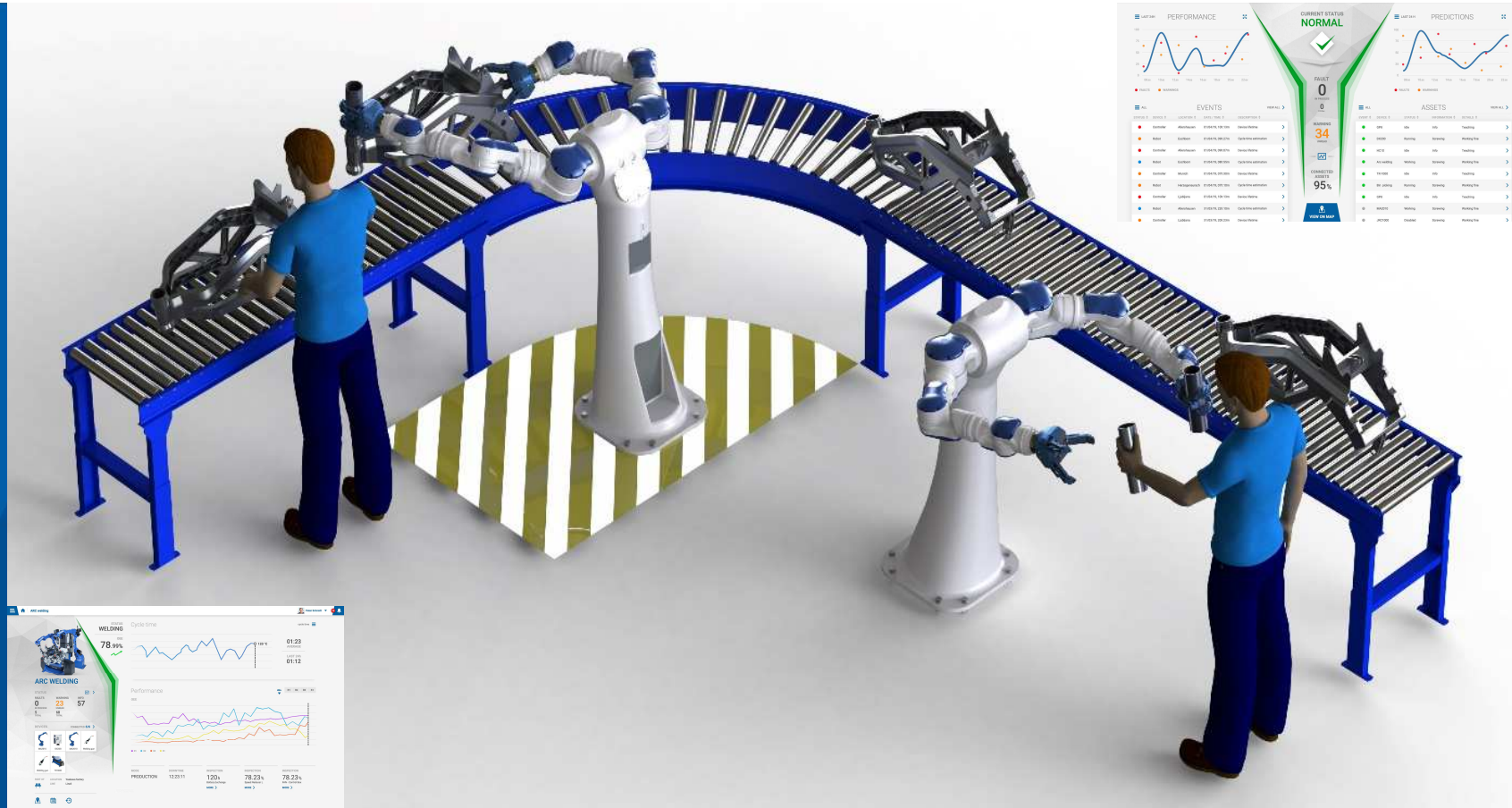


YASKAWA



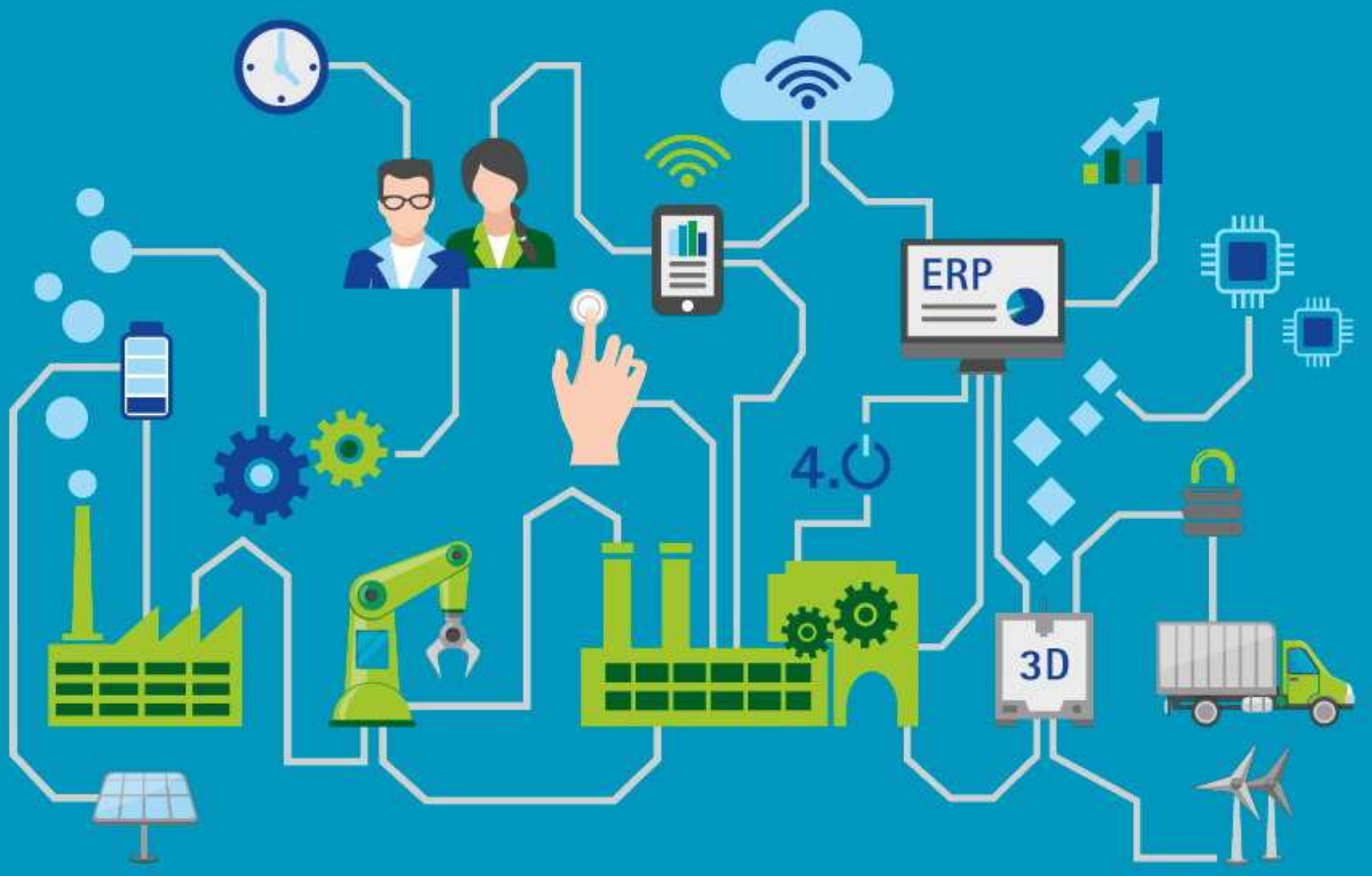
SMART, COLLABORATIVE, INTELLIGENT ROBOTS IN A DIGITAL FACTORY – DREAM AND REALITY

13. Deutsch-Japanisches Wirtschaftsforum, 3. April 2019, Hannover

Dr.-Ing. Michael Klos, YASKAWA Europe GmbH

THIS IS WHAT WE TALK ABOUT

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AND THIS IS WHAT PEOPLE UNDERSTAND...



INDUSTRY 4.0 – SO MANY QUESTIONS



```
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```

- Will computers take control over my production?
- How can a production system optimize itself without me?
- Who will make all those decisions in real time ?
- How to handle the tons of data ?
- Do I need millions of sensors producing billions of data?
- Collecting data is not intelligent decision making !
- Who grants for Process Stability ?
- Where to start resolving error states ?
- Who grants for data security ?
- Who can visualize tons of data in a proper way ?
- Who is leading the Data Revolution“? IT-Gang? Can I trust them?
- And who is taking the risk ?
- Oh God, I have to replace operators with IT nerds ?
- What is the real benefit for my company and customers ?
- Will my customer ever pay for all those efforts ?
- Is this all really „lean“ ?

.....

INDUSTRY 4.0 – SO MANY QUESTIONS



But I just have 2 wishes !?!?

