



**BECKHOFF**

TWINCAT\_HMI  
11:05 am

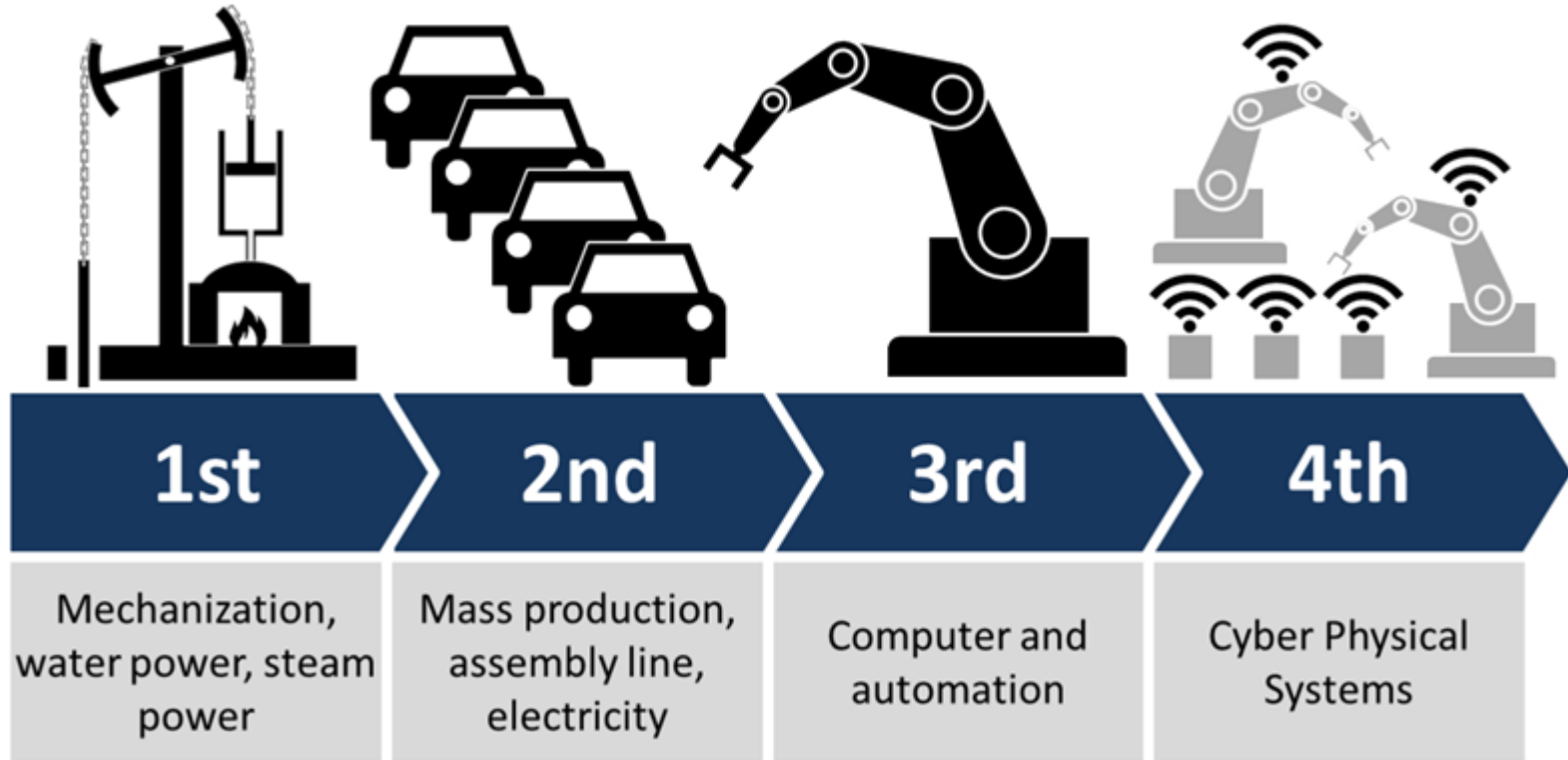
Eventlog

- 11:03 | Sawing station ready
- 11:03 | PLC start
- 11:03 | TwinCAT start
- 11:02 | User login

**BECKHOFF**



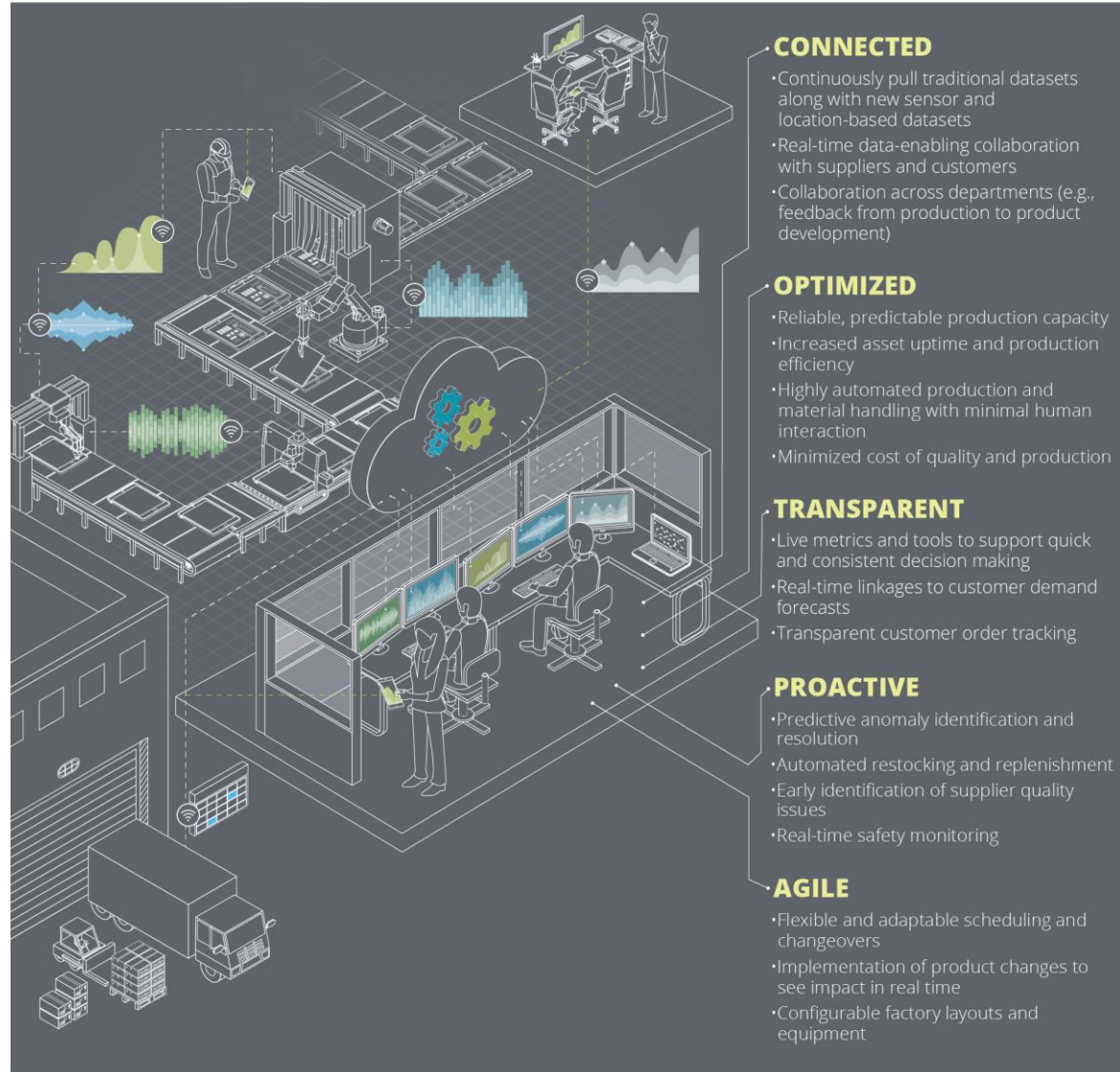
# Motivation



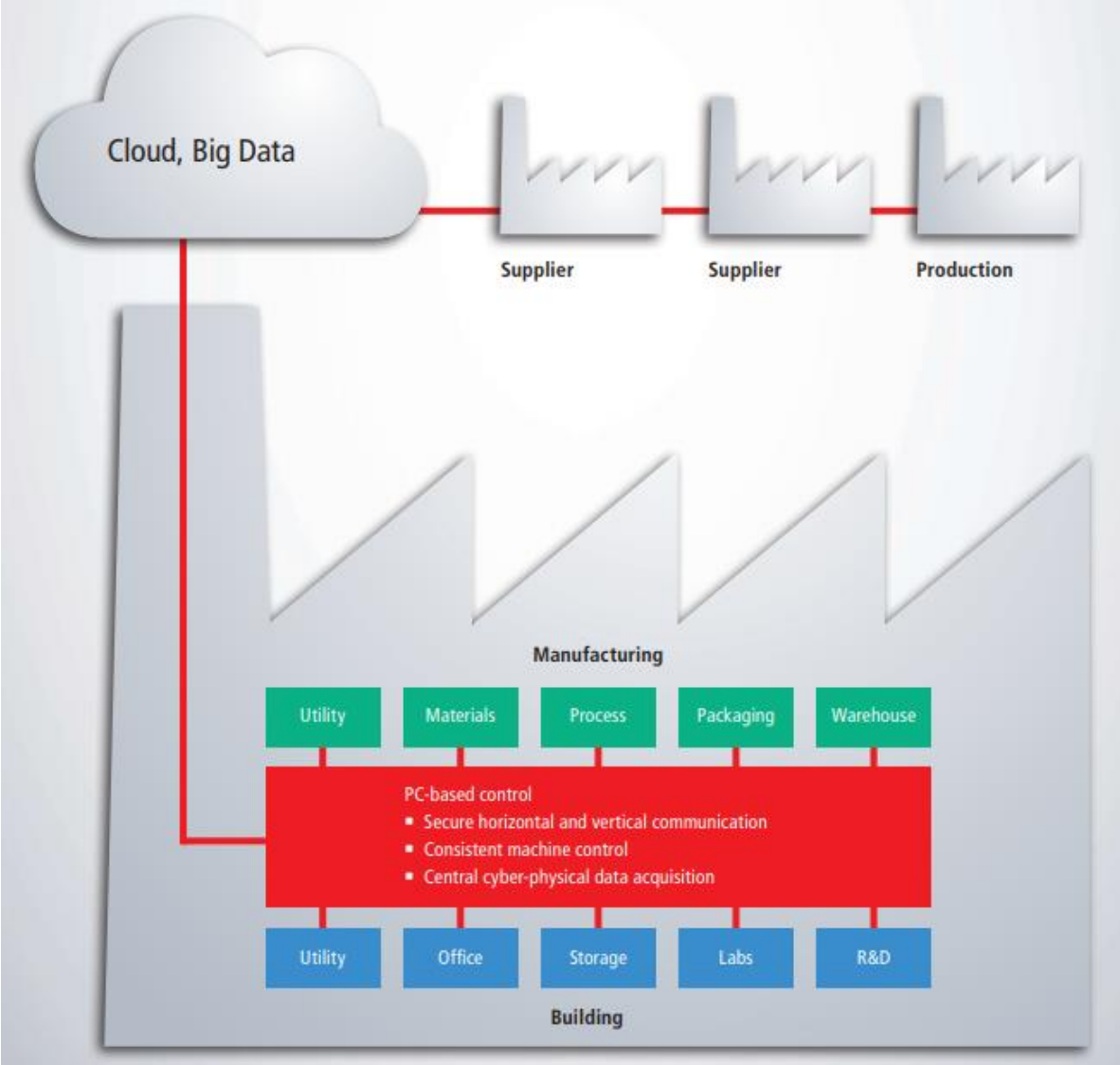
# Industrie 4.0 Smart Factory

The smart factory represents a leap forward from more traditional automation to a fully connected and flexible system.

