

WE ARE
READY FOR
INDUSTRY

4.0

PLANTMASTER



Manufacturing Execution System (MES)

PLANTMASTER is a leading MES system for discrete manufacturing. It is a powerful and extensive yet flexible tool enabling managers to achieve operational excellence and rapidly respond to changing conditions. PLANTMASTER is at the heart of Industry 4.0 and the Smart Factory offering a suite of MES modules with connectivity, powerful storage and secure communication.

Our offering

Real time monitoring



Increased efficiency

Scheduling



Optimized production schedules

Quality control



Quality improvement

Traceability



Improved product compliance

Operator tracking



Less administration

Machine and tool maintenance



Optimized maintenance cycles

Document control



Paperless production

Energy monitoring



Reduced energy consumption

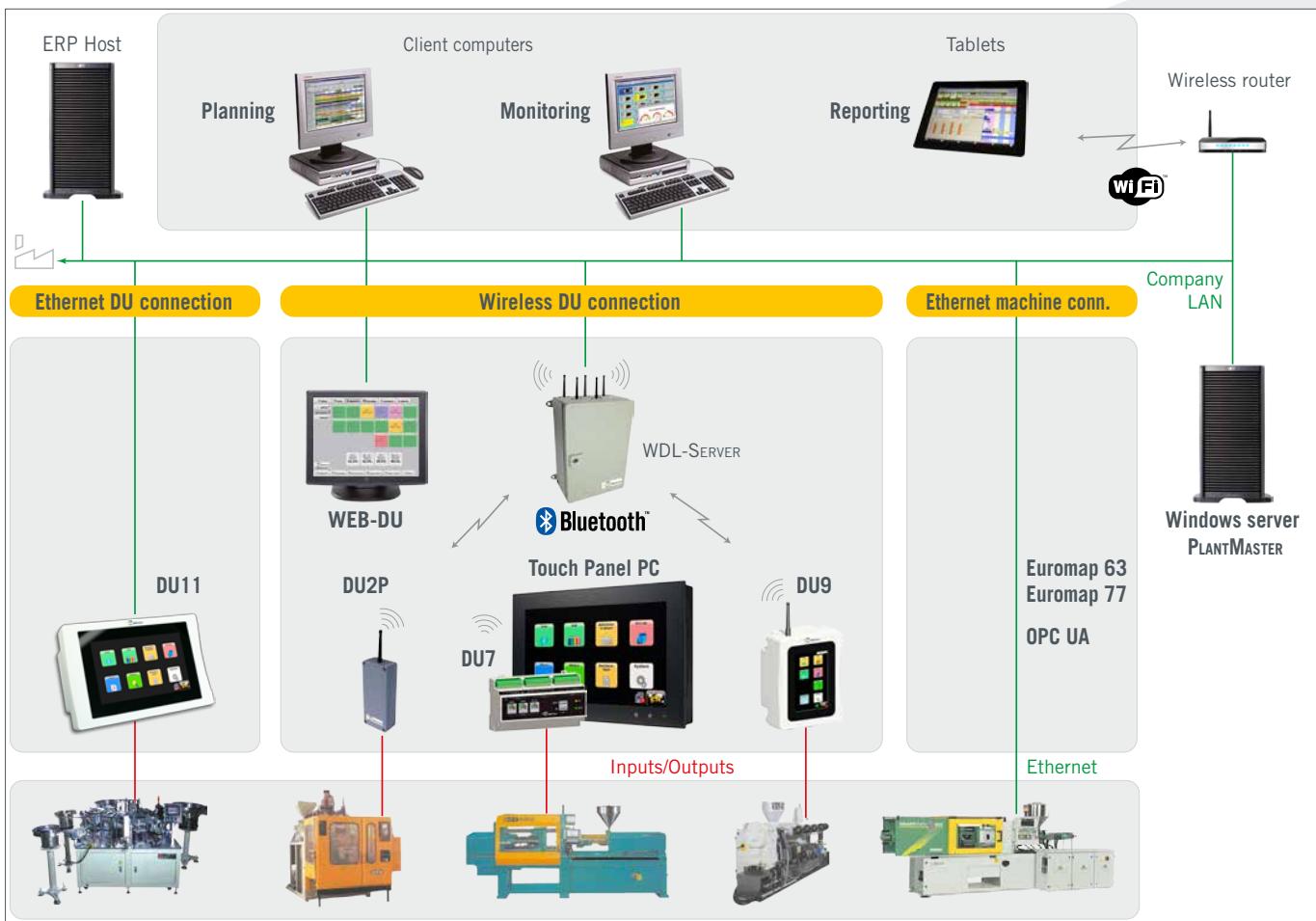
Integration with ERP



Your benefits



PLANTMASTER concept



Networking the machines

PLANTMASTER supports both cabled and wireless networks to connect the machines to the central server. Machines are equipped with one of BMSvision's Data Units (see next page) for automatic as well as manual data collection or linked directly to the server through their Ethernet interface.



Connecting remote sites

PLANTMASTER supports the connection of multiple plants to one central server. On remote sites the BMS Data Units are connected to the PLANTMASTER system via the company's WAN (Wide Area Network). A dedicated "multi-site consolidation module" on the central PLANTMASTER server allows integrated reporting for all sites into one single reporting environment.



System requirements

PLANTMASTER is Windows based and can be installed both on physical systems and in a cloud environment. Application and database can run on separate servers. The database is Oracle driven. Also Terminal Services like Citrix are supported.



ERP system integration

PLANTMASTER is easily integrated with the customer's ERP system. Through a standard interface, order and product data is transferred from the ERP system and imported into the PLANTMASTER database.

The integrated export functionality allows a straightforward upload of production data, calculated production schedules, work in progress and performance indicators from PLANTMASTER to the ERP system.





