

SCHNEIDER Optical Machines

COLA Industry 4.0 / Smart Manufacturing

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VP Sales
Schneider Optical Machines
April 2017**



Fascination for Innovation

Overview

- _ Who is Schneider
- _ What is Industry 4.0 / Smart Manufacturing
- _ Challenges Optical Labs face today
- _ How Schneider is leading the way to Industry 4.0 and beyond
- _ Modulo / Control Center
- _ CMMS Modulo



Who is Schneider:

- Focused company – Optical Surfacing & Coating Machine Experts
- Digital Experts – Invented the ability to surface Digital & Free Form!
- Schneider is the leading machine innovator and process expert for Rx Lens Manufacturing
- New developments never stop coming
 - Focused on labs
 - Focused on production with practical improvement



What is Industry 4.0

- _ Industry 4.0 is the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things and cloud computing.
- _ Industry 4.0 creates what has been called a "smart factory". Within the modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real time, and via the Internet of Services, both internal and cross-organizational services are offered and used by participants of the value chain.

Source: https://en.wikipedia.org/wiki/Industry_4.0



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Current Challenges Optical Labs face:

- Real time process control data (Baumé, polish flow and temp, etc.)
- Data storage / logging
- Smart tray routing
- In line quality verification
- Getting correct info to correct job function i.e. maintenance info to maintenance tech, production data to lab manager
- Centralized Data Collection and Real Time Analysis of both machines and process



The Modulo Principles

- _ Self organizing, cognitive machines
- _ Highest levels of utilization
- _ Centralized data collection
- _ Control Center with different views depending on who needs what info
- _ In line quality control
- _ Minimal operator influence
- _ Significant cost and time savings



The Modulo Control Center



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Control Center - Dashboard

Schneider ControlCenter

File Options View Window Help

Settings Macro manager Tool usage Reports Lab Digicon Time span from 30.06.2015 00:00:00 to 30.07.2015 00:00:00 (1m, 0d, 0h) daily Accept

 CCU001/325.012 Trays in process Order: 71050 Lenses: 85171 Production: D: 1564 H: 96 Expand	 CCU002/325.011 Trays in process Order: 72141 Lenses: 13269 Production: D: 1765 H: 95 Expand	 HSC001/102.008 Trays in process Order: 72010 Lenses: 113629 Production: D: 1207 H: 56 Expand	 HSC002/102.006 Trays in process Order: 73177 Lenses: 95784 Production: D: 1213 H: 47 Expand	 HSC003/102.003 Service Order: 26701 Lenses: 102491 Production: D: 1091 H: 48 Expand	 HSC004/102.005 Trays in process Order: 85854 Lenses: 88194 Production: D: 1114 H: 49 Expand	
 CCP001/208.034 Trays in process Order: 80053 Lenses: 87707 Production: D: 1125 H: 70 Expand	 Lack of consumables Lack of consumables Order: 73317 Lenses: 58387 Production: D: 875 H: 37 Expand	 CCP003/208.031 Trays in process Order: 72602 Lenses: 60114 Production: D: 869 H: 33 Expand	 CCP004/208.032 Trays in process Order: 27796 Lenses: 72537 Production: D: 805 H: 43 Expand	 CCP005/208.033 Trays in process Order: 72152 Lenses: 63615 Production: D: 759 H: 44 Expand	 CCP006/208.030 Error Order: 70296 Lenses: 9044 Production: D: 785 H: 45 Expand	 PMD001/572.104 Trays in process Order: 63571 Lenses: 40013 Production: D: 365 H: 22 Expand
 CCL001/433.009 Trays in process Order: 73703 Expand	 DBA001/ Trays in process Act. order: Expand	 TSA001/ Trays in process Act. order: Expand	 LCU001/ Trays in process Act. order: Expand	 SWA001/ Trays in process Act. order: Expand	 HSE001/131.003 Trays in process Order: 71490 Expand	 HSE002/131.004 Trays in process Order: 71490 Expand

Ready

Machine Status



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Control Center - Dashboard


Schneider ControlCenter

File Options View Window Help

Settings Macro manager Tool usage Reports Lab Digicon Time span from 30.06.2015 00:00:00 to 30.07.2015 00:00:00 (1m, 0d, 0h) daily Accept