Figure 2. Five key characteristics of a smart factory



# Holistic approach to implement Industrie 4.0



/gas production

# New Automation Technology Beckhoff Automation



## Benefits:

- Open control technology
- Improved efficiency and flexibility
- Reduced operational costs
- Lean automation architecture
- Modular, adaptive manufacturing systems
- Improved resource efficiency
- Reduced footprint

What can you do to optimise your production architecture for Industrie 4.0? With its New Automation Technology, Beckhoff enables you to benefit from all Smart Factory advantages with an integrated, interconnected process design – while XTS reduces your factory's floor and energy costs and optimises your footprint at the same time.

# Motivation

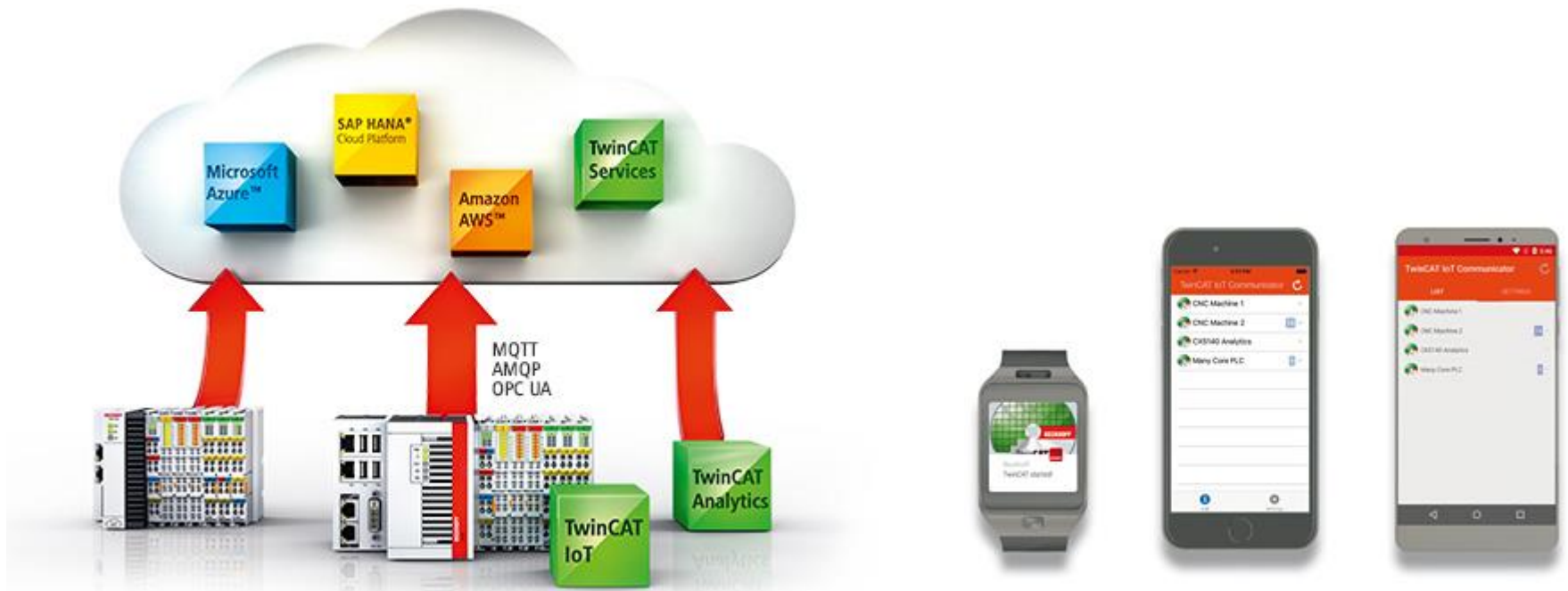


What you are expected to increase ...

... and what to decrease at the same time.

# Creating added value: with IoT and data analytics





# Measuring Productivity



# Measuring Productivity

## Overall Equipment Effectiveness (OEE)

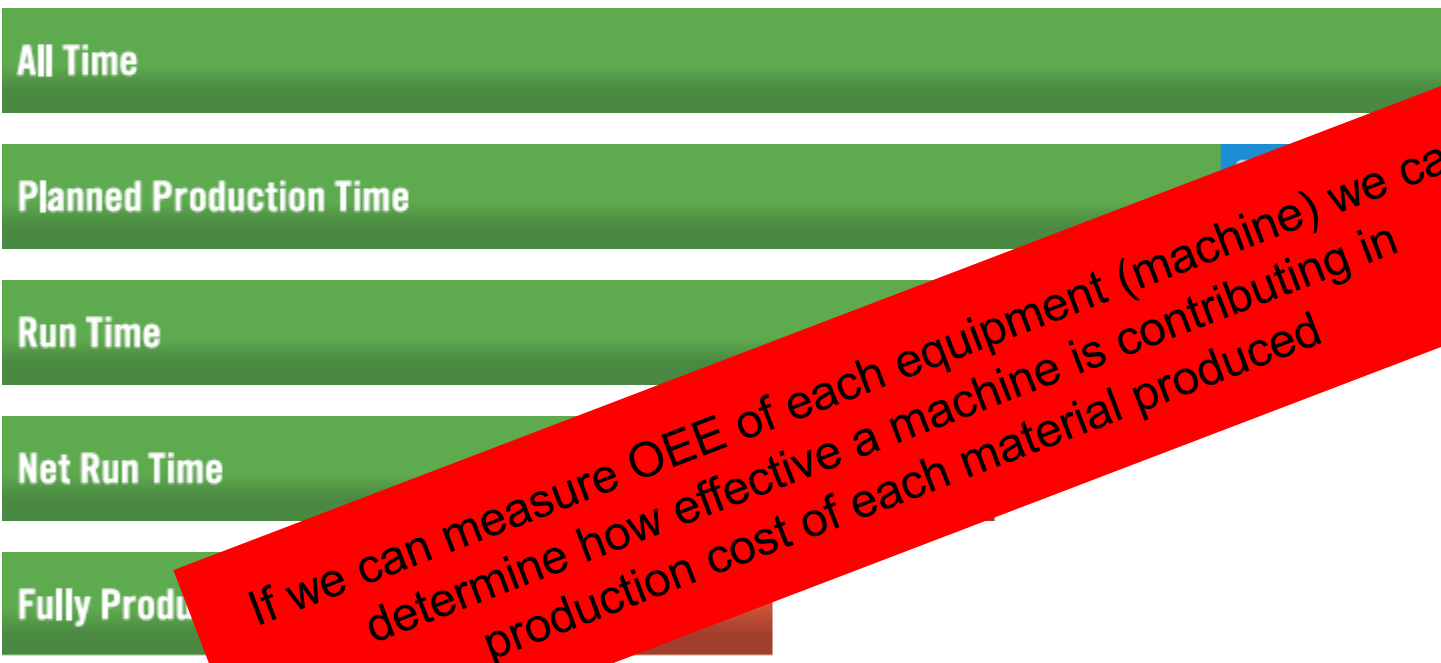
© 2014



# Measuring Productivity

## Overall Equipment Effectiveness (OEE)

© 2015



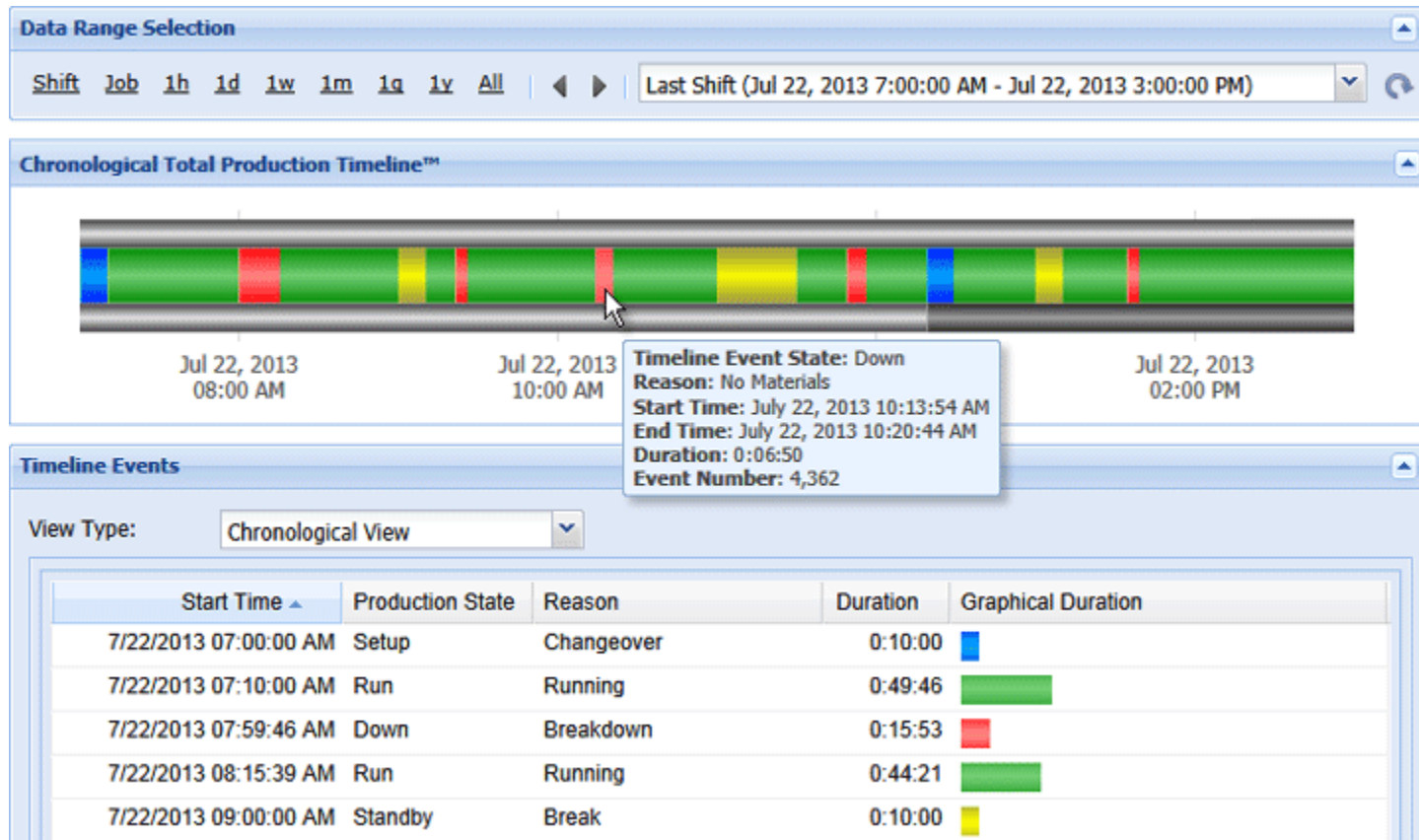
If we can measure OEE of each equipment (machine) we can determine how effective a machine is contributing in production cost of each material produced