Connecting machines to PLANTMASTER



DU11



DU9



WEB-DU



DU7



DU2P



Ethernet



DU11 and DU9: Touch screen Data Units

The IoT ready Data Units DU9 and DU11 have been designed for maximum flexibility and optimal user friendliness.

The DU11 features a 7" color touch screen and a graphical "web based" user interface and can be connected with wired Ethernet or with the proven BMSvision Bluetooth based wireless network interface. The DU11 registers cycle time, produced quantity, run- and stoptime and allow the operator to enter additional information like stop and scrap reasons. Via the configurable display all production and planning data can be shown in real time.

Word or PDF documents can easily be downloaded from the server and visualized. This way, quality control documents, setup data, production drawings, ... are available right where the operators needs them. This is a major step towards "paperless production".

To connect machines with lower demands, the cost-effective DU9 is a good alternative for the DU11. The DU9 is also often used as a second terminal for extrusion lines. In this case, a DU9 is installed on the extruder side for the production data acquisition and input of stop reasons, and a DU11 at the packaging side for the display of packaging instructions, the input of scrap and printing of labels.



DU7 + Touch Panel PC: split data capture and information terminal (RUI)

Especially for the Document Control module, it can be useful to work with a larger display. For this purpose the DU7 can be built in the machine and the customer can decide to use e.g. a 20" Touch Panel PC. These devices are connected via Ethernet. On the Touch Panel PC, it is possible to run the DU11 Remote User Interface (RUI) and other software. It is also possible to use the machine screen instead of the Touch Panel PC if the machine allows this.



WEB-DU: HMI application for multiple machines

The WEB-DU application is used as HMI for a group of machines and can be implemented on any browser enabled touch screen device such as PC, tablet and smartphone. The individual machines are equipped either with a DU2P or DU7 for automatic data collection (production count, stops, ...) while all manual input and information display is handled via the WEB-DU application.



IIoT Machines with Ethernet interface or IIoT

The latest generation of production machines is often equipped with Ethernet interface for host communication. These machines can either be connected by means of a standard Ethernet network (UTP5 cable) or by using the DU7 Data Unit for wireless communication.

PLANTMASTER supports several communication standards such as OPC UA, Euromap 63 and Euromap 77.



Data security

All Data Units except DU2P can be extended with **Backup & Recovery**, allowing a minimum of 24 hours local data storage in case of server or network breakdown.

Inputs/Outputs	DU11	DU9	DU7	DU2P
Digital/counter inputs	16	8	4	4
Analog inputs (optional)	8	-	8	-
Relays	5	5	3	-
Outputs (open collector)	-	-	-	1
Serial ports	2	-	2	-
USB ports	2	2	2	-
Ethernet ports	3	1	3	-

Networking	DU11	DU9	DU7	DU2P
Wireless (WDL)	•	•	• (Ext.)	•
Wireless Ethernet (WLAN)	•	•	-	-
Wired Ethernet	• (PoE)	• (PoE)	• (PoE)	-

Extensions	DU11	DU9	DU7	DU2P
Scanner or printer	•	•	•	-
RFID reader	•	•	•	-



Production visibility and analysis

The screenshot shows a grid of 16 machine status cards and a KPI dashboard.

- Machine Status Cards:**
 - B07: Order 00043640, Product AN00689, Mold 1142, Qty required 29,400, To produce 23,883, Parts OK 5,613, Scrap 0, RUNNING.
 - A04: Order 00044296, Product AN00924, Mold 3035, Qty required 4,640, To produce 343, Parts OK 4,297, Scrap 18, RUNNING.
 - A08: Order 00044083, Product AN00972, Mold 1104, Qty required 5,400, To produce 4,627, Parts OK 10,027, Scrap 894, RUNNING.
 - A09: Order 00044294, Product AN00842, Mold 1017, Qty required 5,400, To produce 2,218, Parts OK 3,182, Scrap 6, RUNNING.
 - A10: Order 00043907, Product AN00863, Mold 2064, Qty required 26,894, To produce 25,538, Parts OK 1,356, Scrap 8, RUNNING.
 - A14: Order 00044301, Product AN01312, Mold 1136, Qty required 22,400, To produce 17,850, Parts OK 4,650, Scrap 68, RUNNING.
 - A16: Order 00044278, Product AN00382, Mold 1136, Qty required 28,125, To produce 124,200, Parts OK 152,332, Scrap 2,132, RUNNING.
 - B01: Order 00043501, Product AN00483, Mold 2055, Qty required 4,175, To produce 1,932, Parts OK 2,243, Scrap 0, RUNNING.
 - B02: Order 00043986, Product AN01495, Mold 3039, Qty required 3,050, To produce 3,050, Parts OK 0, Scrap 0, Pump.
 - B11: Order 00043321, Product AN00018, Mold 2010, Qty required 51,300, To produce 45,240, Parts OK 6,060, Scrap 17, RUNNING.
 - B04: Order 00043011, Product AN00502, Mold 1094, Qty required 12,600, To produce 12,299, Parts OK 301, Scrap 1, Unknown.
 - B06: Order 00044268, Product AN00246, Mold 1270, Qty required 30,240, To produce 23,174, Parts OK 7,066, Scrap 45, RUNNING.
 - B08: Order 00043643, Product AN00731, Mold 1117, Qty required 2,200, To produce 2,200, Parts OK 0, Scrap 0, No Order.
 - B09: Order 00044291, Product AN00698, Mold 1111, Qty required 12,825, To produce 51,175, Parts OK 64,000, Scrap 0, El. Stacking.
 - C01: Order 00042990, Product AT00021, Mold 1069, Qty required 2,750, To produce 1,886, Parts OK 1,864, Scrap 0.
 - C02: Order 00044288, Product AN00669, Mold 2147, Qty required 73,080, To produce 70,793, Parts OK 724, Scrap 0, RUNNING.
 - C05: Order 00044325, Product AN00029, Mold 1139, Qty required 208,800, To produce 208,076, Parts OK 724, Scrap 0, RUNNING.
- KPI Dashboard:** A window titled "Key Performance Indicators (KPI)" showing five gauges: OEE (90.64), Availability (98%), Performance (90%), Yield % (100%), and Cavity % (100%).