<p>CCU001/325.012</p> <p>Trays in process</p> <p>Order: 71050</p> <p>Lenses: 85171</p> <p>Production: D: 1564 H: 96</p> <p>Expand</p>	<p>CCU002/325.011</p> <p>Trays in process</p> <p>Order: 72141</p> <p>Lenses: 13269</p> <p>Production: D: 1765 H: 95</p> <p>Expand</p>	<p>HSC001/102.008</p> <p>Trays in process</p> <p>Order: 72010</p> <p>Lenses: 113629</p> <p>Production: D: 1207 H: 56</p> <p>Expand</p>	<p>HSC002/102.006</p> <p>Trays in process</p> <p>Order: 73177</p> <p>Lenses: 95784</p> <p>Production: D: 1213 H: 47</p> <p>Expand</p>	<p>HSC003/102.003</p> <p>Service</p> <p>Order: 26701</p> <p>Lenses: 102491</p> <p>Production: D: 1091 H: 48</p> <p>Expand</p>	<p>HSC004/102.005</p> <p>Trays in process</p> <p>Order: 85854</p> <p>Lenses: 88194</p> <p>Production: D: 1114 H: 49</p> <p>Expand</p>	
<p>CCP001/208.034</p> <p>Trays in process</p> <p>Order: 80053</p> <p>Lenses: 87707</p> <p>Production: D: 1125 H: 70</p> <p>Expand</p>	<p>Lack of consumables</p> <p>Lack of consumables</p> <p>Order: 73317</p> <p>Lenses: 58387</p> <p>Production: D: 875 H: 37</p> <p>Expand</p>	<p>CCP003/208.031</p> <p>Trays in process</p> <p>Order: 72602</p> <p>Lenses: 60114</p> <p>Production: D: 869 H: 33</p> <p>Expand</p>	<p>CCP004/208.032</p> <p>Trays in process</p> <p>Order: 27796</p> <p>Lenses: 72537</p> <p>Production: D: 805 H: 43</p> <p>Expand</p>	<p>CCP005/208.033</p> <p>Trays in process</p> <p>Order: 72152</p> <p>Lenses: 63615</p> <p>Production: D: 759 H: 44</p> <p>Expand</p>	<p>CCP006/208.030</p> <p>Error</p> <p>Order: 70296</p> <p>Lenses: 9044</p> <p>Production: D: 785 H: 45</p> <p>Expand</p>	<p>PMD001/572.104</p> <p>Trays in process</p> <p>Order: 63571</p> <p>Lenses: 40013</p> <p>Production: D: 365 H: 22</p> <p>Expand</p>
<p>CCL001/433.009</p> <p>Trays in process</p> <p>Order: 73703</p> <p>Production: D: 5825 H: 22</p> <p>Expand</p>	<p>DBA001/</p> <p>Trays in process</p> <p>Act. order:</p> <p>Production: D: 5825 H: 22</p> <p>Expand</p>	<p>TSA001/</p> <p>Trays in process</p> <p>Act. order:</p> <p>Production: D: 5825 H: 22</p> <p>Expand</p>	<p>LCU001/</p> <p>Trays in process</p> <p>Act. order:</p> <p>Production: D: 5825 H: 22</p> <p>Expand</p>	<p>SWA001/</p> <p>Trays in process</p> <p>Act. order:</p> <p>Production: D: 5825 H: 22</p> <p>Expand</p>	<p>HSE001/131.003</p> <p>Trays in process</p> <p>Order: 71490</p> <p>Production: D: 5825 H: 22</p> <p>Expand</p>	<p>HSE002/131.004</p> <p>Trays in process</p> <p>Order: 71490</p> <p>Production: D: 5825 H: 22</p> <p>Expand</p>

Ready



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CC - Machine Status Information

Schneider ControlCenter

File Options View Window Help

Settings Macro manager Tool usage Reports Lab Digicon

Time span from 30.06.2015 00:00:00 to 30.07.2015 00:00:00 (1m, 0d, 0h) daily Accept

CCU001/325.012

Trays in process

Order: 71050

Lenses: 85171

Production: D: 1564 | H: 96

Expand

CCU002/325.011

Trays in process

Order: 72141

Lenses: 13269

Production: D: 1765 | H: 94

Expand

HSC001/102.008

Trays in process

Order: 72010

Lenses: 113629

Production: D: 1207 | H: 5

Expand

HSC002/102.006

Trays in process

Order: 72010

Lenses: 113629

Production: D: 1207 | H: 5

Expand

HSC003/102.003

Trays in process

Order: 72010

Lenses: 113629

Production: D: 1207 | H: 5

Expand

HSC004/102.005

Trays in process

Order: 72010

Lenses: 113629

Production: D: 1207 | H: 5

Expand

CCP001/208.034

Trays in process

Order: 80053

Lenses: 87707

Production: D: 1125 | H: 70

Expand

CCP002/208.035

Lack of consumables

Order: 73317

Lenses: 58387

Production: D: 875 | H: 36

Expand

CCP003/208.031

Trays in process

Order: 72602

Lenses: 60114

Production: D: 869 | H: 3

Expand

CCL001/433.009

Trays in process

Order: 73703

Act. order:

Expand

DBA001/

Trays in process

Act. order:

Expand

TSA001/

Trays in process

Act. order:

Expand

LCU001/

Trays in process

Act. order:

Expand

SWA001/

Trays in process

Act. order:

Expand

HSE001/131.003

Trays in process

Order: 71490

Expand

HSE002/131.004

Trays in process

Order: 71490

Expand

CCU001/325.012

Last event
16.06.2015 07:29:38: Tray(s) in process

Blockpiece magazine 7 / 10

Machine status Process data **Messages** Maintenance

Time	Message	Order
21.05.2015 23:59:58	Tray(s) in process	93427/L
21.05.2015 23:59:50	Tray(s) in process	93427/L
21.05.2015 23:59:43	Tray(s) in process	93427/R
21.05.2015 23:59:26	Tray(s) in process	93427/R
21.05.2015 23:59:22	Tray(s) in process	92530/L
21.05.2015 23:58:57	Tray(s) in process	92530/L
21.05.2015 23:58:49	Tray(s) in process	92530/R
21.05.2015 23:58:49	Waiting for trays	
21.05.2015 23:58:45	Tray(s) in process	92530/R
21.05.2015 23:58:39	Waiting for trays	
21.05.2015 23:58:34	Initialization in progress...	
21.05.2015 23:57:28	Automatic mode has been aborted!	92946/R
21.05.2015 23:57:23	Automatic mode has been aborted!	92413/L

Show only error messages

Time span from 22.04.2015 00:00:00 to 22.05.2015 00:00:00 (1m, 0d, 0h) daily Accept