**Error free
production**

**Quickly recover from
production stops**

FROM „SMALL DATA“ TO „BIG DATA“



Smart Factory PERFORMANCE

UPTIME

30.5 31.5 1.6 2.6 3.6 4.6 5.6

- Aggregate & Display Data
- ⇒ strong KPIs
- ⇒ statistical interpretation
- ⇒ manual interventions

„Big Data“

Ihre Roboterschweißanlage YASKAWA

✓ Läuft Artikel: 100003 UVH150 Auto Union 12:43 23.11.2017

0 3 Nachschub Auslastung Gas

Fortschritt: 46 % Laufzeit: 1:03 h Takt: 2:02 min Stückzahl: 345

16 min 840 45 846

5,1 l/min +3,4 % Druckluft 5,14 l/min -0,1 % Leistung 6,4 kVA +1,3 %

- Display Data
- ⇒ Interfacing
- ⇒ Some KPI
- ⇒ manual interpretation
- ⇒ manual interventions

„Small Data“

PREDICTIONS YASKAWA

100 75 50 25 0

5.6 6.6 7.6 8.6 9.6 10.6

- Drive Process using Data
- ⇒ Powerful KPIs
- ⇒ automatic, intelligent evaluation and predictions
- ⇒ automatic interventions supported by AI

„Big Data & AI“

HOW IS MY FACTORY RUNNING ?



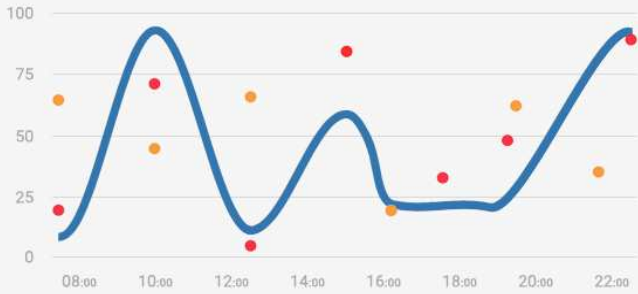
Peter Schmidt

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YASKAWA
COCKPIT

Yaskawa smart factory

LAST 24H PERFORMANCE



● FAULTS ● WARNINGS

CURRENT STATUS
NORMAL



FAULT

0

IN PROCESS

0

TOTAL

WARNING

34

UNREAD

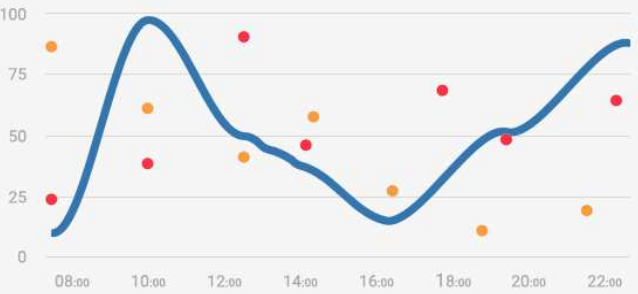


CONNECTED
ASSETS

95%

VIEW ON MAP

LAST 24H PREDICTIONS



● FAULTS ● WARNINGS

ALL EVENTS VIEW ALL >

STATUS	DEVICE	LOCATION	DATE / TIME	DESCRIPTION
●	Controller	Allershhausen	01/04/19, 10h:13m	Device lifetime >
●	Robot	Eschborn	01/04/19, 09h:27m	Cycle time estimation >
●	Controller	Allershhausen	01/04/19, 09h:07m	Device lifetime >
●	Robot	Eschborn	01/04/19, 08h:55m	Cycle time estimation >
●	Controller	Munich	01/04/19, 07h:30m	Device lifetime >
●	Robot	Herzogenaurach	01/04/19, 07h:10m	Cycle time estimation >
●	Controller	Ljubljana	01/04/19, 10h:13m	Device lifetime >
●	Robot	Allershhausen	31/03/19, 22h:10m	Cycle time estimation >
●	Controller	Ljubljana	31/03/19, 20h:23m	Device lifetime >

ALL ASSETS VIEW ALL >

EVENT	DEVICE	STATUS	INFORMATION	DETAILS
●	GP8	Idle	Info	Teaching >
●	DX200	Running	Screwing	Working fine >
●	HC10	Idle	Info	Teaching >
●	Arc welding	Working	Screwing	Working fine >
●	TR-1000	Idle	Info	Teaching >
●	Bin picking	Running	Screwing	Working fine >
●	GP8	Idle	Info	Teaching >
●	MA2010	Working	Screwing	Working fine >
●	JRC1000	Disabled	Screwing	Working fine >

DOES THE BOTTLE NECK ARC WELDING CELL WORK PROPERLY ?