Real time machine monitoring

PLANTMASTER's most important real time analysis tool is the PLANTVIEW. In this color-coded layout of the plant, the machine color indicates the machine status or alarm condition.

The user can select the type of information to be displayed. User definable "filter sets" display only those machines which match a certain condition, for example all machines with OEE below 85%, machines producing too much waste, ...

A "mouse click" on a specific machine or group of machines opens a window with detailed information for the selected machine(s).



Reporting

All data is stored in an Oracle relational database. By means of a powerful report and formula generator, featuring interactive reports and charts with multiple period selection and ad hoc filtering, users can define and configure their own calculations and reports.

Integrated graphics allow managers to build their own personalized "dashboards" for a quick and transparent analysis and evaluation of all Key Performance Indicators (KPI).

The screenshot shows the Reporting module interface.

- Tree View:** Shows categories like EnergyMaster, Production Report, Stop Detail, and Stop Details per machine type.
- Report View:** Displays a bar chart titled "Production Report By Tool" showing efficiency over time. The chart has a legend for "% Efficiency".
- Table View:** A detailed production report table for Work Centre: Hold. The table includes columns for Machine, Available, Running, Stopped, Time, Efficiency, #, Total, Scrap, Good, Theoretical, %Net, Availability, Efficiency, Performance, Quality, and OEE %.



Management reporting



MANAGEMENT DASHBOARD

This module allows the combined presentation of any data available in different BMSvision software modules into a single web based report.

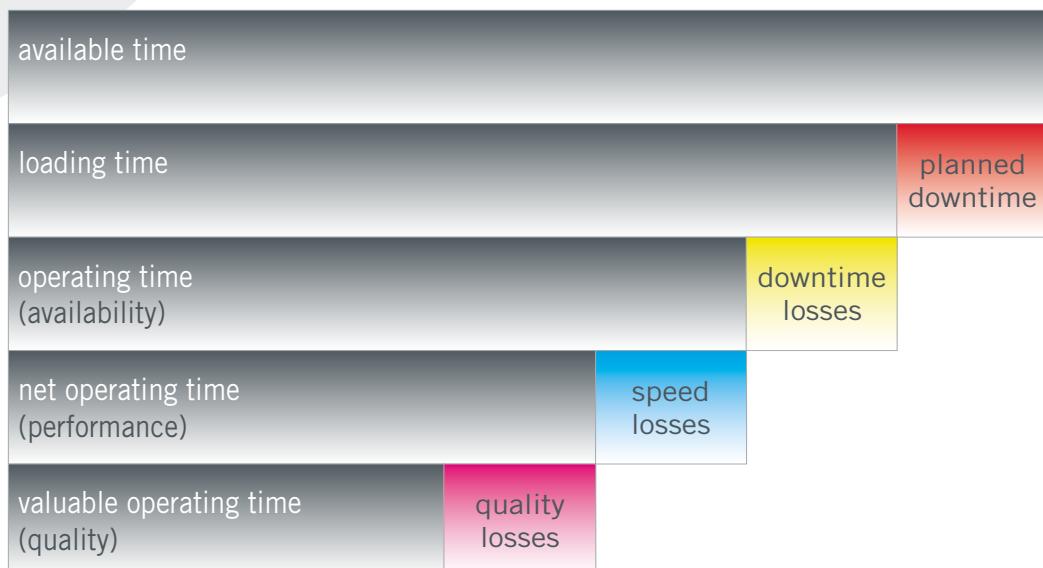
With this tool, each user can create his own dashboard showing all important KPI's at a glance. As such, the manager can have all important information regarding efficiencies, quality and energy consumption displayed in real time on one single screen. Zooming functions allow him to drill down further in detail if required.



OEE (Overall Equipment Effectiveness)

PLANTMASTER includes all elements required for OEE reporting: equipment availability, performance and production quality (rejects) is collected automatically from the machines. Analysis of these important KPI's drives efficiency improvements resulting in considerable cost savings.

With the "multi-site consolidation" module, managers can compare KPI's between sites allowing operations to learn from the best performers (benchmarking).





Managing job schedules

The screenshot displays the Planboard software interface, which is a project management tool. The top menu bar includes File, Edit, View, Editors, Reports, Help, and various icons for search, export, and refresh. The main area features a Gantt chart with multiple tracks representing different work items or machines. The tracks are color-coded and show progress bars and specific tasks. A legend at the bottom identifies the colors: yellow for P1, green for P2, blue for P3, red for P4, orange for P5, grey for P6, purple for P7, black for P8, and dark blue for P9. On the left, a vertical list shows tasks labeled P1 through P11, each with a status indicator (Job or Work) and a progress bar. Below the Gantt chart, there is a section for 'Operator resources' with tabs for Report, Packers, Shift schedule, New printing, Period, Shift, and Refresh. At the bottom, there is a 'Report: Graph' section with a bar chart showing resource utilization over time, grouped by team. The x-axis represents dates from 27/03 to 05/04, and the y-axis represents utilization levels from 0.0 to 2.0. Buttons for Print, Export, Previous, and Exit are located at the bottom right.



Real time job schedule

PLANTMASTER's planboard lets you know within seconds whether you can meet customer's requested delivery dates. Orders can be entered directly into the system or downloaded from the ERP system.