Ready

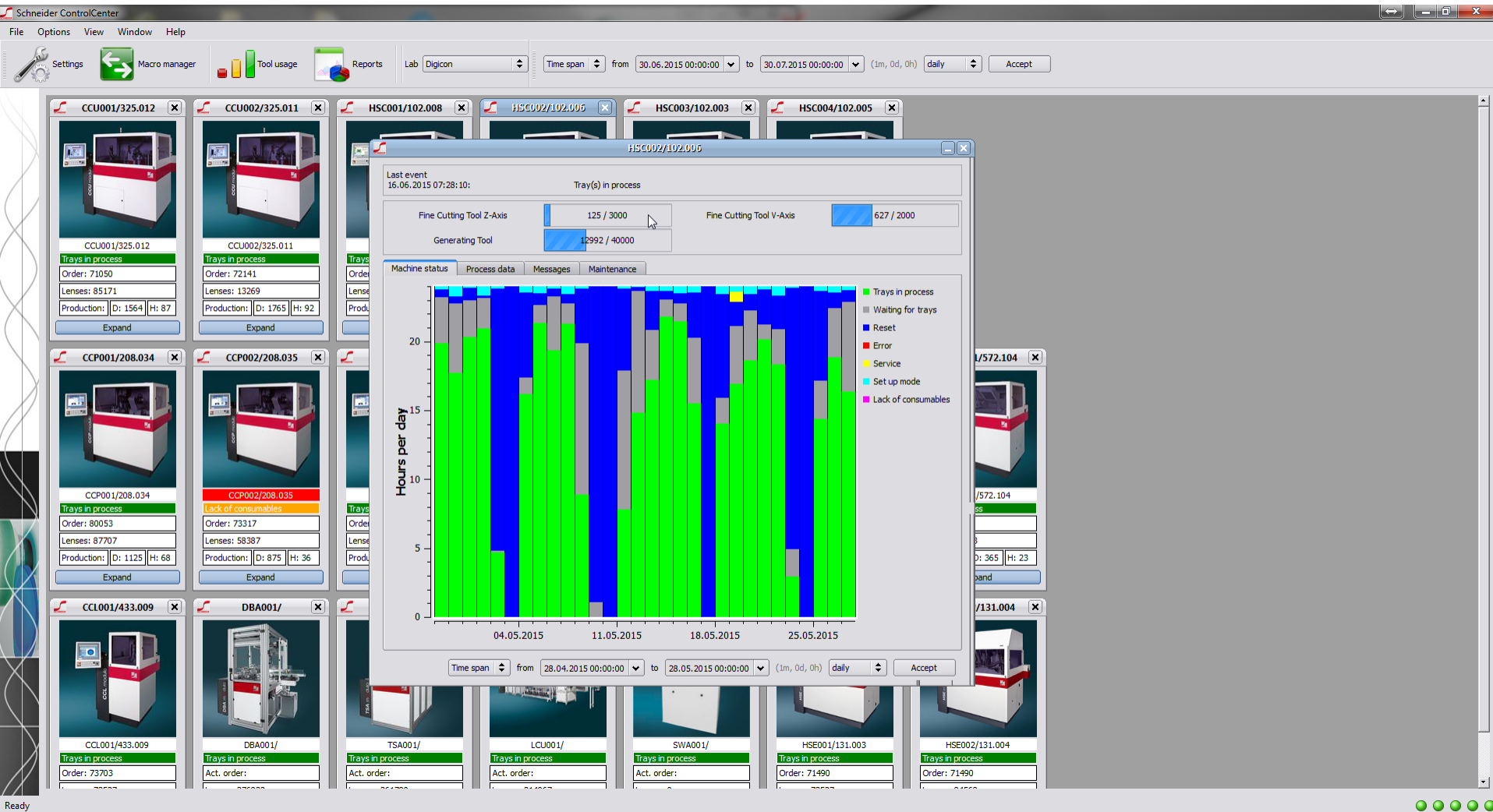


CC - Throughput Statistics

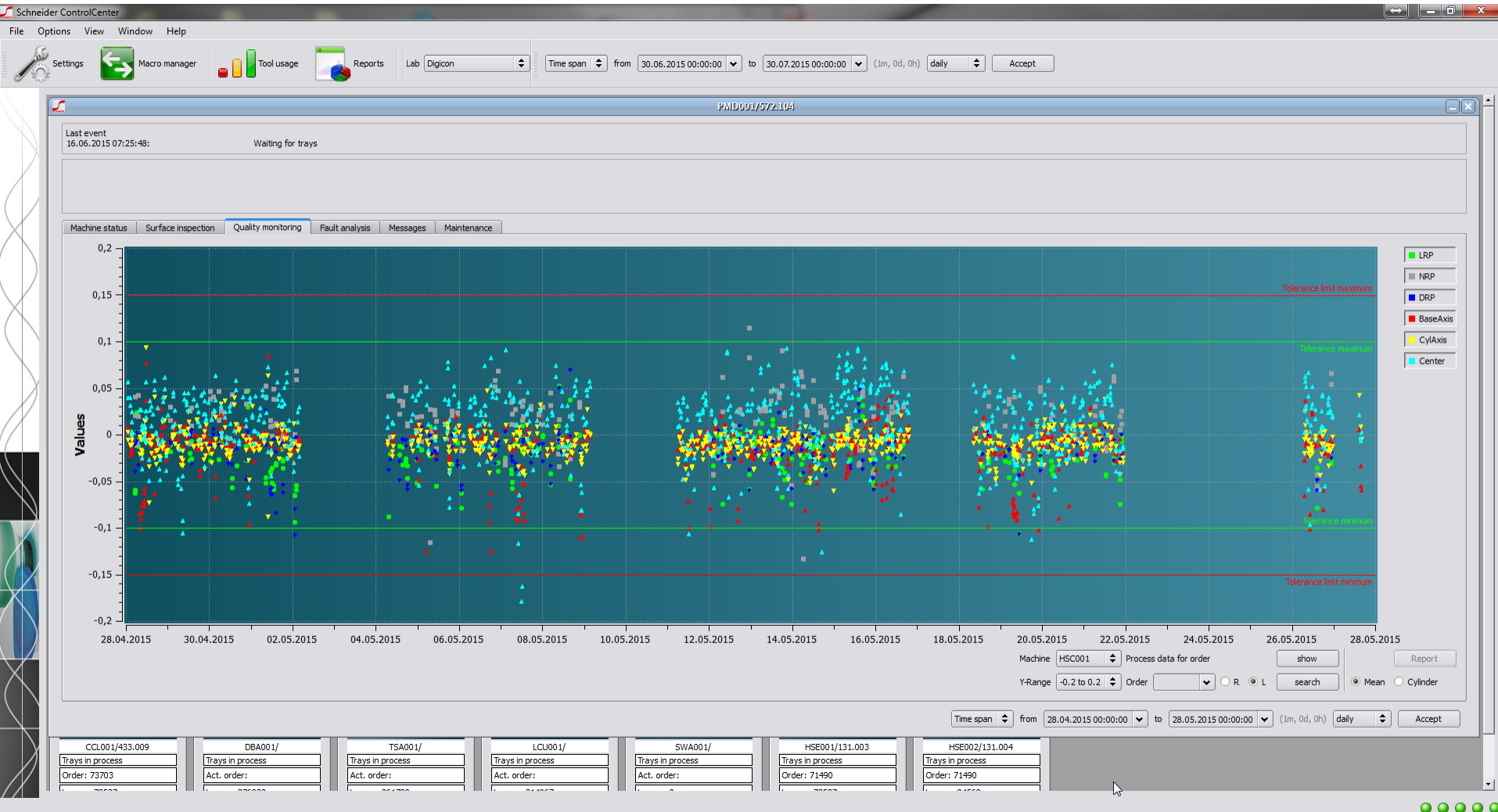


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CC – Capacity Utilization



CC – Quality Inspection



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CC – Consumable Statistics

Schneider ControlCenter

File Options View Window Help

Settings Macro manager Tool usage Reports Lab Digicon Time span from 30.06.2015 00:00:00 to 30.07.2015 00:00:00 (1m, 0d, 0h) daily Accept