Peter Schmidt

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STATUS
WELDING

OEE
78.99%



Cycle time

cycle time



01:23
AVERAGE

LAST 24h
01:12

ARC WELDING

STATUS

0 IN PROCESS 5 TOTAL	WARNING 23 UNREAD 68 TOTAL	INFO 57
--------------------------------------	---	----------------

DEVICES CONNECTED 6/6

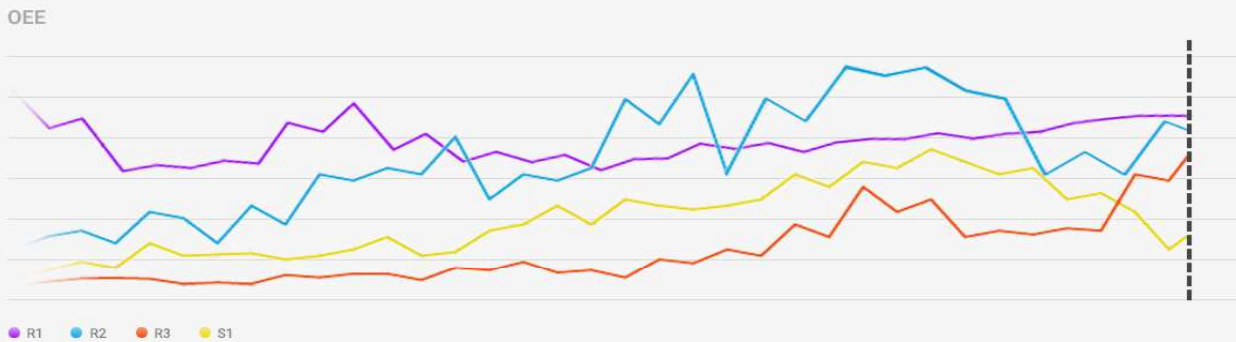
MA2010	DX200	MA2010	Welding gun
Welding gun	TR1000		

PART OF LOCATION Yaskawa factory
LINE Line3



Performance

ALL R1 R2 R3 S1



MODE PRODUCTION	DOWNTIME 12:23:11	INSPECTION 120h Battery Exchange MORE >	INSPECTION 78.23% Speed Reducer L MORE >	INSPECTION 78.23% FAN - Control Box MORE >
---------------------------	----------------------	--	---	---

ARE THE COMPONENTS IN GOOD CONDITION?



Peter Schmidt

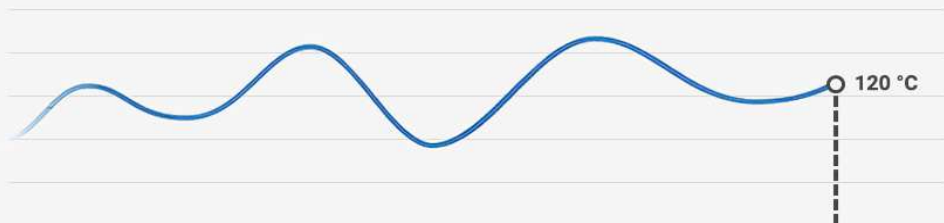
16



STATUS
WELDING

OEE
78.99%

Cycle time



benchmark

01:23
AVERAGE

LAST 24h
01:12

WELDING

MODEL TYPE 1-06VX8-A0*(GP8)

STATUS

0 FAULTS IN PROCESS 5 TOTAL	23 WARNING UNREAD 68 TOTAL	57 INFO
--	---	-------------------

DEVICES CONNECTED 2/2



PART OF LOCATION Yaskawa factory
LINE Line3
CELL Arc welding cell



Predictive

INSPECTION

BATTERY EXCHANGE 1.000 h

Design lifetime: 2300h Expected Date: 23.6.2018

- WIRE HARNES EXCHANGE
- GREASE SUPPLY
- BATTERY EXCHANGE**
- GREASE EXCHANGE
- EXCHANGE OVERHAUL

HARDWARE COMPONENTS LIFE TIME

SPEED REDUCER

S L U R B T

L Notice time: 1.000 h

Time to replace: 2300h Expected Date: 23.6.2018

- SPEED REDUCER**
- APLIFIER
- MOTOR
- CONTROL BOX FAN
- MANIPULATOR FAN
- REGENERATION FAN
- OPS FAN

NOTIFY ME IMMEDIATELY IN CASE OF PROBLEMS !