Based on the actual situation in the plant and technical restrictions stored in the database, the system helps the planner in finding the optimum job sequence. Jobs can be rescheduled by simple "drag and drop" operations on the planboard. Jobs which are too late are automatically highlighted allowing the planner to take the necessary actions to get the situation under control again.



Kan Ban support

More and more manufacturers have switched from traditional order-based planning (push) to Kan Ban planning (pull). PLANTMASTER supports this Kan Ban functionality.

In the Kan Ban philosophy, material or component requirements are triggered by the process that consumes this component. A "Kan Ban Card" is sent to the workcenter that produces this component. This bar coded card contains the product code, tool and quantity required. Scanning this card at the machine automatically generates a "production job" in the PLANTMASTER database.



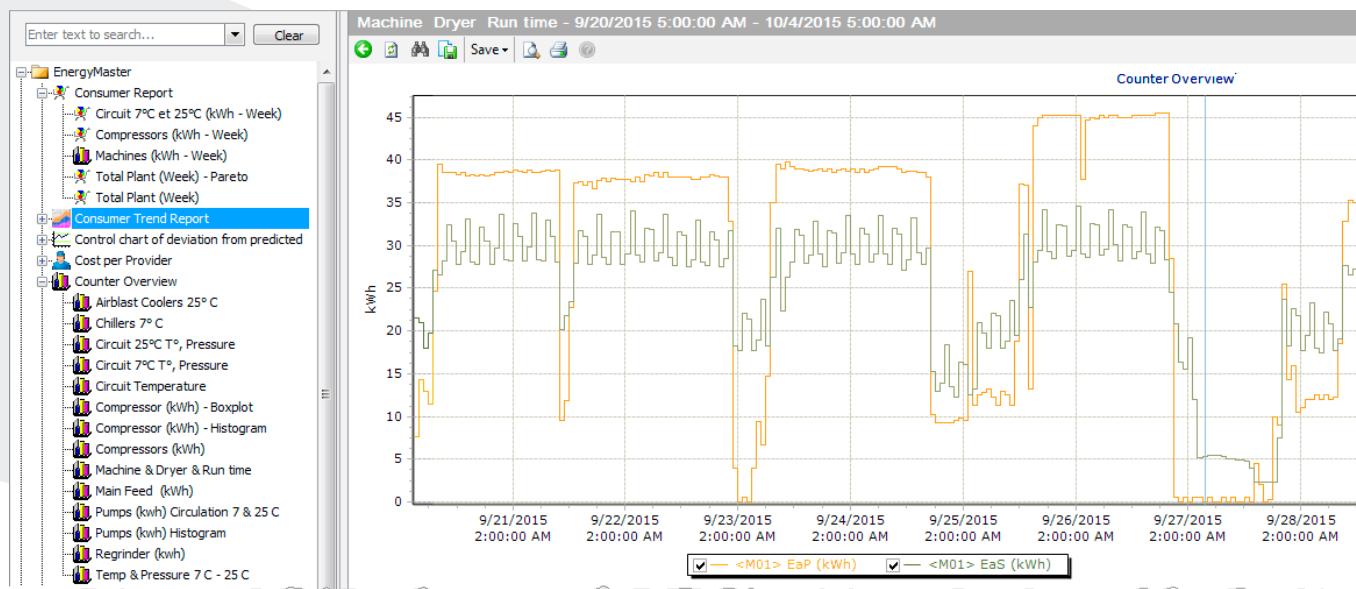
Label printing and logistics

PLANTMASTER also supports the registration of logistics data for the produced packaging or pallets. The correct labels are printed in real-time and the production data are automatically reported back to ERP.





ENERGYMASTER: Energy management



Monitoring energy consumption

With the ENERGYMASTER module, the PLANTMASTER MES system is extended with a powerful tool to optimize the use of energy in the plant. Following the principle of Monitoring & Targeting, it maps the various energy consumptions (electricity, gas, compressed air, water, steam) for full analysis and optimization.

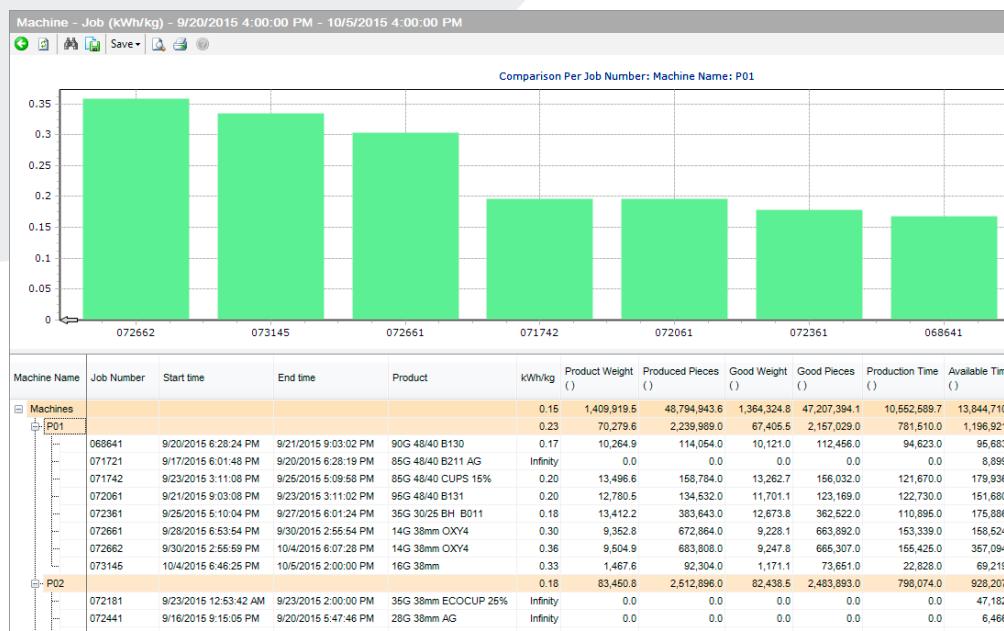
Energy meters can be connected to the Data Units on the machines and energy data is passed on to the server using the MES data collection network. As such, no additional investment in data collection infrastructure is required.