CCU001/325.012

Trays in process

Order: 71050

Lenses: 85171

Production: D: 1564 H: 94

Expand

CCU002/325.011

Trays in process

Order: 72141

Lenses: 13269

Production: D: 1765 H: 94

Expand

HSC001/102.008

Trays in process

Order: 72010

Lenses: 113629

Production: D: 1207 H: 54

Expand

HSC002/102.006

HSC003/102.003

HSC004/102.005

CCP001/208.034

Trays in process

Order: 80053

Lenses: 87707

Production: D: 1125 H: 68

Expand

CCP002/208.035

Lack of consumables

Order: 73317

Lenses: 58387

Production: D: 875 H: 36

Expand

CCP003/208.031

Trays in process

Order: 72602

Lenses: 60114

Production: D: 869 H: 34

Expand

CCL001/433.009

Trays in process

Order: 73703

DBA001/

Trays in process

Act. order:

TSA001/

Trays in process

Act. order:

LCU001/

Trays in process

Act. order:

SWA001/

Trays in process

Act. order:

HSE001/131.003

Trays in process

Order: 71490

HSE002/131.004

Trays in process

Order: 71490

CCP002/208.035

Last event: 16.06.2015 07:25:20: Set up mode

Machine status Process data **Tool wear statistics** Messages Tool status Maintenance

Date	Tool Count	Label
13.04.2015	23	CW 15
20.04.2015	25	CW 16
27.04.2015	10	CW 17
04.05.2015	4	CW 18
04.05.2015	21	CW 19

Tool type: Fine Polishing tool 'Black Pad' Pad radius: 75

Time span from 08.04.2015 00:00:00 to 08.05.2015 00:00:00 (1m, 0d, 0h) daily Accept

Ready



CC – Process Parameter Control

Schneider ControlCenter

File Options View Window Help

Settings Macro manager Tool usage Reports Lab Digicon Time span from 30.06.2015 00:00:00 to 30.07.2015 00:00:00 (1m, 0d, 0h) daily Accept

CCU001/325.012

Trays in process

Order: 71050
Lenses: 85171
Production: D: 1564 | H: 96

Expand

CCU002/325.011

Trays in process

Order: 72141
Lenses: 13269
Production: D: 1765 | H: 95

Expand

HSC001/102.008

Trays in process

Order: 72010
Lenses: 113629
Production: D: 1207 | H: 3

Expand

HSC002/102.006

Trays in process

HSC003/102.003

Trays in process

HSC004/102.005

Trays in process

CCP001/208.034

Trays in process

Order: 80053
Lenses: 87707
Production: D: 1125 | H: 68

Expand

CCP002/208.035

Lack of consumables

Order: 73317
Lenses: 58387
Production: D: 875 | H: 35

Expand

CCP003/208.031

Trays in process

Order: 72602
Lenses: 60114
Production: D: 869 | H: 3

Expand

CCL001/433.009

Trays in process

Order: 73703

Expand

DBA001/

Trays in process

Act. order:

Expand

TSA001/

Trays in process

Act. order:

Expand

LCU001/

Trays in process

Act. order:

Expand

SWA001/

Trays in process

Act. order:

Expand

HSE001/131.003

Trays in process

Order: 71490

Expand

HSE002/131.004

Trays in process

Order: 71490

Expand

CCU001/325.012

Last event: 16.06.2015 07:29:38: Tray(s) in process

Blockpiece magazine: 7 / 10

Machine status Process data Messages Maintenance

Alloy temperatur
Cooling temperature station 1
Cooling temperature station 2
Cooling temperature station 3
Cooling flow

Values

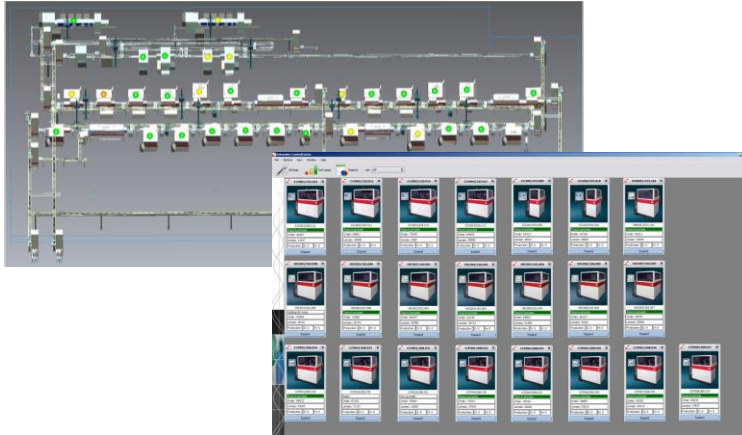
27.04.2015 04.05.2015 11.05.2015 18.05.2015

Time span from 22.04.2015 00:00:00 to 22.05.2015 00:00:00 (1m, 0d, 0h) daily Accept

Ready



Perspective of Line Driver

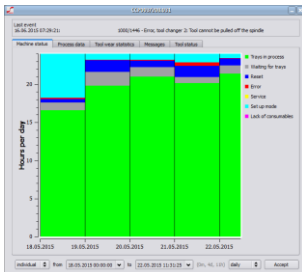


Lab Overview

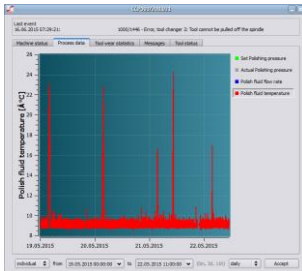
- _ Monitoring of entire production line
- _ Detailed information about machine status
- _ Immediate notification in case of failure, low response time