$$A \times P \times Q = OEE$$

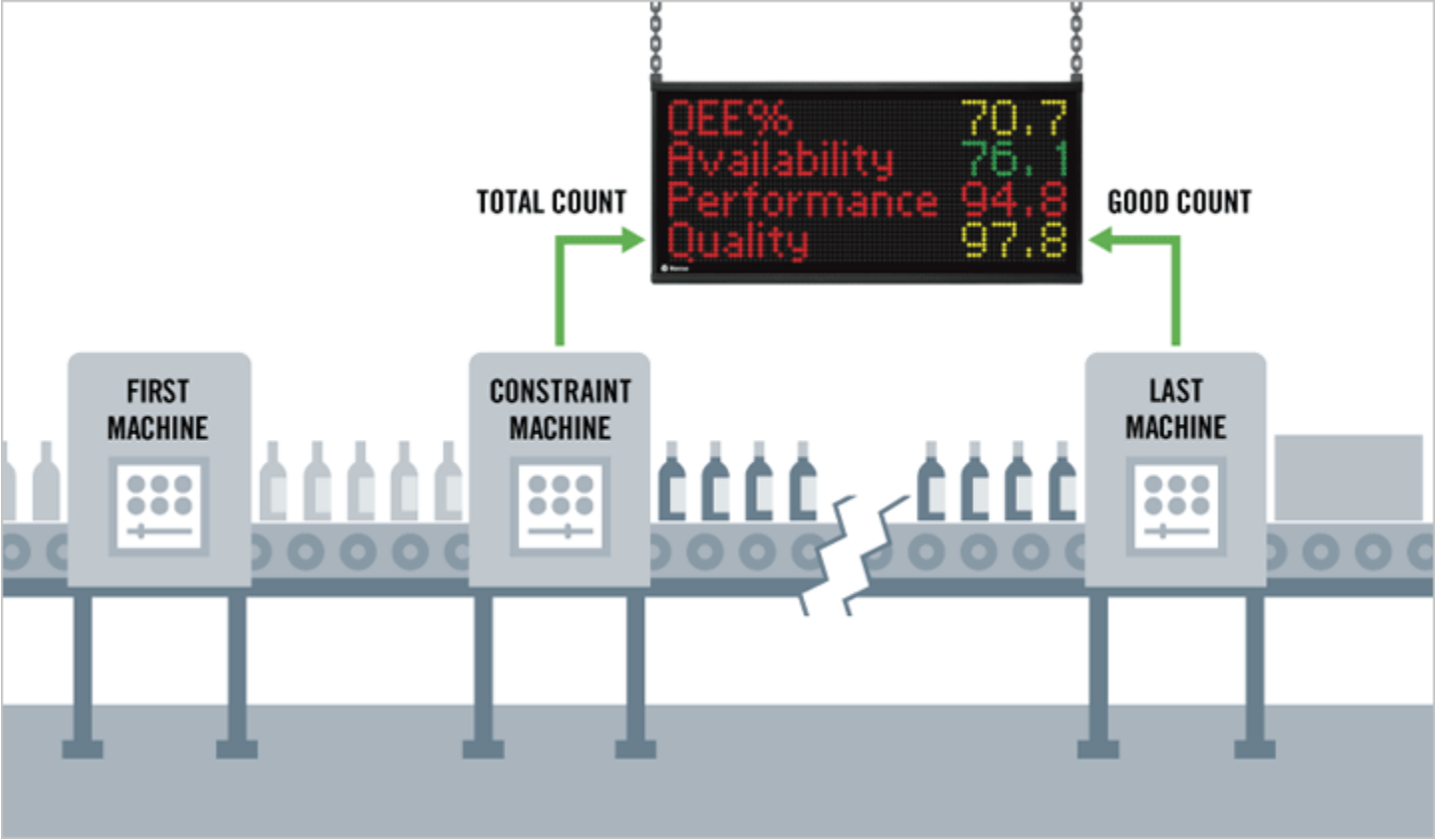
# Availability



# Performance



# Quality



# Measuring Productivity

## Overall Equipment Effectiveness (OEE)

© 2015

Overall Equipment Effectiveness	Recommended Six Big Losses	Traditional Six Big Losses
Availability Loss	Unplanned Stops	Equipment Failure
	Planned Stops	Setup and Adjustments
Performance Loss	Small Stops	Idling and Minor Stops
	Slow Cycles	Reduced Speed
Quality Loss	Production Rejects	Process Defects
	Startup Rejects	Reduced Yield
OEE	Fully Productive Time	Valuable Operating Time

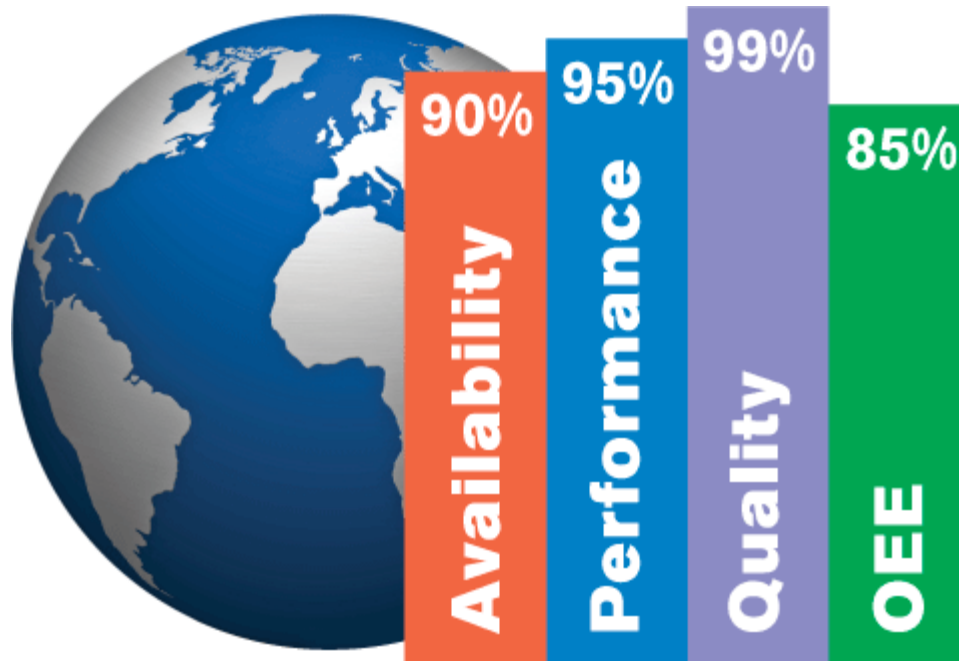
# Measuring Productivity

## Overall Equipment Effectiveness (OEE)

- **Unplanned stops:** equipment failures, starved stations or unplanned maintenance.
- **Planned stops:** changeovers, machine cleaning, tooling swap outs, etc.
- **Small stops:** minor or idling stops usually less than two minutes that could include things like a sensor obstruction, jams, feeds, etc.
- **Slow cycles:** anything slowing the production time from its maximum speed, like a worn out conveyor belt, poorly maintained equipment or an inexperienced machine operator.
- **Process defects:** defective parts produced during stable production due to equipment handling errors or incorrect equipment settings.
- **Reduced yield:** defective parts produced after an equipment failure until equipment has returned to a steady state.

# Measuring Productivity

## Overall Equipment Effectiveness (OEE)

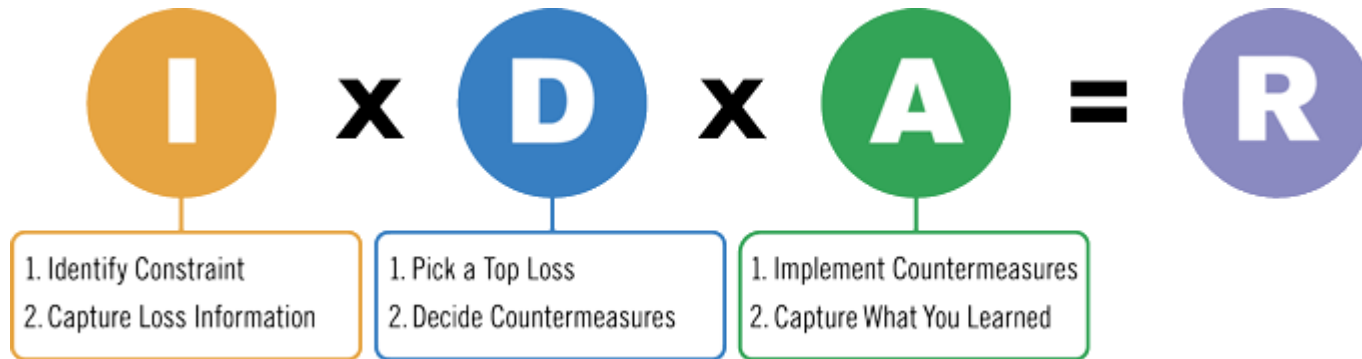


*It is often thought that a World-Class OEE score is 85%. Don't fixate on the absolute value of OEE, instead fixate on your ability to improve your OEE.*



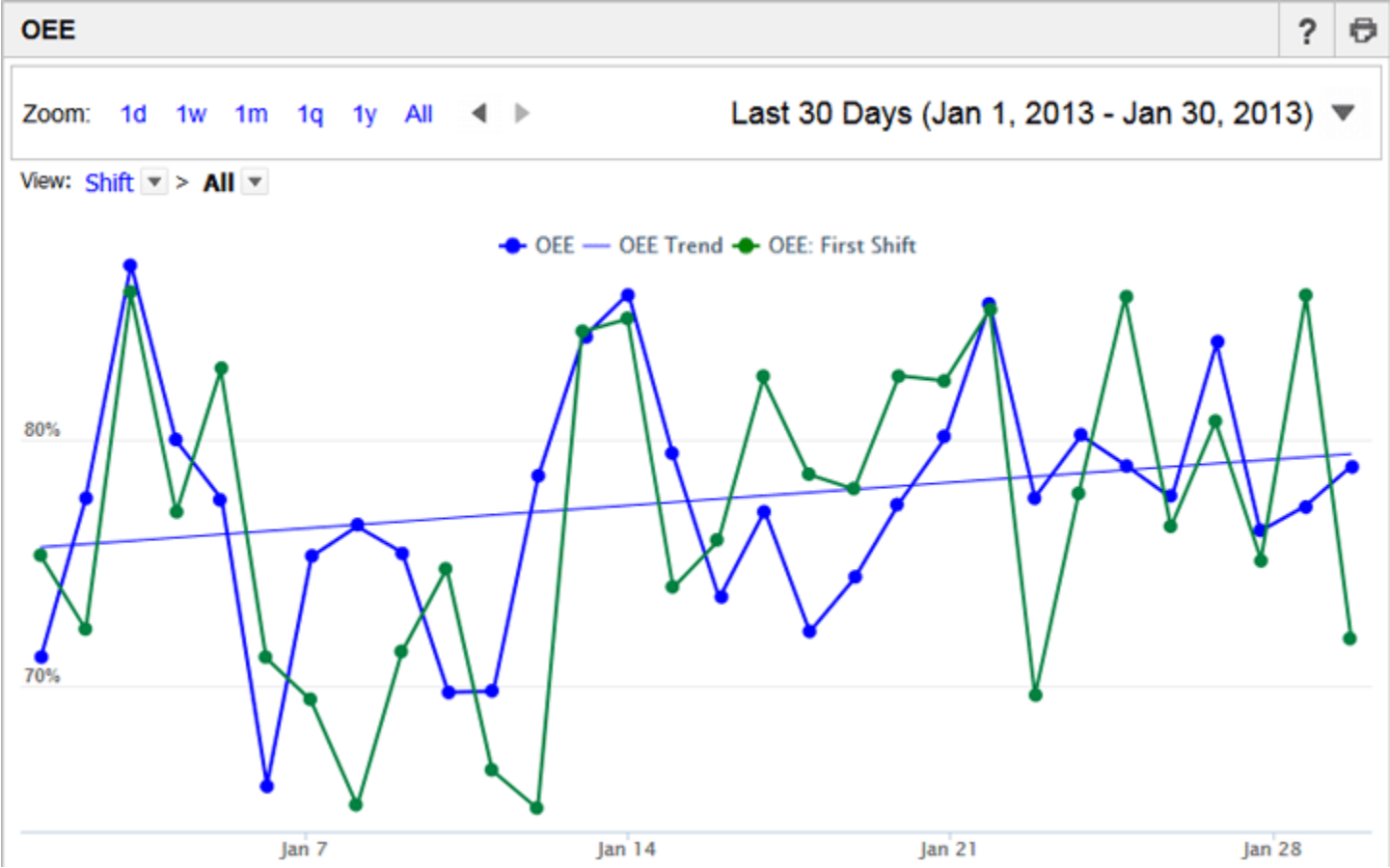
# Measuring Productivity

## Overall Equipment Effectiveness (OEE)






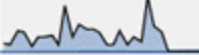

*IDA (Information, Decision, Action) is a simple and highly effective process for improving productivity using information*