Reporting consumptions

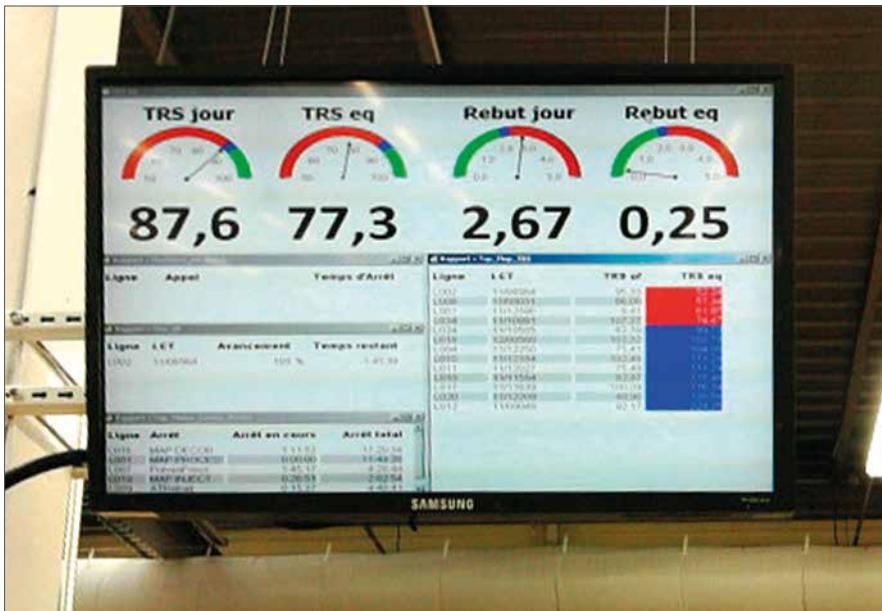
ENERGYMASTER integrates seamlessly with the PLANTMASTER monitoring and scheduling module. Combining production data with information about energy consumption is a powerful feature that allows evaluating the energy component in the overall production cost of each order and product.

By defining an Energy Efficiency Plan with clear objectives, significant energy savings can be realized. ENERGYMASTER is the right software package to provide analysis and decision support for quick energy saving actions while ensuring a short pay-back time.





Communication in the plant



Digital signage

PLANTMASTER can be extended with a DID (Digital Information Display) for quick and effective communication of actual performance (OEE), outputs/rejects, alarm conditions, etc. in the plant. The DID driver software allows flexible configuration of the displays, such as:

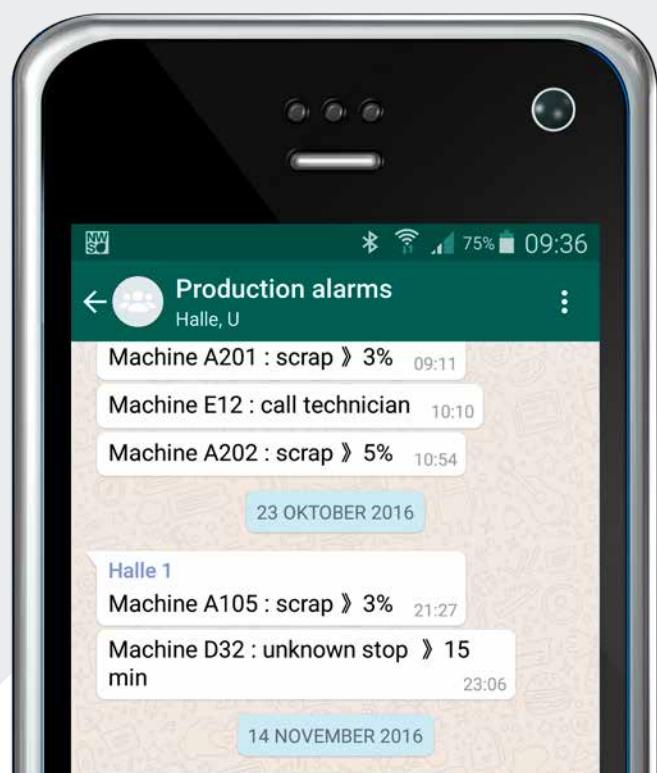
- Data to be displayed (selectable from the BMSvision PLANTVIEW data items).
- Text font/size/color.
- Machine filter.
- Update interval.



Alarm handling & messaging

The “alarm handling” software continuously compares selected parameters or KPI’s with predefined exception limits.

As soon as an “alarm condition” is detected, the software triggers one or more actions, such as sending an e-mail message to selected people, transmitting an alarm message to the machine’s Data Unit, where a lamp can be activated and a message displayed on the Data Unit screen. “Escalation scenario’s” can be defined, for example if one person does not react to a message within a certain amount of time, a message will be sent to another person.