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YASKAWA
COCKPIT

Yaskawa smart factory



CURRENT STATUS PRODUCTION STOP



FAULT

1

IN PROCESS

5

TOTAL

WARNING

34

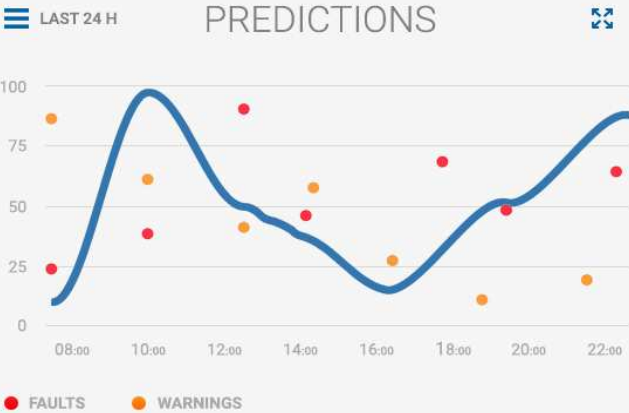
UNREAD



CONNECTED
ASSETS

95%

VIEW ON MAP



ALL EVENTS [VIEW ALL >](#)

STATUS	DEVICE	LOCATION	DATE / TIME	DESCRIPTION
●	Controller	Allershausen	01/04/19, 10h:13m	Device lifetime >
●	Robot	Eschborn	01/04/19, 09h:27m	Cycle time estimation >
●	Controller	Allershausen	01/04/19, 09h:07m	Device lifetime >
●	Robot	Eschborn	01/04/19, 08h:55m	Cycle time estimation >
●	Controller	Munich	01/04/19, 07h:30m	Device lifetime >
●	Robot	Herzogenaurach	01/04/19, 07h:10m	Cycle time estimation >
●	Controller	Ljubljana	01/04/19, 10h:13m	Device lifetime >
●	Robot	Allershausen	31/03/19, 22h:10m	Cycle time estimation >
●	Controller	Ljubljana	31/03/19, 20h:23m	Device lifetime >

ALL ASSETS [VIEW ALL >](#)

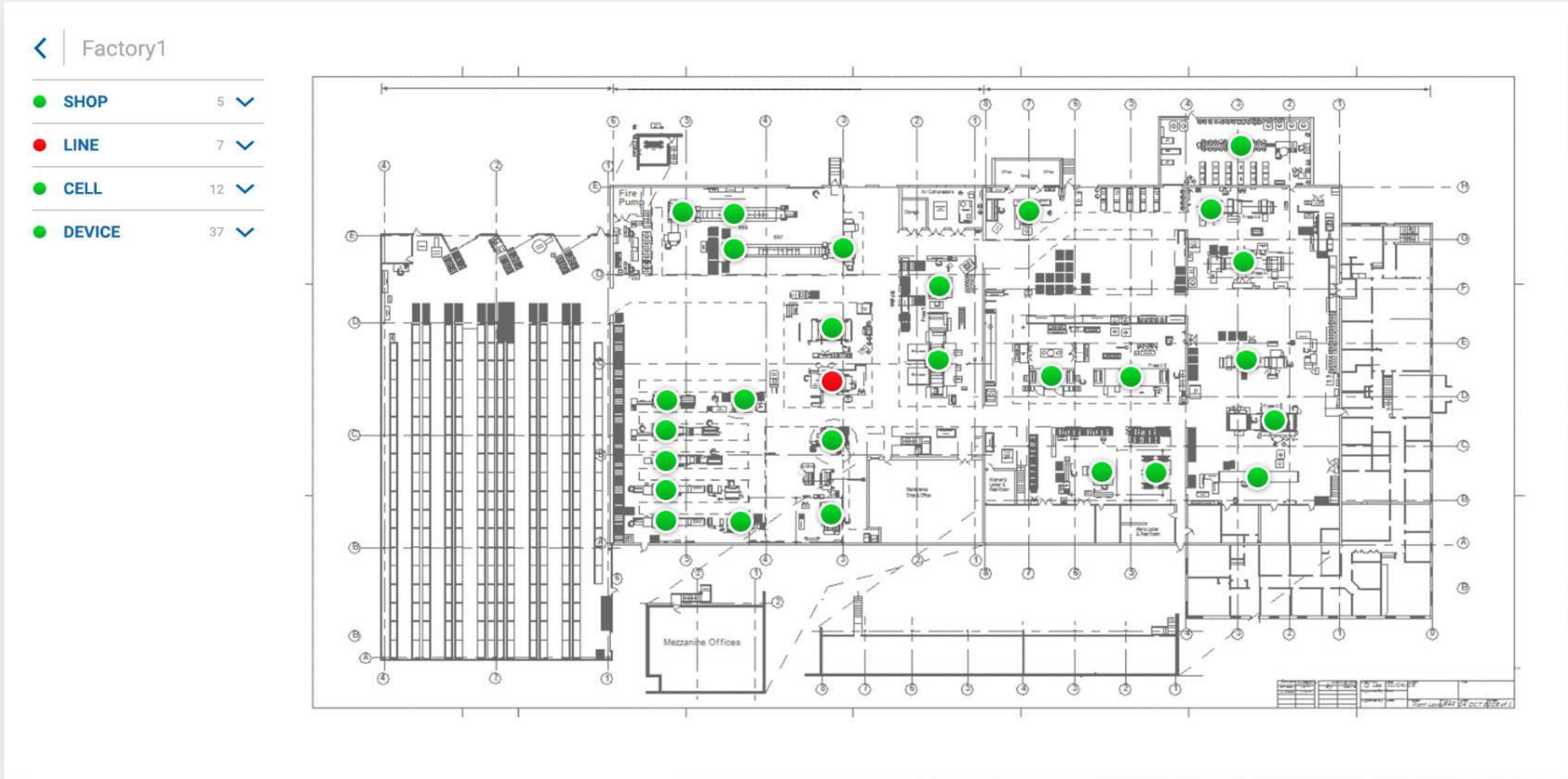
EVENT	DEVICE	STATUS	INFORMATION	DETAILS
●	GP8	Idle	Info	Teaching >
●	DX200	Running	Screwing	Working fine >
●	HC10	Idle	Info	Teaching >
●	Arc welding	Working	Screwing	Working fine >
●	TR-1000	Idle	Info	Teaching >
●	Bin picking	Running	Screwing	Working fine >
●	GP8	Idle	Info	Teaching >
●	MA2010	Working	Screwing	Working fine >
●	JRC1000	Disabled	Screwing	Working fine >

WHERE IS THE PROBLEM ?