# OEE trends



# Observing top losses

Your top 5 losses account for **45:23:02** of lost time (**66.88%** of all losses). Your OEE over this time period was **85.4%**.

<p><b>1</b></p>	<p><b>15h:05</b></p> <p>22.2% of losses</p>	<p><b>Your top loss is Down Time &gt; Infeed Material Jam.</b></p> <ul style="list-style-type: none"> <li>■ This loss increased at a rate of 7.9% over the selected time period.</li> <li>■ There have been 73 occurrences (averaging 0:12:23 each).</li> </ul>	<p>● Trend: +7.9%</p> 
<p><b>2</b></p>	<p><b>12h:27</b></p> <p>18.3% of losses</p>	<p><b>Your next largest loss is Setup &gt; Removing Die.</b></p> <ul style="list-style-type: none"> <li>■ This loss increased at a rate of 4.1% over the selected time period.</li> <li>■ There have been 67 occurrences (averaging 0:11:08 each).</li> </ul>	<p>● Trend: +4.1%</p> 
<p><b>3</b></p>	<p><b>11h:05</b></p> <p>16.3% of losses</p>	<p><b>Your next largest loss is Speed Loss.</b></p> <ul style="list-style-type: none"> <li>■ This loss decreased at a rate of 16.3% over the selected time period.</li> <li>■ There have been 1,467 slow cycles (averaging 0:00:09 each).</li> <li>■ There have been 714 small stops (averaging 0:00:13 each).</li> </ul>	<p>● Trend: -16.3%</p> 
<p><b>4</b></p>	<p><b>3h:25</b></p> <p>5.0% of losses</p>	<p><b>Your next largest loss is Down Time &gt; Engineering Adjustments.</b></p> <ul style="list-style-type: none"> <li>■ This loss increased at a rate of 16.5% over the selected time period.</li> <li>■ There have been 94 occurrences (averaging 0:02:10 each).</li> </ul>	<p>● Trend: +16.5%</p> 
<p><b>5</b></p>	<p><b>3h:21</b></p> <p>4.9% of losses</p>	<p><b>Your next largest loss is Setup &gt; Installing New Die.</b></p> <ul style="list-style-type: none"> <li>■ This loss decreased at a rate of 39.6% over the selected time period.</li> <li>■ There have been 100 occurrences (averaging 0:02:00 each).</li> </ul>	<p>● Trend: -39.6%</p> 

# Reporting.. for example in .xls/.csv format

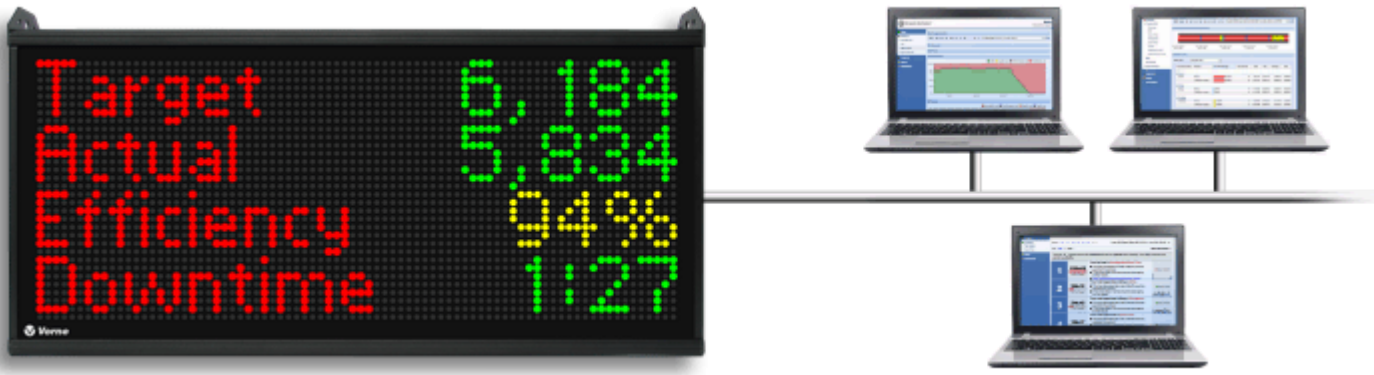
The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I
1	Start Time	End Time	Shift ID	Total	Good	Reject	Target	Efficiency	OEE
2	12/7/2015 06:00	12/7/2015 13:59	Shift 1	5,960	5,834	126	6,184	94.34%	70.71%
3	12/7/2015 14:00	12/7/2015 21:59	Shift 2	6,875	6,737	138	7,746	86.97%	65.04%
4	12/8/2015 06:00	12/8/2015 13:59	Shift 1	5,717	5,119	598	7,926	64.58%	68.58%
5	12/8/2015 14:00	12/8/2015 21:59	Shift 2	5,741	5,248	493	7,942	66.08%	61.48%
6	12/9/2015 06:00	12/9/2015 13:59	Shift 1	5,623	5,274	349	7,693	68.56%	54.79%
7	12/9/2015 14:00	12/9/2015 21:59	Shift 2	7,139	6,776	363	7,798	86.89%	50.31%
8	12/10/2015 06:00	12/10/2015 13:59	Shift 1	6,844	6,151	693	7,846	78.40%	55.58%
9	12/10/2015 14:00	12/10/2015 21:59	Shift 2	7,347	6,910	437	7,845	88.08%	61.31%
10	12/11/2015 06:00	12/11/2015 13:59	Shift 1	5,023	4,619	404	7,827	59.01%	56.11%
11	12/11/2015 14:00	12/11/2015 21:59	Shift 2	5,022	4,315	707	7,666	56.29%	64.37%

# Multiple asset viewing

Multiple Asset View					
View as Hierarchy		Information to View: Shift TAED			
Asset	Production State	Target Sum	Actual Sum	Efficiency Mean	Down Time Mean
<ul style="list-style-type: none"> <li>Vorne Industries                             <ul style="list-style-type: none"> <li>Itasca                                     <ul style="list-style-type: none"> <li>Stamping 1</li> <li>Stamping 2</li> </ul> </li> <li>Birmingham                                     <ul style="list-style-type: none"> <li>Assembly   <ul style="list-style-type: none"> <li>Cell 1</li> <li>Cell 2</li> </ul> </li> <li>Finishing   <ul style="list-style-type: none"> <li>Paint Line</li> </ul> </li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Run</li> <li>Standby</li> <li>Run</li> <li>Down</li> <li>Run</li> </ul>	<ul style="list-style-type: none"> <li>30,324</li> <li>15,193</li> <li>14,209</li> <li>984</li> <li>15,131</li> <li>9,291</li> <li>4,568</li> <li>4,723</li> <li>5,840</li> <li>5,840</li> </ul>	<ul style="list-style-type: none"> <li>23,295</li> <li>12,335</li> <li>11,558</li> <li>777</li> <li>10,960</li> <li>6,904</li> <li>3,414</li> <li>3,490</li> <li>4,056</li> <li>4,056</li> </ul>	<ul style="list-style-type: none"> <li>76.02%</li> <li>80.16%</li> <li>81.34%</li> <li>78.97%</li> <li>71.89%</li> <li>74.32%</li> <li>74.74%</li> <li>73.90%</li> <li>69.45%</li> <li>69.45%</li> </ul>	<ul style="list-style-type: none"> <li>1:40:43</li> <li>1:23:21</li> <li>1:18:22</li> <li>1:28:20</li> <li>1:58:05</li> <li>1:47:51</li> <li>1:46:06</li> <li>1:49:37</li> <li>2:08:19</li> <li>2:08:19</li> </ul>

# Multiple OEE viewing



# OEE sample page

Application Name -  
File Security Tools



## InduSoft Performance Management System Overall Equipment Effectiveness (OEE) Demo

09/10/2018  
14:48:14  
Guest

Product B - Machine 1

Plant

- Austin
  - Line #1
    - Product A - Machine 1
    - Product A - Machine 2
    - Product A - Machine 3
  - Line #2
    - Product B - Machine 1
    - Product B - Machine 2
    - Product B - Machine 3
    - Product B - Machine 4
    - Product B - Machine 5

	Availability	Performance	Quality	OEE
Actual	0.00 % ✓	0.00 % ✓	0.00 % ✓	0.00 % ✓
Target	0.00 %	0.00 %	0.00 %	0.00 %