QMASTER: Statistical Process and Quality Control (SPC/SQC)

Inspection plans

Record 7 of 50

Name: K-2016 Duvet

Description: Inspection plan for Duvet beer crate

Inspection process: Characteristic by characteristic

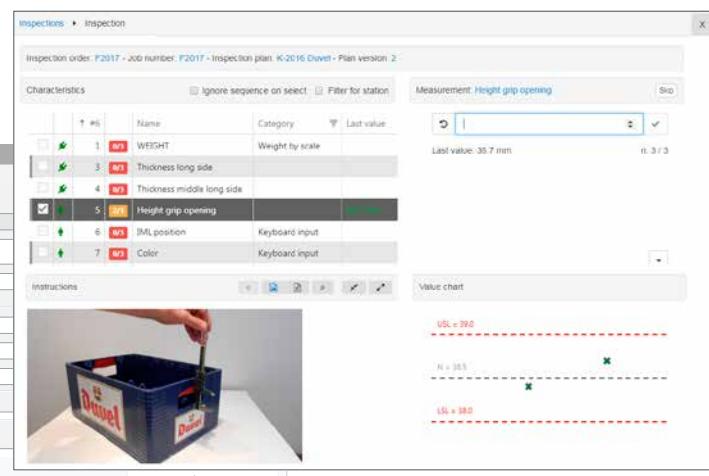
Status: Version: 2 Version info: Added parameter "color"

Approval status: Approved

Valid from: 10/17/2016 12:00:00 AM

Characteristics Sampling strategy Creation rules Documentation Inspection station Actions Other

Name	Description	Type	Category	Characteristic group	Inspection sequence /	1 Hours - n=3	4Hour...
WEIGHT	WEIGHT	Variable	Weight by scale	DefaultGroupForCharacteristicAssignments (WEIGHT)	1	X	✓
Thickness long side	Thickness long	Variable		DefaultGroupForCharacteristicAssignments (Thickness long side)	3	X	✓
Thickness middle ...	Thickness in the	Variable		DefaultGroupForCharacteristicAssignments (Thickness middle lo...	4	X	✓
Height grip opening	Height of the	Variable		DefaultGroupForCharacteristicAssignments (Height grip opening)	5	X	✓
IML position	Check if the in	Attribute pass/...	Keyboard input	Attributes (IML position)	6	✓	X
Color	Check the color of	Attribute pass/...	Keyboard input	Attributes (Color)	7	✓	X



Inspection plan and inspection order

The PLANTMASTER SPC module QMASTER keeps your process within the specifications required for optimum product quality and generates the documentation your customers demand for their quality assurance programs.

For every product, the quality manager defines the quality and process control plan including the parameters to be monitored, the sampling strategy as well as the calculations to be used.

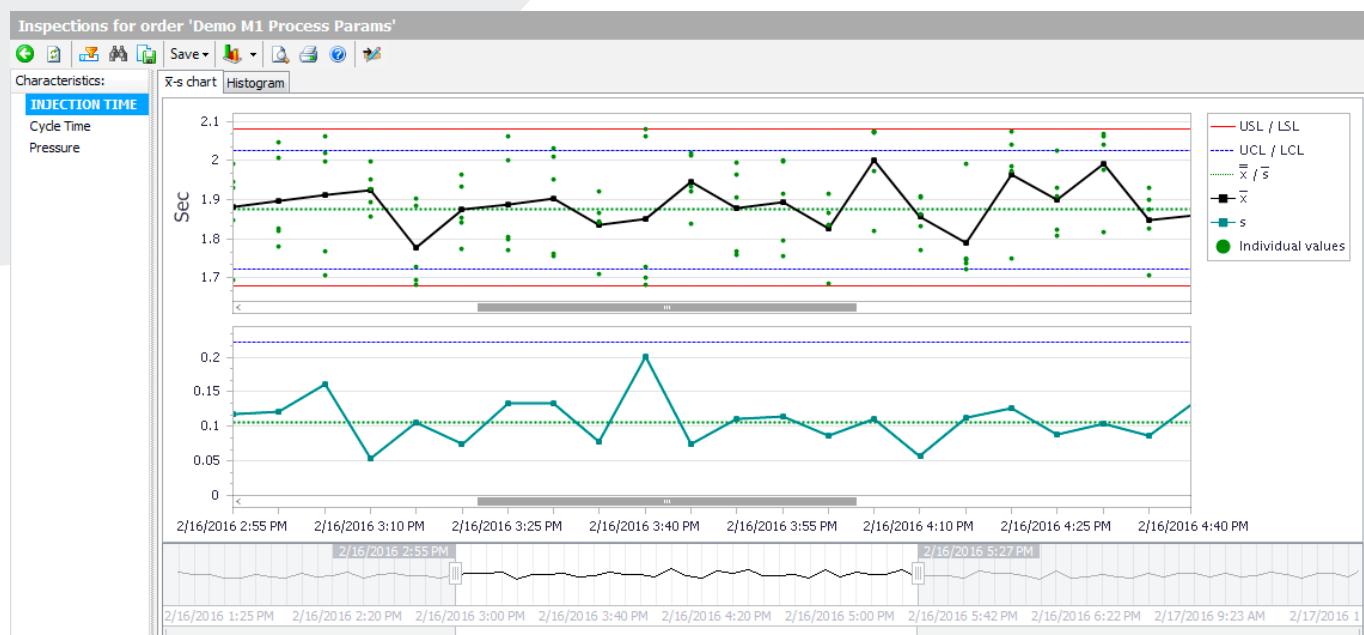
A link with the PLANTMASTER scheduling software assures an automatic generation of inspection orders at the start of each production order. Production orders for which the quality checks are overdue are automatically highlighted by the system.



Real time data input processing and reporting

Process parameters are collected automatically using the Data Units at the machines (serial or Ethernet interface with the machine controller or analog inputs) while part related data is sampled directly from measurement devices such as scales and calipers or entered manually through an input program on a PC or a mobile device, such as a tablet or smartphone.

The PLANTMASTER SPC/SQC module offers an extensive set of reporting tools: control charts for variables and attributes, histograms and process capability calculations. For variables, the user can select from X-R, X-S and individual values charts. P, NP as well as pareto charts are available for attributes. The system automatically calculates alarm and warning limits.