Map

100%



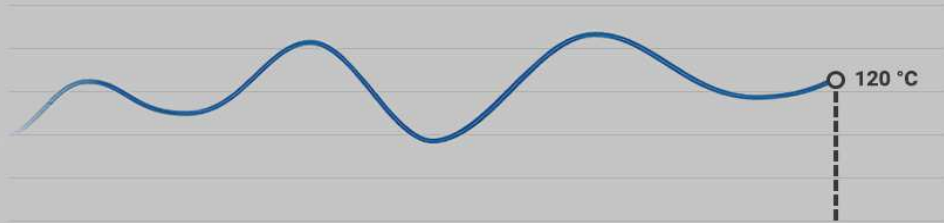
WHICH COMPONENT CAUSES THE PROBLEM ?



STATUS
WELDING

OEE
78.99%

Cycle time



benchmark

01:23
AVERAGE

LAST 24h
01:12

WELDING
MODEL TYPE 1-06VX8-A0*(GP8)



FAULT

SYSTEM ERROR
No response was sent from the YCP01 board when the control power turned ON.
01.04.2019 / 12:24:11

REVIEW

STATUS

FAULTS	WARNING	INFO
1	23	57
IN PROCESS	UNREAD	
5	68	
TOTAL	TOTAL	

DEVICES CONNECTED 2/2

DX200	Welding gun

PART OF LOCATION Yaskawa factory

LINE Line3

CELL Arc welding cell

INSPECTION

BATTERY EXCHANGE 1.000 h

Design lifetime: 2300h Expected Date: 23.6.2018

HARDWARE COMPONENTS LIFE TIME

SPEED REDUCER

S L U R B T

● ● ● ● ● ●

L Notice time: 1.000 h

Time to replace: 2300h Expected Date: 23.6.2018

- WIRE HARNES EXCHANGE ●
- GREASE SUPPLY ●
- BATTERY EXCHANGE** ●
- GREASE EXCHANGE ●
- EXCHANGE OVERHAUL ●
- SPEED REDUCER** ●
- APLIFIER ●
- MOTOR ●
- CONTROL BOX FAN ●
- MANIPULATOR FAN ●
- REGENERATION FAN ●
- OPS FAN ●

GIVE ME MATERIAL TO FIX THE PROBLEM !



STATUS
WELDING

OEE
78.99%



WELDING
MODEL TYPE 1-06VX8-A0*(GP8)

STATUS

0 IN PROCESS 5 TOTAL	WARNING 23 UNREAD 68 TOTAL	INFO 57
--------------------------------------	---	--------------------------

DEVICES CONNECTED 2/2

DX200	Welding gun
-------	-------------

PART OF LOCATION Yaskawa factory
LINE Line3
CELL Arc welding cell



Log files

NEW SCHEDULE

TYPE

- JOB
- FILE / GENERAL DATA**
- PARAMETER
- I/O DATA SYSTEM
- DATA SYSTEM BACKUP
- ALL SINGLE FILES BACKUP

AVAILABLE

- Tool data
- Weaving data
- User coordinate data