From: 09/10/2018 To: 09/11/2018

Up Time: 0.00 hs    Down Time: 0.00 hs    Cycle Speed: 0.00 un/hour

Good units: 0    Bad units: 0    Total units: 0

Cursor Date/Time: 09/26/2018 15:22:29.019

Availability    ??????? %

Performance    ??????? %


Quality    ??????? %

OEE    ??????? %



# OEE sample page

DEMOCRAT

 PackML

 OEE

Stage 1

Stage 2

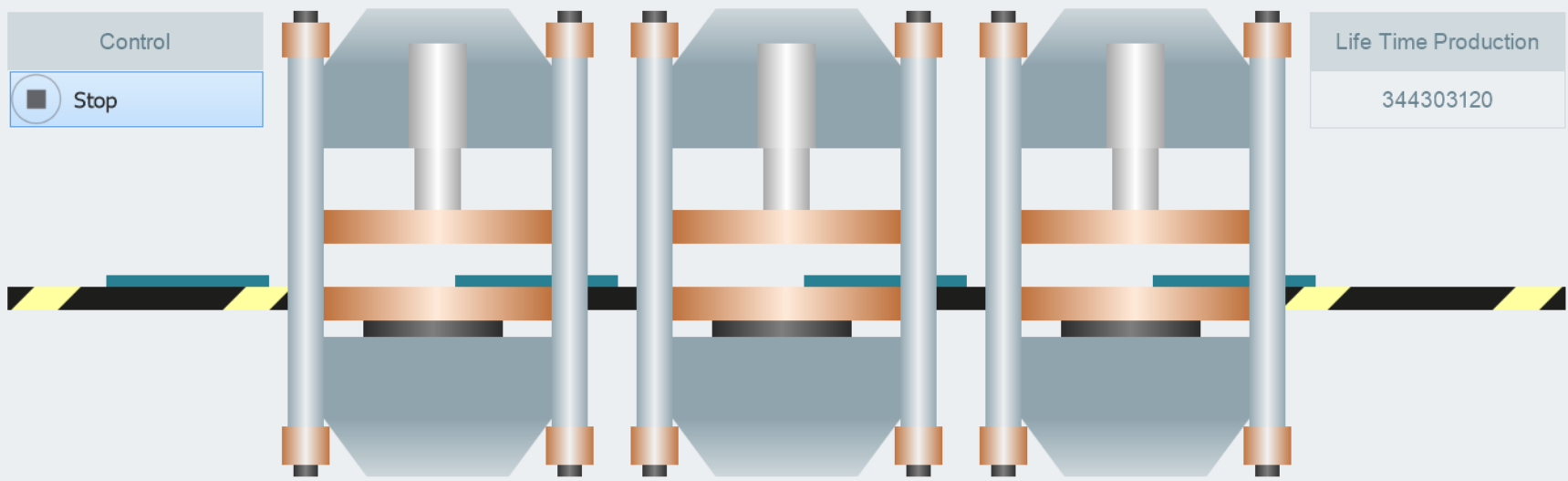
Stage 3

Control

Stop

Life Time Production

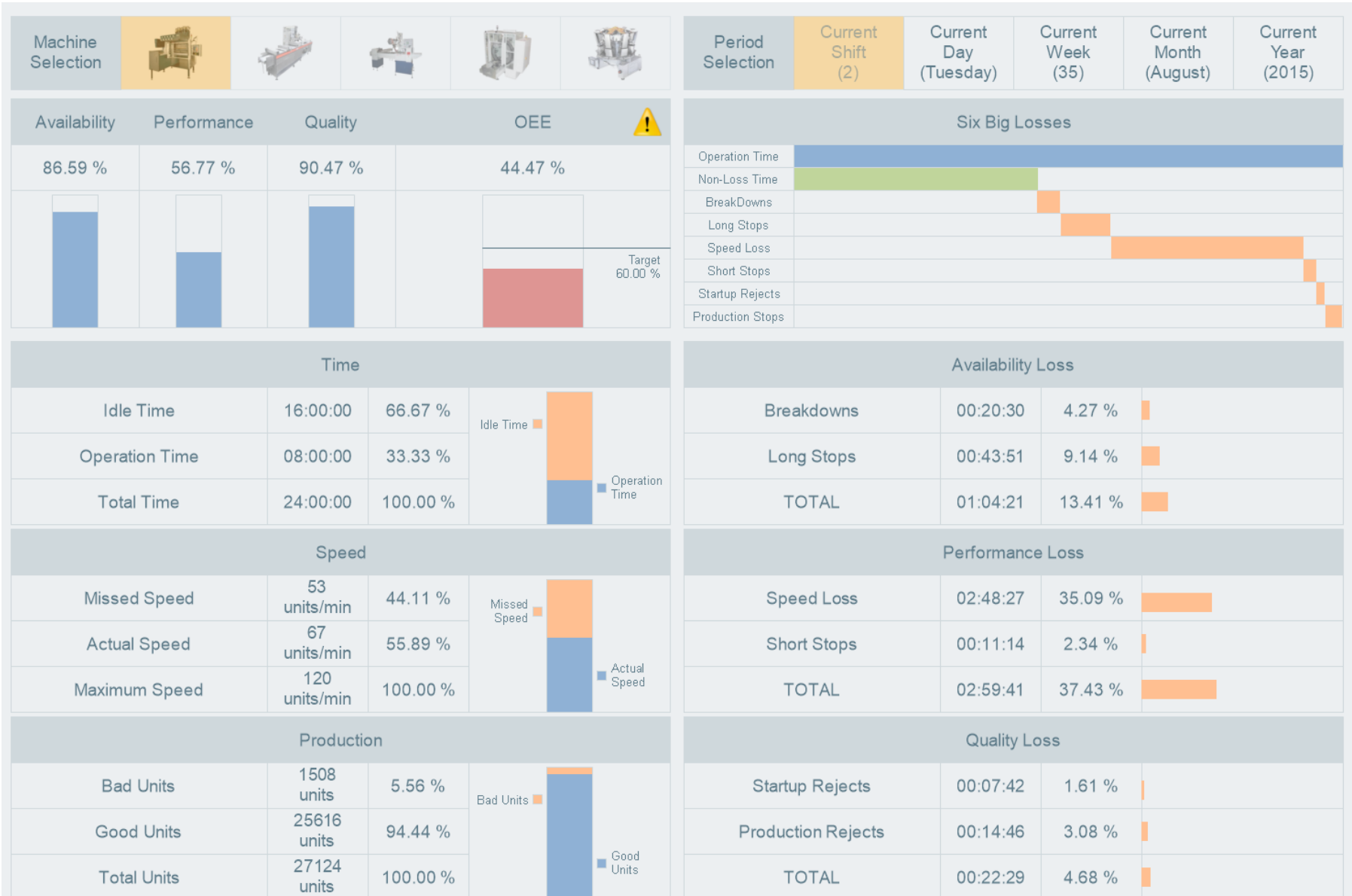
344303120



Progress Status	Job #11: Fender FL XYZ				
Whitin Target	Target	Actual	Remaining	Actual (%)	Progress
Parts	10	5	5	50 %	<div style="width: 50%; background-color: #4F81BD;"></div>
Time	00:01:00	00:00:22	00:00:38	37 %	<div style="width: 37%; background-color: #4F81BD;"></div>