Machine details

- _ Productivity statistic
- _ Tool lifetime monitoring
- _ Process data visualization
- _ Alarm message history

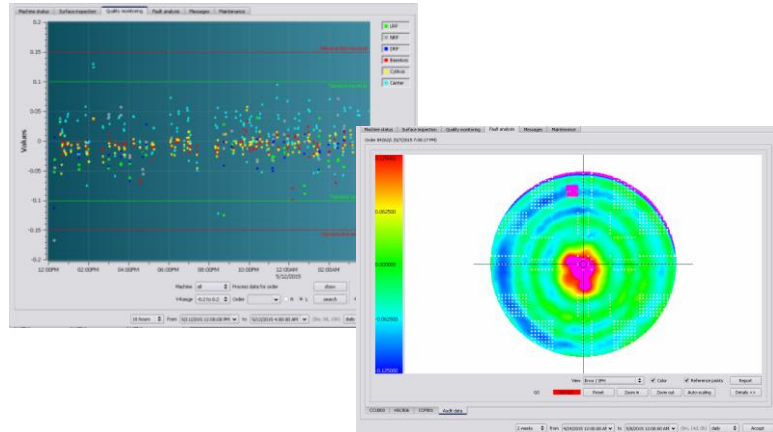
A table showing productivity statistics for Left and Right magazines. The columns are Type, Standing time, and Type. The rows list various machine models and their corresponding standing times.

Left magazine			Right magazine		
Type	Standing time	Type	Standing time	Type	Standing time
8 R075	91 / 1000	8 R075	70 / 1000		
8 R120	70 / 1000	8 R120	160 / 1000		
8 R000	20 / 1000	8 R000	1453 / 1000		
PA02 R015	21 / 1000	PA02 R015	21 / 1000		
PA02 R030	1033 / 1000	PA02 R030	2108 / 1000		
PA02 R060	6967 / 1000	PA02 R060	7967 / 1000		
PI1 R075	401 / 1000	PI1 R075	524 / 1000		
PI1 R120	617 / 1000	PI1 R120	698 / 1000		
PI1 R000	1429 / 1000	PI1 R000	467 / 1000		
PA1 R075	360 / 1000	PA1 R075	167 / 1000		
PI1 R120	2361 / 1000	PI1 R120	2222 / 1000		
PI1 R000	767 / 1000	PI1 R000	1028 / 1000		

A table showing alarm message history. The columns are Time, Message, and Code. The rows list various alarm messages and their corresponding codes.

Time	Message	Code
22.05.2015 10:58:09	Tray() in process	002615
22.05.2015 10:58:09	Tray() in process	002616
22.05.2015 10:58:06	Tray() in process	002515
22.05.2015 10:58:06	Tray() in process	002516
22.05.2015 10:58:03	Tray() in process	002615
22.05.2015 10:58:03	Tray() in process	002616
22.05.2015 10:48:57	Tray() in process	040215
22.05.2015 10:48:57	Tray() in process	040216
22.05.2015 10:47:20	Tray() in process	002615
22.05.2015 10:47:20	Tray() in process	002616
22.05.2015 10:44:11	Tray() in process	002615
22.05.2015 10:44:11	Tray() in process	002616
22.05.2015 10:44:11	Tray() in process	002615
22.05.2015 10:44:11	Tray() in process	002616

Perspective of Quality Manager



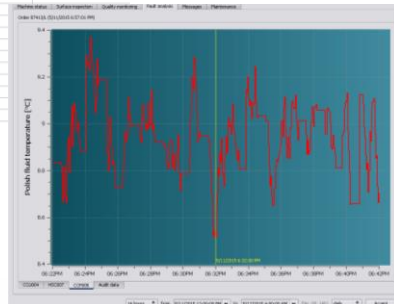
Quality monitoring

- _ Implemented quality control using an inline measurement system (PMD Modulo)
- _ Immediate detection of quality drifts

Troubleshooting

- _ Tracking of jobs using the Order History
- _ Root cause analysis based on measurements, process data and error messages