- Variable data
- Variable data
- User coordinate data
- Variable data
- User coordinate data

ACTIVE BACKUPS

#	NAME	FILE TYPE	REPEAT	LAST UPDATE	
1	Daily backup - 2019 to 2020	DAT	every day	14.01.19 - 13:31:23	
2	Weekly backup - 2018 to 2019	DAT	every week	15.01.19 - 12:00:18	
3	Monthly backup - 2018 to 2019	DAT	every month	01.01.19 - 13:31:23	
4	Yearly backup - 2017 to 2022	DAT	every year	011.01.19 - 12:00:18	

EFFICIENT SCHEDULING OF MY MAINTENANCE STAFF



Peter Schmidt

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Calendar

April 2019						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
28	29	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

From 06. to 12. April 2019

STATUS	DESCRIPTION	CREATOR	DATE/TIME
CREATED	Predictive Maintenance GP8 - JP1234 (Welding cell 1)	AUTO	04/06/2019 12:00 - 16:00
DELETED	Inspection - Yaskawa Maintenance MA2010 (Welding cell 1)	SCHEDULED	04/06/2019 12:00 - 16:00
COMPLETED	Service and part replacement GP7 (Welding cell 1)	USER	04/06/2019 12:00 - 16:00
CREATED	Fault - (Description) GP8 (Welding cell 1)	AUTO	04/07/2019 12:00 - 16:00
DELETED	HW - End of life GP8 (Welding cell 1)	SCHEDULED	04/07/2019 12:00 - 16:00
DOWNLOAD	New SW patch GP8 (Welding cell 1)	USER	04/07/2019 12:00 - 16:00
CREATED	Predictive Maintenance GP8 - JP1234 (Welding cell 1)	AUTO	04/08/2019 12:00 - 16:00
CREATED	Inspection - Yaskawa Maintenance MA2010 (Welding cell 1)	AUTO	04/08/2019 12:00 - 16:00
DELETED	Service and part replacement GP7 (Welding cell 1)	SCHEDULED	04/09/2019 12:00 - 16:00