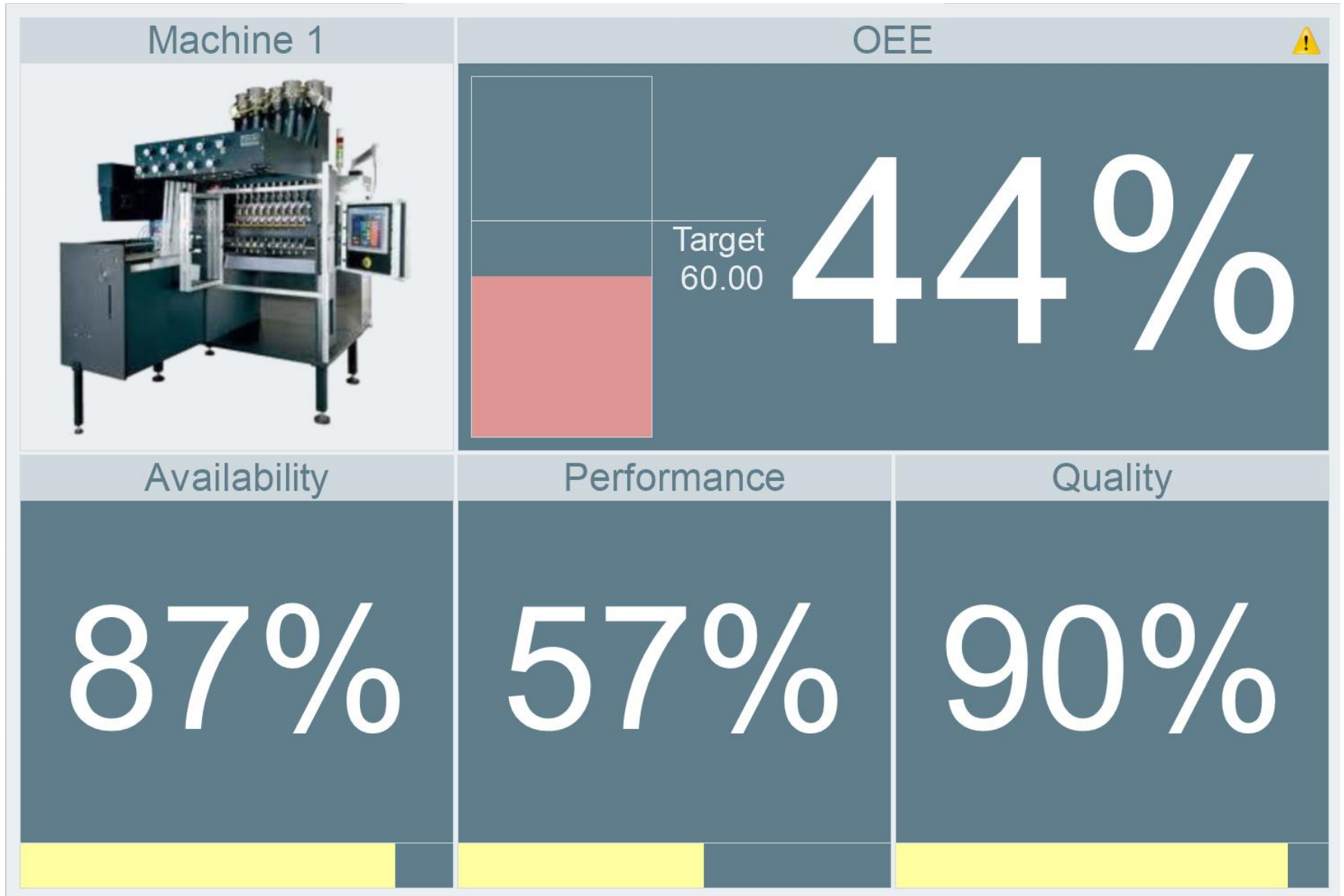


# OEE sample page



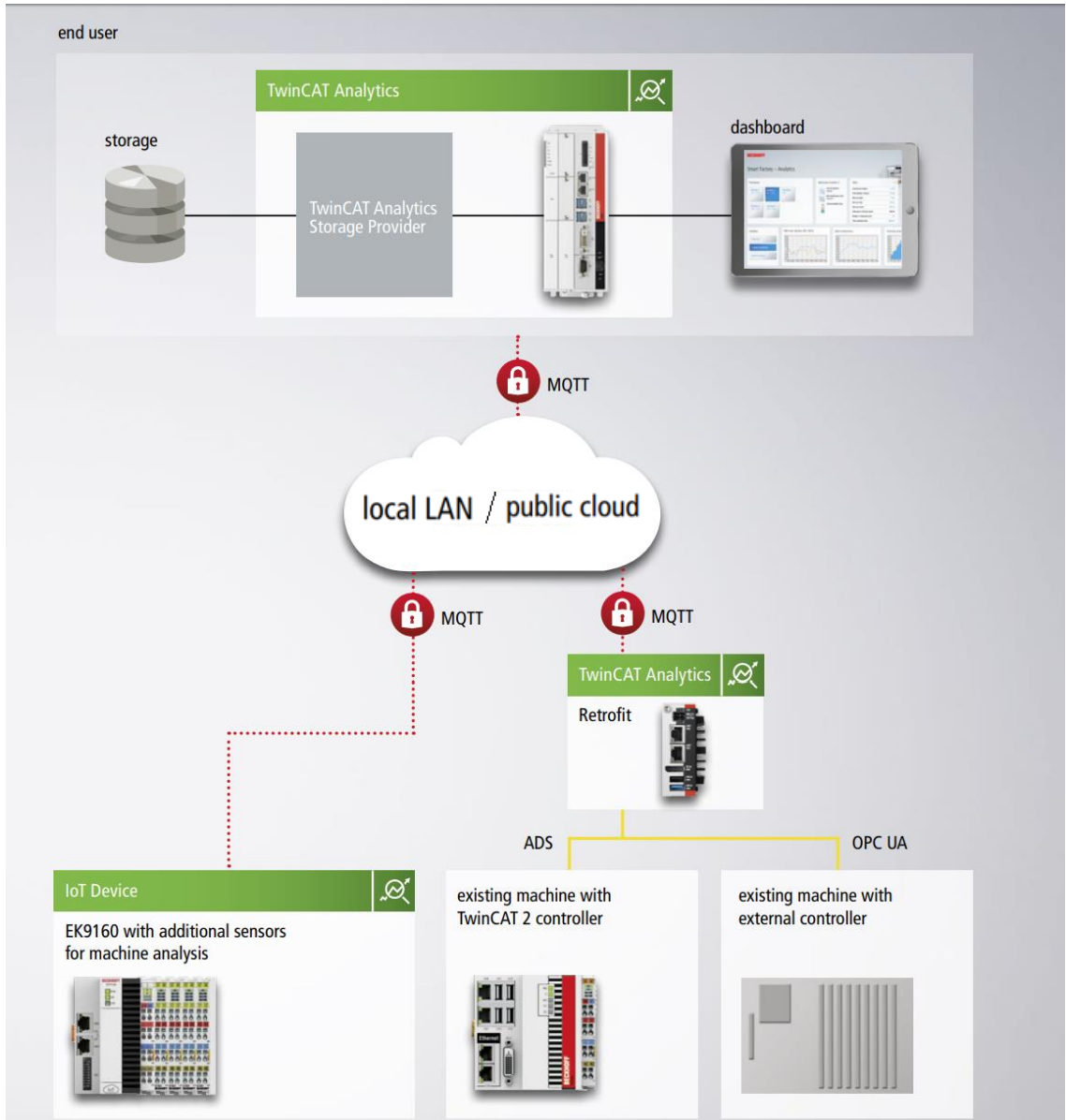
# Other term - ANDON

DEMONSTRATION



# Leveraging your asset management

## Analytics in use: 24/7 machine monitoring

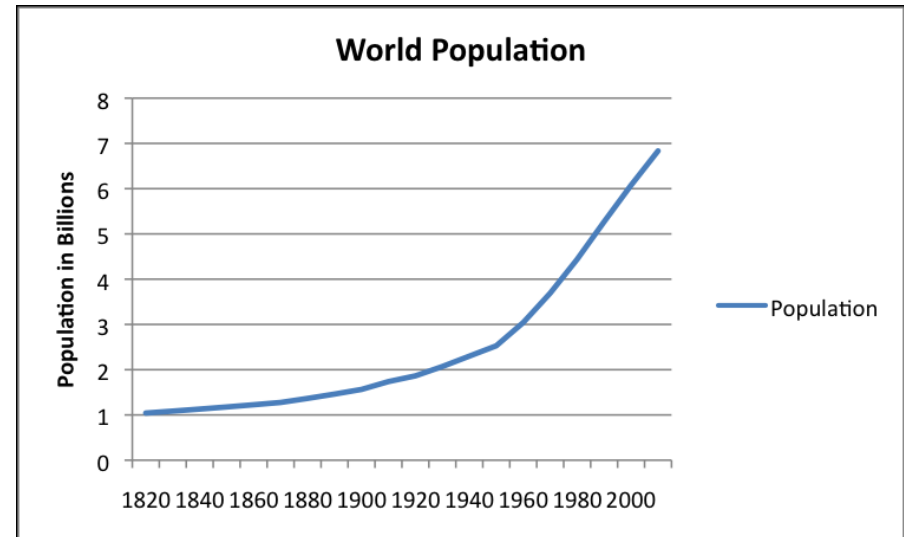
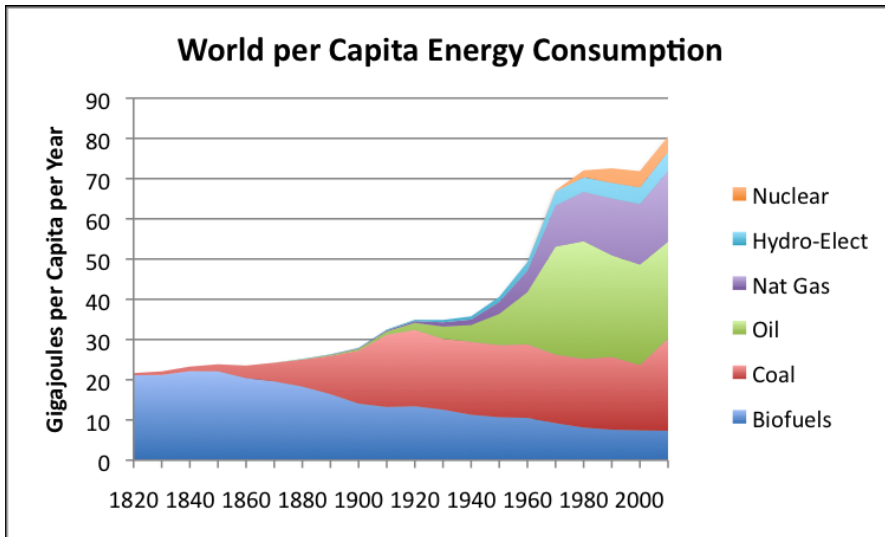
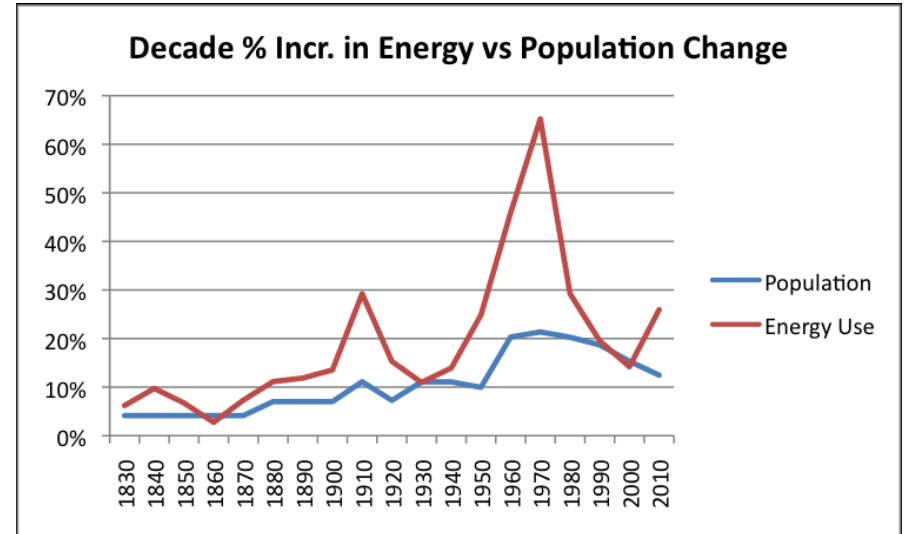
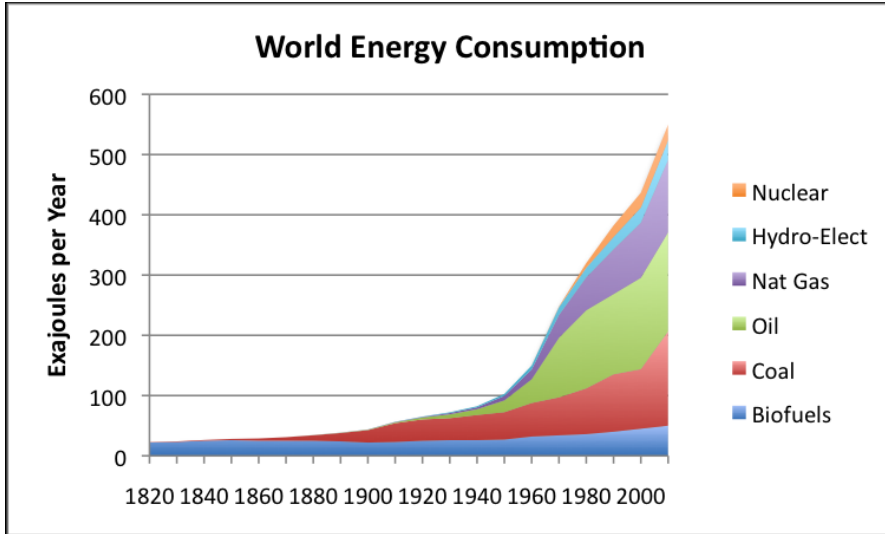


Energy and raw materials:  
Discover your savings potential

ENERMIS

PC-based Control:  
Cut Costs Using Comprehensive  
Energy Data Management

# Motivation



# Integrated Energy Data Management

Integrated energy data management enables the implementation of ISO 50001...



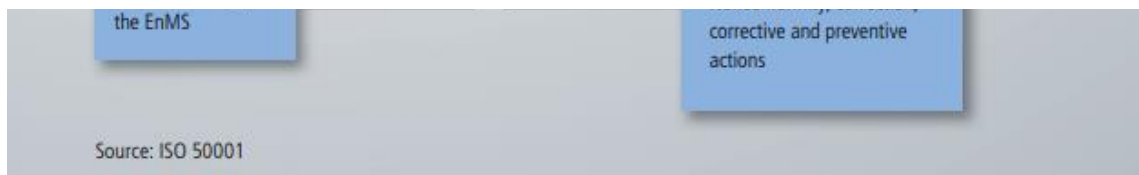
## ISO 50001:2018 – Energy Management System

ISO 50001 is based on the management system model of continual improvement also used for other well-known standards such as ISO 9001 or ISO 14001. This makes it easier for organizations to integrate energy management into their overall efforts to improve quality and environmental management.

ISO 50001:2018 provides a framework of requirements for organizations to:

- Develop a policy for more efficient use of energy
- Fix targets and objectives to meet the policy
- Use data to better understand and make decisions about energy use
- Measure the results
- Review how well the policy works, and
- Continually improve energy management.