Tracing from raw material to finished product

The screenshot displays two windows side-by-side. The left window, titled 'Edit Process Routes', shows a form with fields for 'Process Route' (Flexo Pkg), 'Version' (1), 'Short Description' (Flexo Packaging), 'Status' (Released), 'Product Family' (Cartons), and 'Long Description' (Flexo Packaging). Below this is a grid titled 'Process Steps' with columns: Process Step, Version, Short Description, Seq. Nr., Type, Status, Scrap Table, Ded. Table, Admin Table, Print T, and Min. step delay time. The grid lists various steps like FL Reception, FL Printing, FL Laminating, etc. The right window, titled 'Edit Process Steps', shows a form for 'FL Laminating' with fields for 'Process Step' (FL Laminating), 'Version' (1), 'Short Description' (FL Laminating), 'Link with PlantMaster' (checkbox), 'Type' (Assembly), 'Status' (Released), 'Sequence' (3), 'Long Description' (FL Laminating), and tabs for 'Instructions', 'Additional', 'Checks', and 'Results'. It also includes a checkbox for instructions and dropdowns for preceeding steps and min/max step delay times.



Process routing

In the “process routing” module, the user defines a routing for each product or product group. This routing describes all product steps necessary to manufacture the product. For each process step in the routing, the machine or workstation is defined as well as all data to be collected.

Typical traceability data includes operators, lot and component numbers and process and quality parameters to be documented.

During the production process, the system checks in real time whether all data is collected and generates an alarm (for example activate a lamp) in case certain data is forgotten or is falsely entered.



Traceability reports

A powerful reporting module offers reports for forward and backward tracking per product, component and raw material and the search for causes in case of customer complaints.

For each individual product shipped, the system stores and reports raw materials and components used in each production step, process parameters, results of quality checks and operators that manufactured the product.

Information can be retrieved for as long as ten years in the past.

The screenshot shows a window titled 'Trace Back for Assembly'. It has a 'Show' tab with a question mark icon and a 'Selections' tab. Under 'Selections', there is a 'Type' section with radio buttons for Resin Lot, Master Batch, Material Lot, Part Number, Assembly, Part, Carton, Container, Job, Tool, and Archive data. A 'Selection' section with a dropdown menu labeled 'Assembly' is also present. Below this is a tree view titled 'Trace Back for Container: PDBRL-004061190' with nodes like PDBRL-004061190, PFFA108592000034, PFFA108592000035, PFFA108592000033, BX-200404190006, PFFA10852L000068, PX-200404190009, PT-200404190004, PB-200404190011, VIS-8560001, PLN-9020451, BP-6890001, PP-9990003, VIS-55860001, AIRB-78-14106, and PLR-52350001. The tree is expandable with '+' and '-' symbols.

The screenshot shows a window titled 'Summary for PORT-RL PFFA10852L000068'. It includes sections for 'General' (Portillon Renault Laguna, image of a car headlight), 'Process Steps' (listing steps PT02 to PT05 with descriptions like '02 INJECTION POR', '03 ASS.BAR.FIX.POR', etc.), 'Parameters' (listing Poids 0.215 kg), and 'Materials' (listing components like BAR.PORT X56, MAT.PLAST.N, PEAU.THF.POR.X56, PUR.SR.MDI, and VIS-8560001 with their respective part numbers and quantities).



Operator tracking



Edit Operators

Record 5 of 1,322

Operator: 903 Short Description: R491

General Advanced Machines

Name:	Tianna Smothers	User Values
Clock Number:	30702BAB41	1:
Operator Type:	PACKERS . Packers	2:
Department:	PDS	3:
Workcentre:	MLD . Molding Germany	
Shift Schedule:	3. New Injection	
Shift Code:		
Maximum Machines:	2	
Maximum Load:	120	
Long Description:	6901015067088	
Remarks:	208040340289	



Logon/logoff

Operator tracking allows both direct and indirect operators to log on/off at a machine via the BMSvision Data Unit. This can be done in a number of ways:

- The operator simply types in a number (operator ID)
- RFID proximity device (tag reader)
- Barcode slot reader
- CCD scanner

Operators can be categorized into those that only need to log on at the machine (automatically logged off at the end of a shift) and those such as supervisors, quality operatives and maintenance people who need to both log on and log off.



Operator based reports

The operator tracking software stores all recorded information by operator code. Reports can be generated showing production, scrap, downtime and efficiencies by operator. Both direct and indirect labor component can thus be reported for each production order allowing accurate allocation of labor cost to orders and products.

