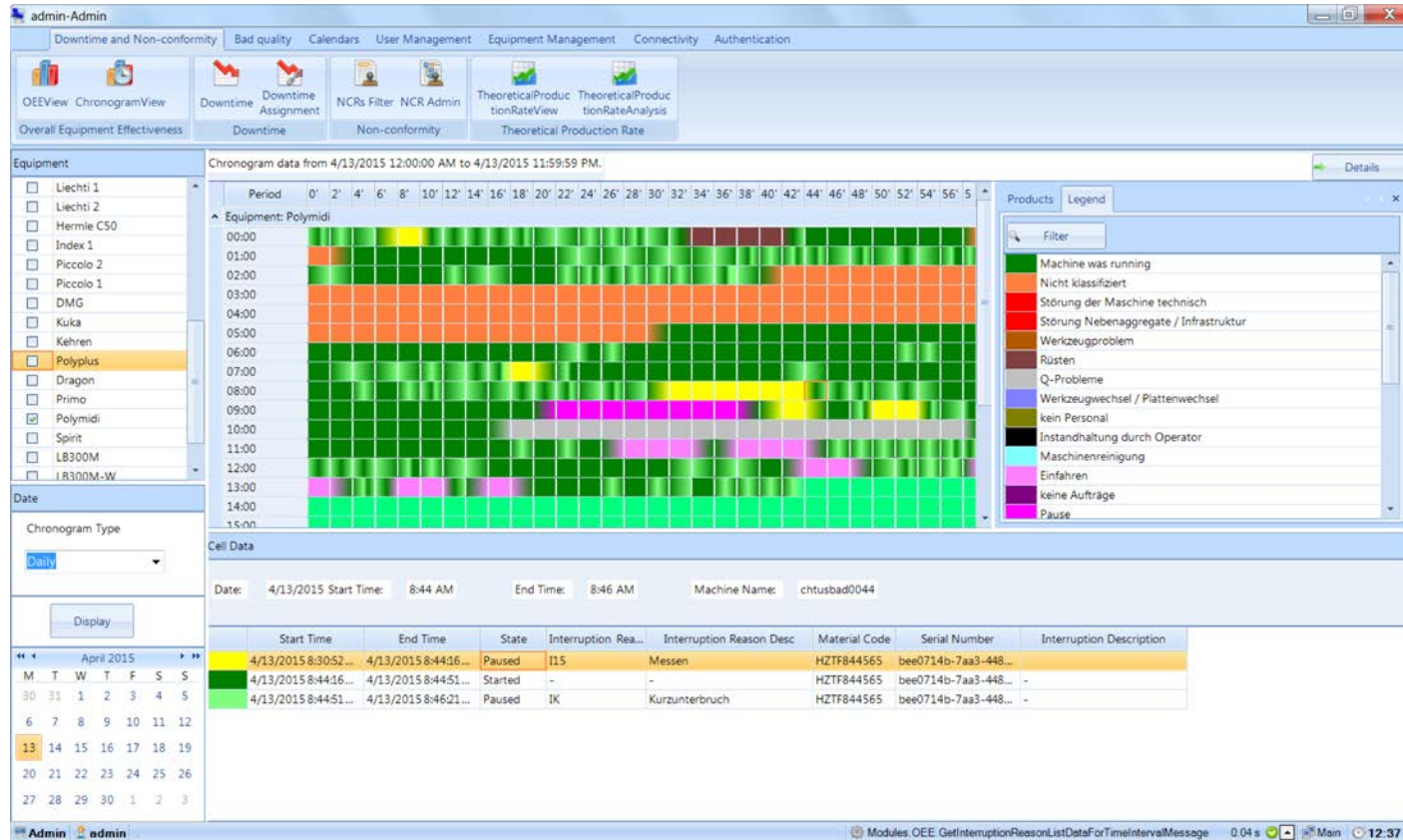
and drill down to analyse underlying information





Availability – Downtime over time

Line status in chronological order



Energy Monitor App

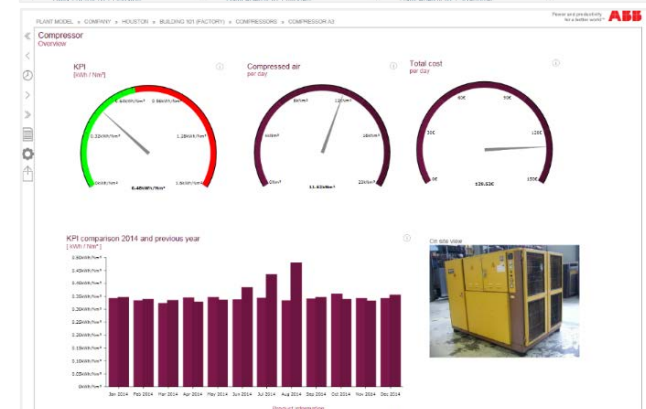
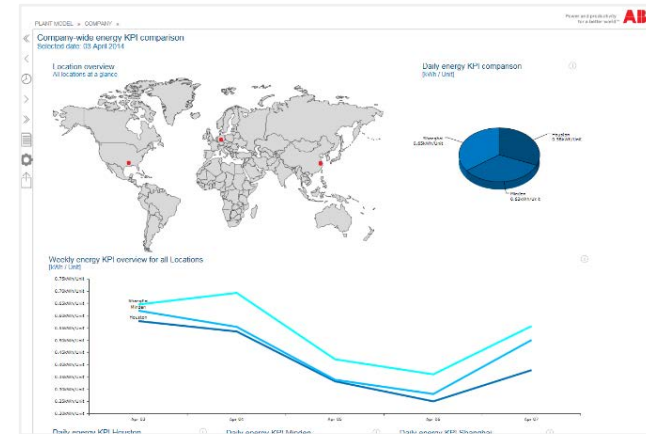
ISO 50001 Energy Management

Energy Monitor

MOM

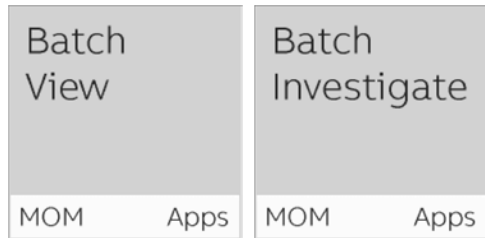
Apps

- Visualizes all resources (energy, gas, steam, water etc.)
- Supports custom defined KPI and EnPI
- Comprehensive benchmarking and comparison
- Helps to identify weak spots and saving potentials
- Supports certification regarding DIN EN ISO 50001
- Easy to getting started
 - Efficient engineering of the enterprise hierarchy
 - Fast commissioning using predefined dashboards



Batch View and Batch Investigate App

Investigate any batch data using advanced queries



Search result + navigation through traditional batch level context

Available data from the point of reference such as Parameters, Resources, various Events and PFC

Smart intelligent batch data search with time scope

Navigate directly from PFC

Advanced query of any batch data content. Structured queries in multiple levels like:

Locate all batches within a certain campaign that have a PH value below 6.9 in a certain operation in a certain unit



Děkujeme za pozornost 😊