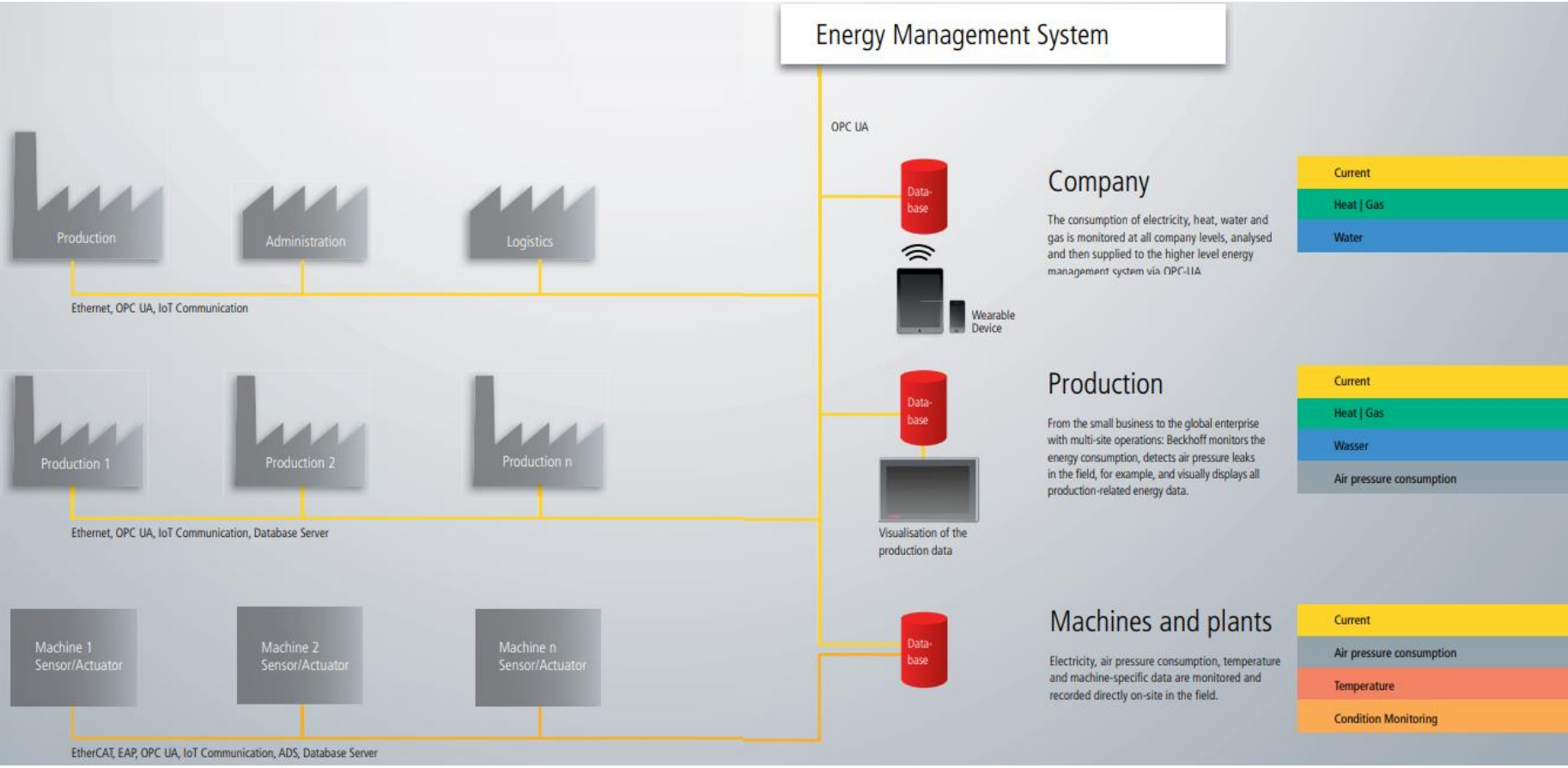
**YOU CAN'T  
IMPROVE  
WHAT YOU  
DON'T  
MEASURE.**



Source: ISO 50001

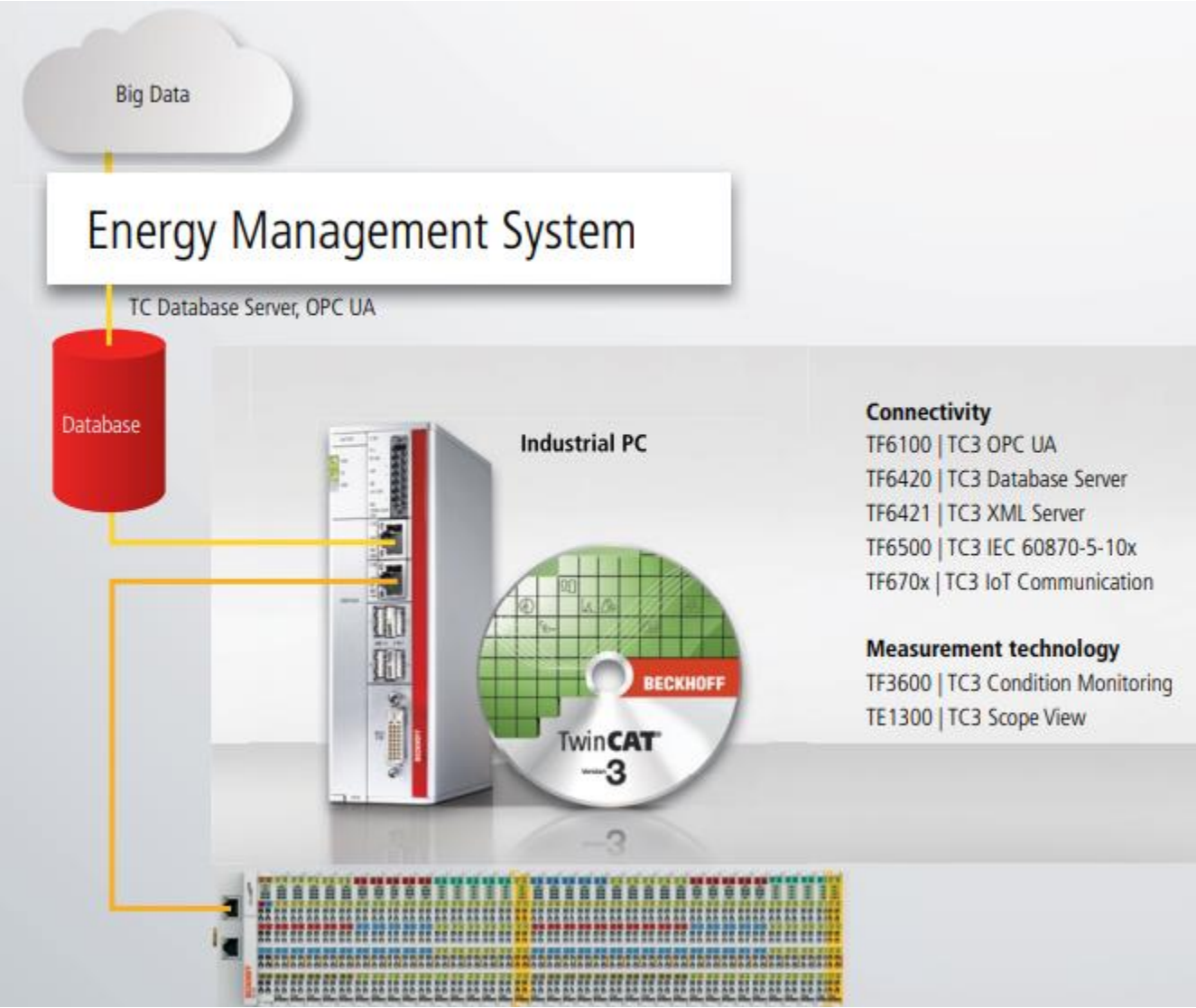
# Integrated Energy Data Management

BECKHOFF



Oil/gas production

# Integrated Energy Data Management





# Measurement technology

## System-integrated energy data management

### Direct measurement

- EL3403 and KL3403 3-phase power measurement, 500 V AC
- EL3413 3-phase power measurement, 690 V AC
- EL3773 high-end power analysis



Current

### Indirect measurement (meter)

- KL6401 LON Bus Terminal
- KL6781 M-Bus master terminal
- EL6224, KL6224 IO-Link master terminals
- EL1xxx/KL1xxx digital input terminals (acquisition of pulse outputs)



Heat | Gas

### Indirect measurement (meter)

- KL6401 LON Bus Terminal
- KL6781 M-Bus master terminal



Water

# Measurement technology

## System-integrated energy data management

### Direct measurement

- EP3744 pressure measurement box
- KM37xx and EM37xx pressure measurement terminals

### Indirect measurement (analog)

- EL3xxx and KL3xxx analog input terminals
- EP3xxx analog input modules
- EL6224, KL6224 IO-Link master terminals



Air pressure consumption

### Direct measurement

- KL33xx, EL33xx and EP3314 thermocouple
- KL32xx, EL32xx and EP3204 resistance sensor RTD



Temperature

### Direct measurement

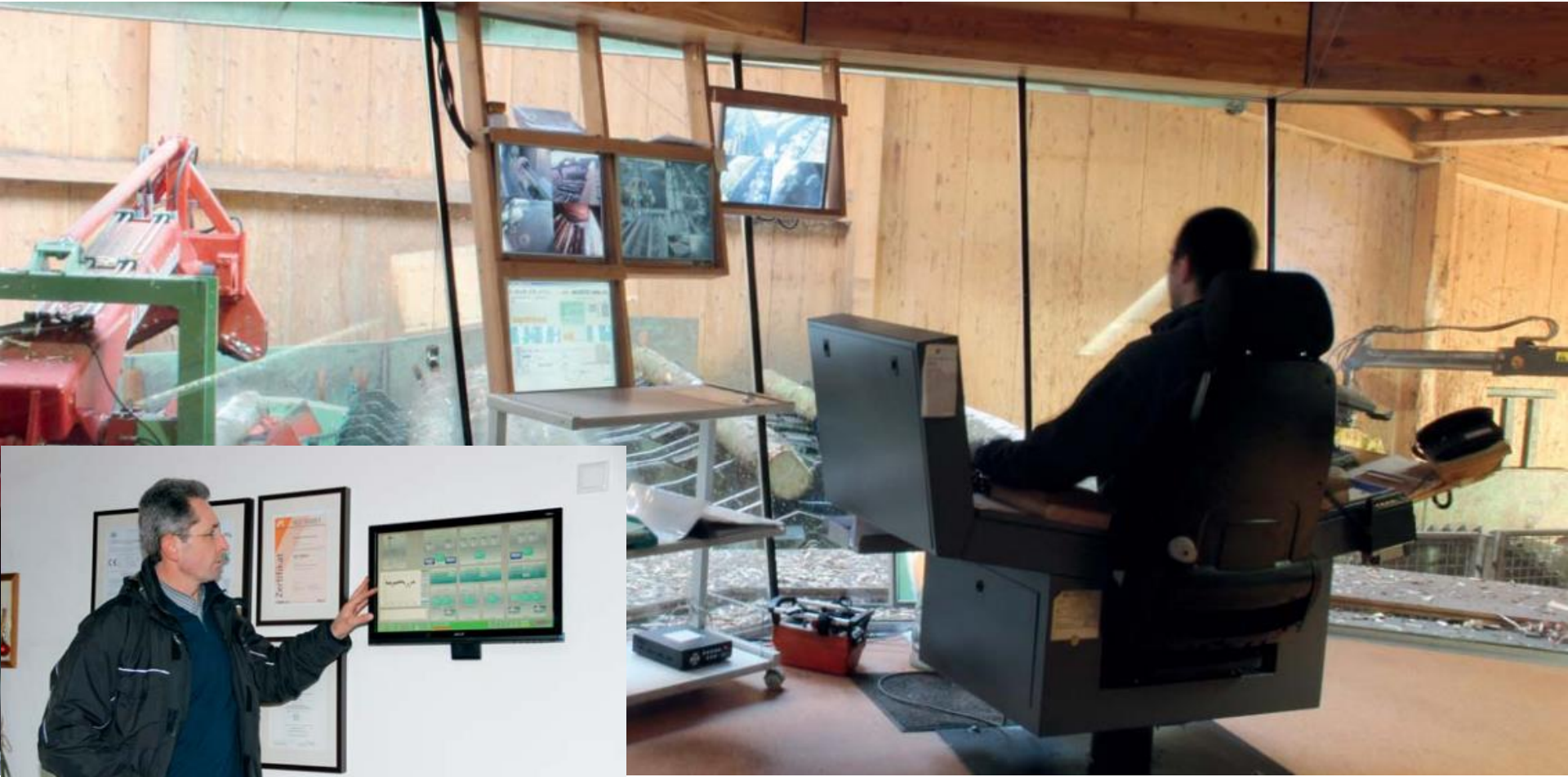
- EL3632 CMS terminal (IEPE)