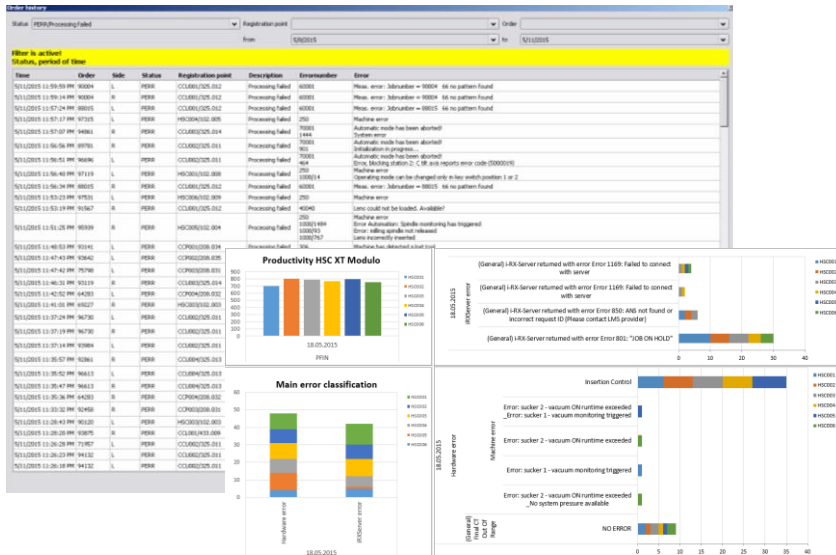
Time	Order	Side	Status	Registration point	Description	Errornumber	Error
5/11/2015 11:14:29 AM	7952	B	PPN	DNL001	Order finished		
5/11/2015 10:46:56 AM	7952	B	SCIT	DNL002	Surface finished		
5/11/2015 10:09:16 PM	7952	L	CNP	DNL001	Manually Inspected		
5/11/2015 10:09:16 PM	7952	R	CNP	DNL001	Manually Inspected		
5/11/2015 9:54:21 PM	7952	R	PPN	PH0001072.104	Processing finished		
5/11/2015 9:53:47 PM	7952	L	PPN	PH0001072.104	Processing finished	104	NOIS: Deviation exceeds limit
5/11/2015 9:52:01 PM	7952	L	SNP	PH0001072.104	Surface Inspection		
5/11/2015 9:52:01 PM	7952	R	SNP	PH0001072.104	Surface Inspection		
5/11/2015 9:37:19 PM	7952	B	TRAN	DNL003			
5/11/2015 9:27:46 PM	7952	B	TRAN	DNL002			
5/11/2015 9:26:36 PM	7952	L	PPN	CO0906208.003	Processing finished		
5/11/2015 9:26:36 PM	7952	R	PPN	CO0906208.003	Processing finished		
5/11/2015 9:20:58 PM	7952	L	SPCL	CO0906208.003	Surface Finisher		
5/11/2015 9:20:58 PM	7952	R	SPCL	CO0906208.003	Surface Finisher		
5/11/2015 7:43:38 AM	7952	L	PPN	HSC003102.003	Processing finished		
5/11/2015 7:43:40 AM	7952	R	PPN	HSC003102.003	Processing finished		
5/11/2015 7:42:12 AM	7952	L	SGEN	HSC003102.003	Surface Generator		
5/11/2015 7:40:53 AM	7952	R	SGEN	HSC003102.003	Surface Generator		
5/11/2015 7:22:05 AM	7952	B	TRAN	DNL002			
5/11/2015 6:39:47 AM	7952	L	CHK	DNL001	Manually Blocked		
5/11/2015 6:39:47 AM	7952	R	CHK	DNL001	Manually Blocked		



Perspective of Service Manager

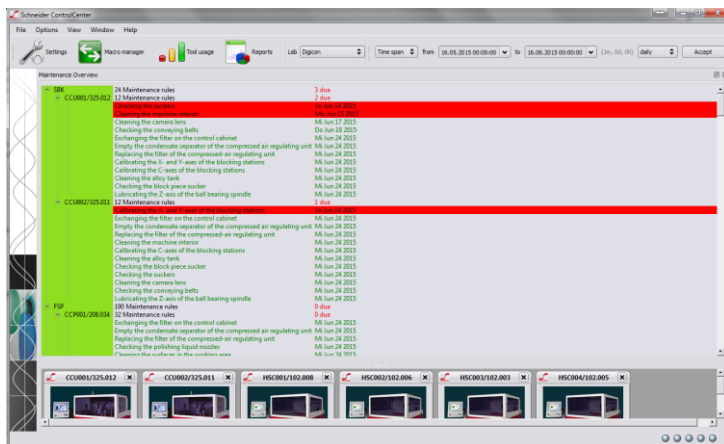
Order History

- _ Database of all occurred error messages
- _ Export function for statistical analysis (e.g. Excel)