CREATED	Predictive Maintenance GP8 - JP1234 (Welding cell 1)	AUTO	04/09/2019 12:00 - 16:00
DOWNLOAD	Service and part replacement GP7 (Welding cell 1)	USER	04/09/2019 12:00 - 16:00
DELETED	Inspection - Yaskawa Maintenance MA2010 (Welding cell 1)	AUTO	04/10/2019 12:00 - 16:00
CREATED	HW - End of life GP8 (Welding cell 1)	USER	04/10/2019 12:00 - 16:00

FAULT - (Description)

DATE / TIME: 04072019 / 12:24:11
 NAME: SYSTEM ERROR
 EVENT: FAULT
 SOURCE: GP8
 NAME.: Goofy
 CODE: 12345
 LOCATION: Allershausen
 SIMILAR DEVICE: 12
 DIFFERENT DEVICE: 23

STATUS: IN PROGRESS
 DOWNTIME: 5H:12M:24S
 PART OF:



REVIEW

PREDICTIVE MAINTENANCE	3	ON
INSPECTION		OFF
WARRANTY	1	ON
FAULT	3	ON
WARNING	2	ON
INFORMATION	5	ON
EVENT	1	ON
LOG FILE		OFF
TASK	3	ON
NOTE	2	ON

MAN ROBOT COLLABORATION – CYCLE TIME CONTROL

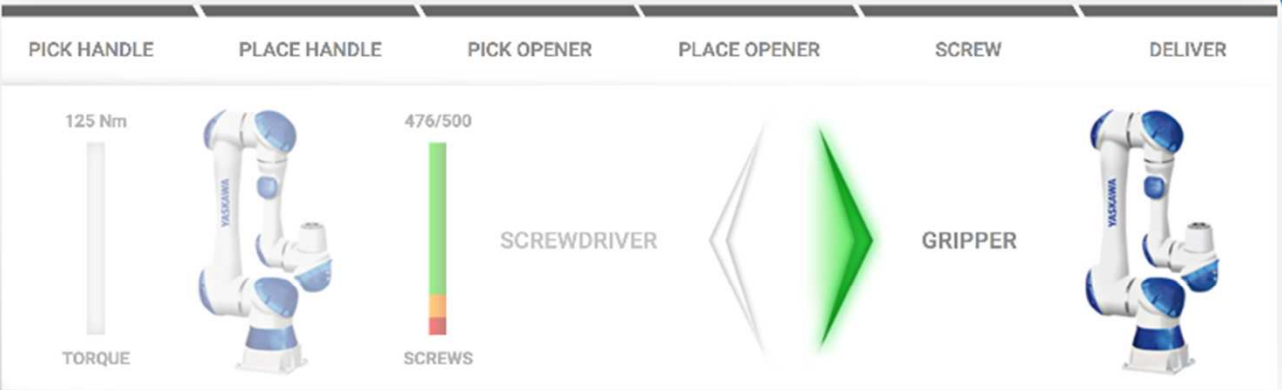
YASKAWA COCKPIT

Yaskawa Cockpit / Smart Factory / Bottle Opener

Bottle Opener Cell View



IDLE
0s

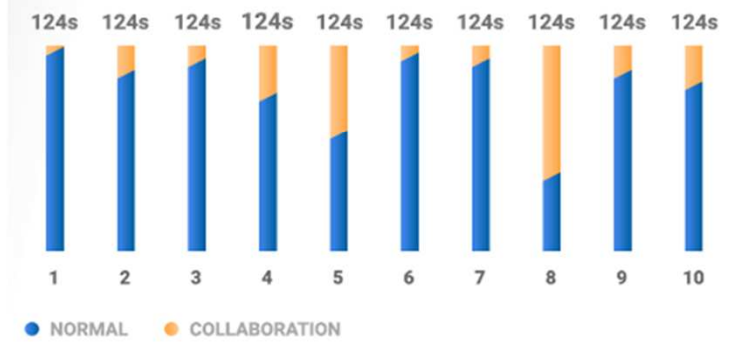


CONNECTED

CYCLE TIMES

2m 19s
AVERAGE

1m 0s
MINIMUM



STATUS

FAULT **8** / 6 REVIEWED / 0 IN PROGRESS

WARNING **2** / 2 REVIEWED / 0 IN PROGRESS

INFORMATION **0** / 0 REVIEWED / 0 IN PROGRESS

YASKAWA DEVICES

Gripper Screwdriver [VIEW ON MAP](#)

LOCATION: Hannover Messe
CELL: Bottle Opener

NOTIFICATION **10**

SCHEDULE **3**

SETTINGS [MORE >](#)

YASKAWA

LIVE DEMO

MAP

REVIEW

WARNING

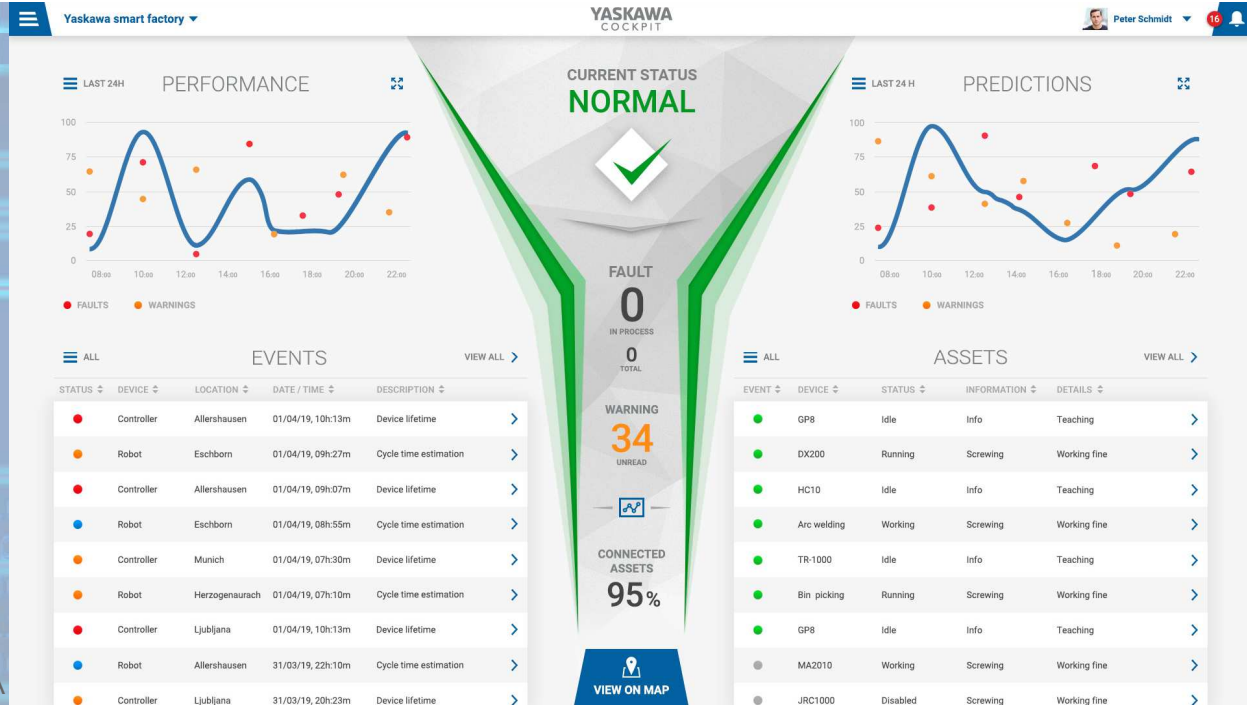
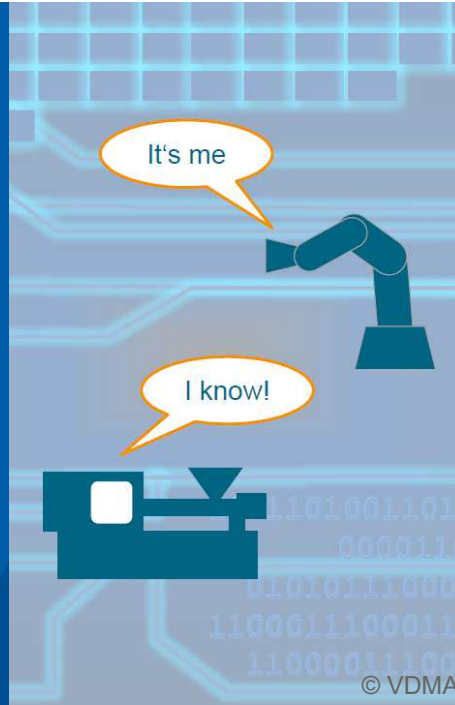
FAULT

BOTTLE OPENER

ON OFF

< >

YASKAWA



STEP BY STEP ON THE INDUSTRY 4.0 JOURNEY !

YASKAWA EUROPE HALL 17 BOOTH B50

YASKAWA