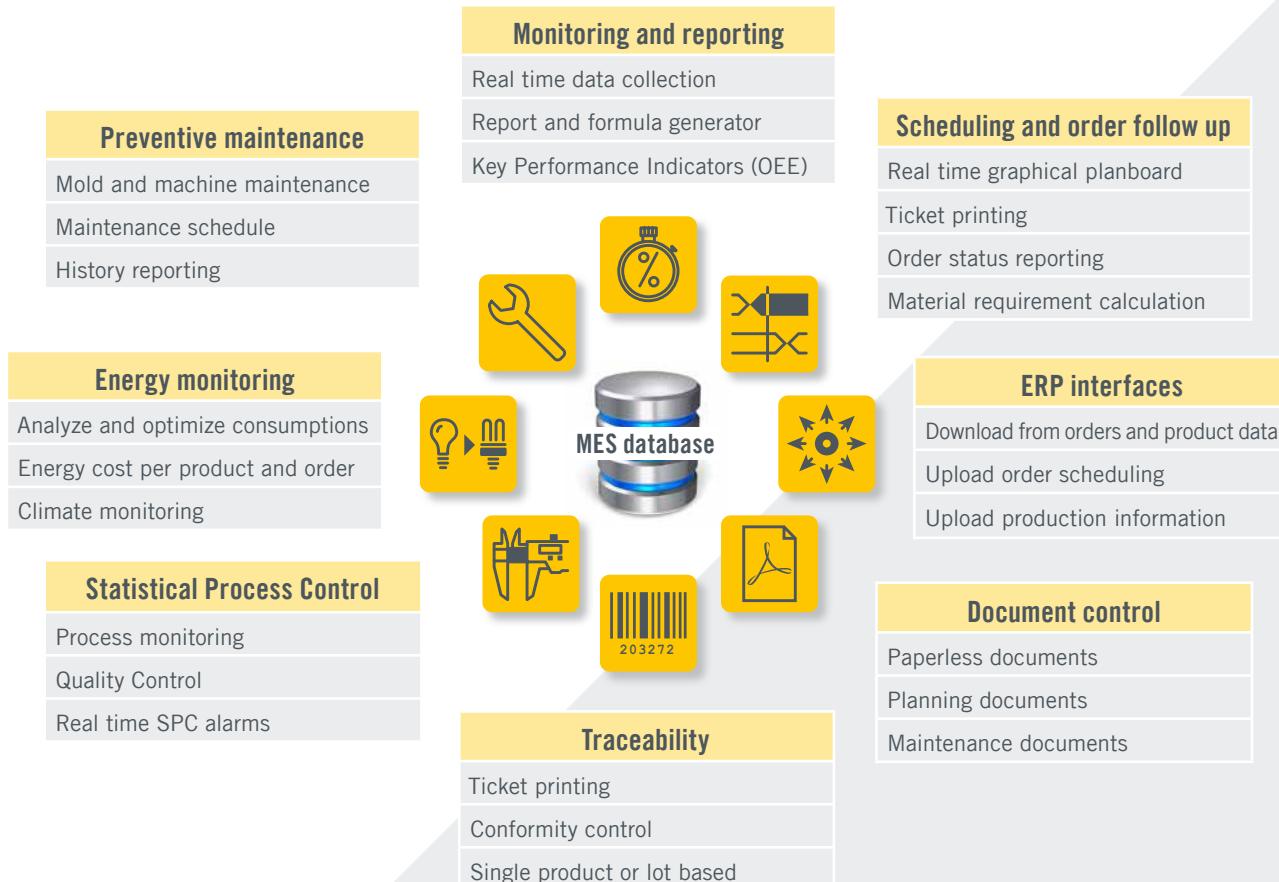
Operator Tracking detail - 5/9/2015 6:00:00 AM - 5/10/2015 6:00:00 PM																	
Key Items		Times				Cycles				Production							
Record Start	Record End	Available	Running	Stopped	M-Stop Time	M-Operator	Time	Efficiency	#	Total	Scrap	Good	Theoretical	%Net	Availability		
Operator Name: Adamina Precht																	
<input type="checkbox"/> Machine: C01																	
5/9/2015 8:40:27 AM	5/9/2015 8:54:10 AM	13:43	13:43			13:43	19.1	106.12	43	43		43	41	106.12	100.00		
5/9/2015 9:12:01 AM	5/9/2015 2:32:51 PM	5:20:51	5:09:11	9:51	9:44	5:09:18	19.7	103.35	944	944	20	924	942	98.04	99.96		
5/9/2015 2:54:57 PM	5/9/2015 4:23:05 PM	1:28:09	1:14:14	6:23	6:04	1:14:33	17.8	114.00	250	250	9	241	238	101.19	92.08		
5/9/2015 4:23:05 PM	5/9/2015 5:51:40 PM	1:28:35	1:27:08	1:27	1:27	1:27:08	19.8	102.56	264	264		264	262	100.88	98.66		
		8:31:18	8:04:16	17:41		17:15	8:04:42	19.4	104.92	1,501	1,501	29	1,472	1,483	99.27	98.44	
		8:31:18	8:04:16	17:41		17:15	8:04:42	19.4	104.92	1,501	1,501	29	1,472	1,483	99.27	98.44	
Operator Name: Aislin Bicknell																	
<input type="checkbox"/> Machine: A04																	
5/9/2015 6:00:35 AM	5/9/2015 8:06:03 AM	2:05:28	1:51:53	13:35	10:31	1:54:57	56.4	79.77	119	119		119	167	71.13	97.33		
5/9/2015 8:21:08 AM	5/9/2015 8:36:49 AM	1:00:15:43	14:43			1:43	55.2	81.54	16	16		16	20	81.54	100.00		
5/9/2015 8:39:17 AM	5/9/2015 11:53:17 AM	3:14:00	2:39:42	34:18		3:14:00	55.7	80.78	172	172		172	259	66.49	82.32		
5/9/2015 12:25:06 PM	5/9/2015 5:53:29 PM	5:32:34	3:41:40	1:41:36		5:23:16	41.0	109.62	324	324	92	232	431	53.83	68.57		
		1 11:07:45	8:27:58	2:29:29	10:31	10:46:56	48.3	93.17	631	631	92	539	877	61.49	78.52		
		1 11:07:45	8:27:58	2:29:29	10:31	10:46:56	48.3	93.17	631	631	92	539	877	61.49	78.52		
Operator Name: Alec Wallick																	
<input type="checkbox"/> Machine: A14																	
5/9/2015 5:51:21 PM	5/9/2015 6:00:00 PM	8:39	8:39			8:39	10.4	115.61	50	50		50	43	115.61	100.00		
		8:39	8:39			8:39	10.4	115.61	50	50		50	43	115.61	100.00		
		8:39	8:39			8:39	10.4	115.61	50	50		50	43	115.61	100.00		
Operator Name: Alyx Gronko																	



References



PLANTMASTER modular concept



BMSvision

In Pursuit of Productivity



www.bmsvision.com

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