Maintenance Overview

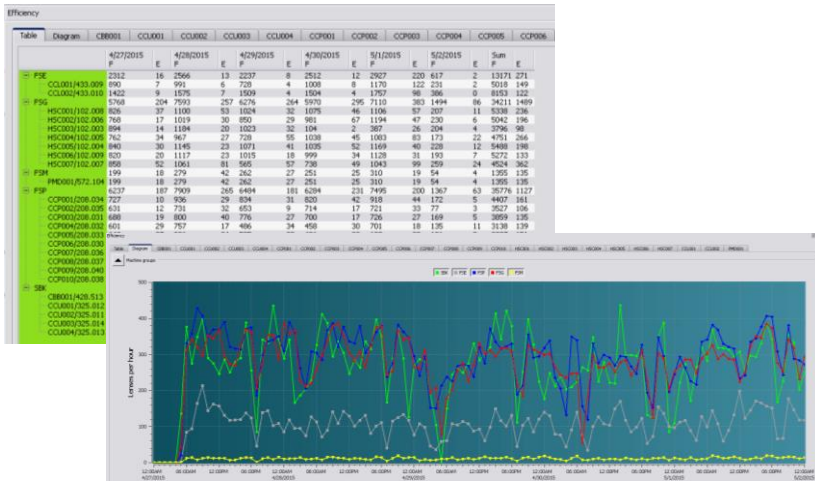
- _ Scheduling and follow-up of preventive maintenance tasks



Perspective of Lab Manager

Efficiency

- Full overview of productivity of single machines or machine groups
- Monitoring of goals in individual time intervals
- Statistic of e.g. material mix, surface type and cribbing shape for every machine



Modulo Answers the Challenges Head on!

- ✓ Real time process control data (Baumé, polish flow and temp, etc.)
- ✓ Data storage / logging
- ✓ Smart tray routing
- ✓ In line quality verification / Preventative Quality Monitoring – know before you make a bad lens
- ✓ Getting correct info to correct job function i.e. maintenance info to maintenance tech, production data to lab manager
- ✓ Centralized Data Collection and Real Time Analysis of both machines and process



More to Come as Modulo evolves

CMMS Modulo –

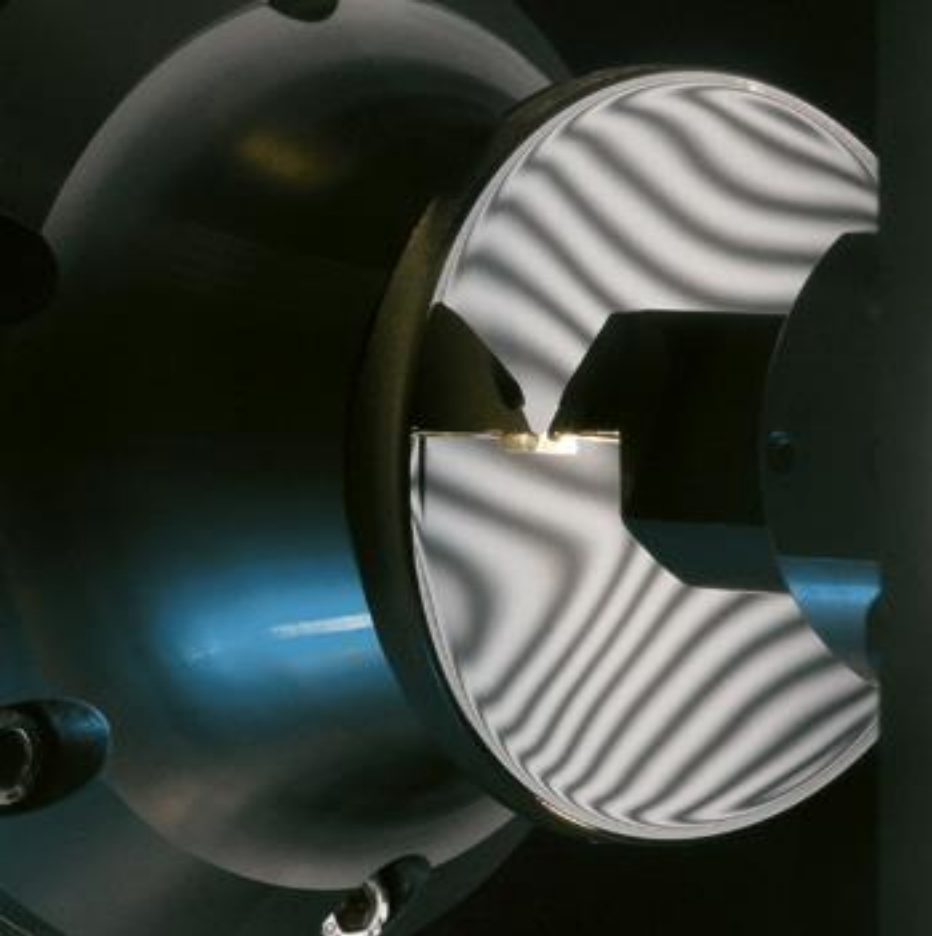
Computerized Maintenance Management System

- On board Preventative Maintenance videos
- PM status reporting and accountability with tracking system
- Reactive Maintenance tools for fastest resolution
- Machines will come with a tablet instead of book based manual – completely interactive manual and tools for each machine / line
- Available Q3/Q4 2017

Industry 4.0 and Beyond...Modulo Delivers Today



Fascination for Innovation



Thank You!

DigiCon 2017

May 10-12

Frisco, TX

www.schneider-om.com/digicon



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