Condition Monitoring

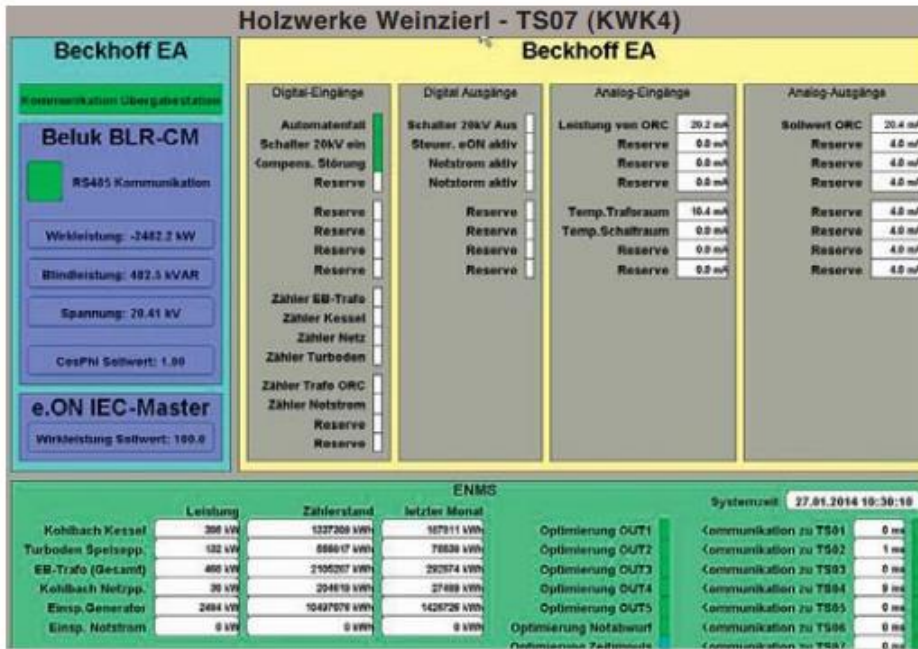
# Case study - Holzwerke Weinzierl GmbH

## Energy management system for lumber mill



# Case study - Holzwerke Weinzierl GmbH

## Energy management system for lumber mill

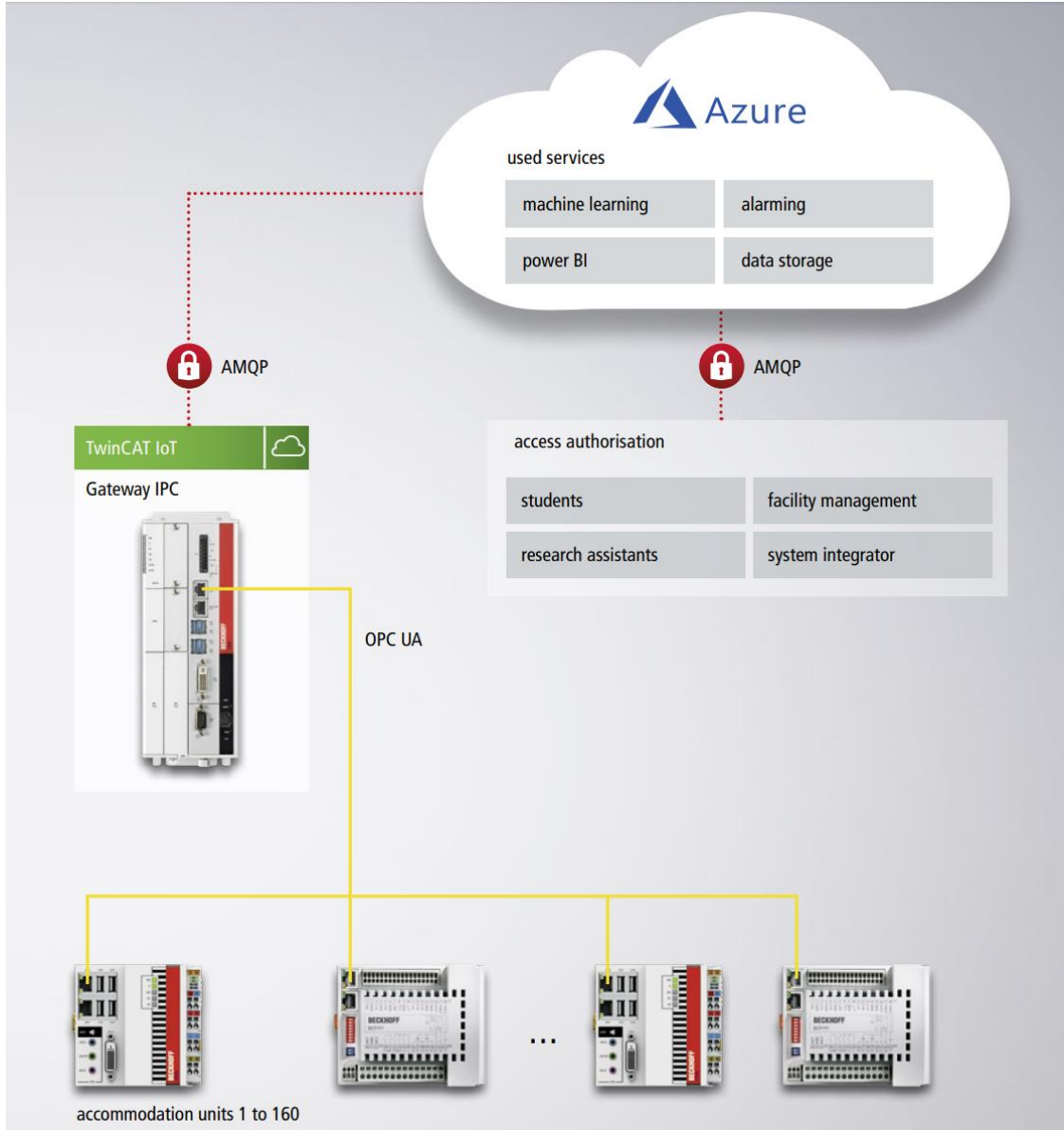


The web-based visualization system provides a rapid overview and diagnostic capabilities.

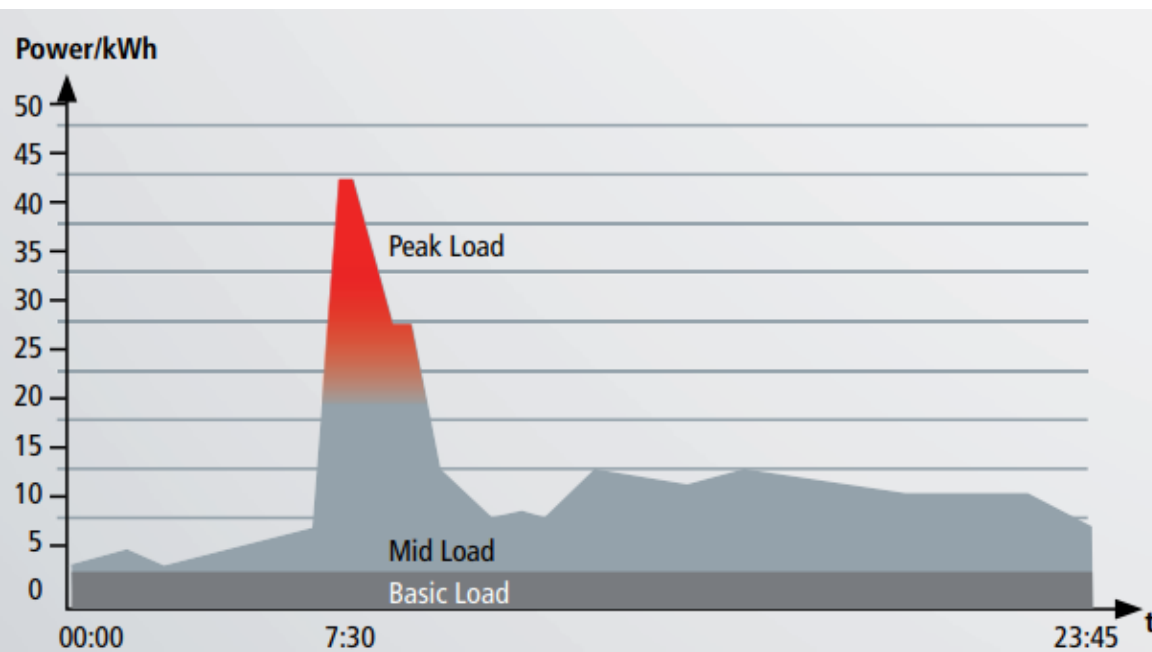


With several bio-mass boilers and solar power installations, Holzwerke Weinzierl generates "green" electricity that is CO<sub>2</sub>-neutral.

# IoT in use: 24/7 energy management



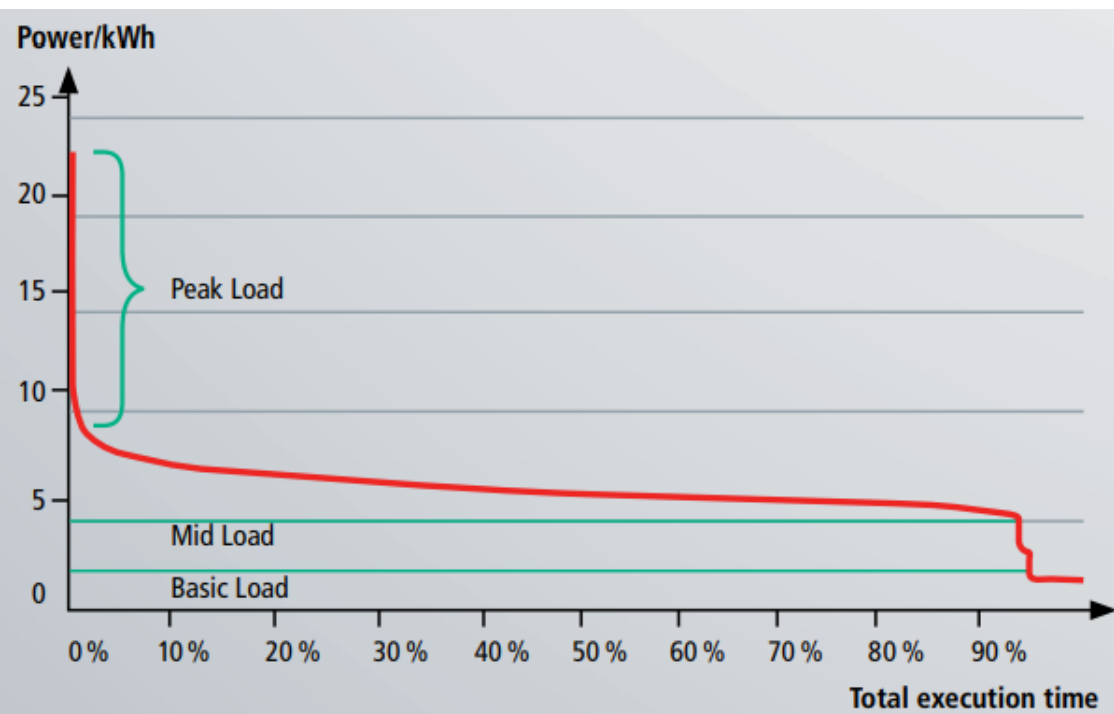
...creating the basis for extensive and actionable analyses



### Load curve determination with PC-based control.

PC-based control supplies the data on the basis of which load curves are created, the peak loads are determined and peak load compensation is enabled.

...creating the basis for extensive and actionable analyses



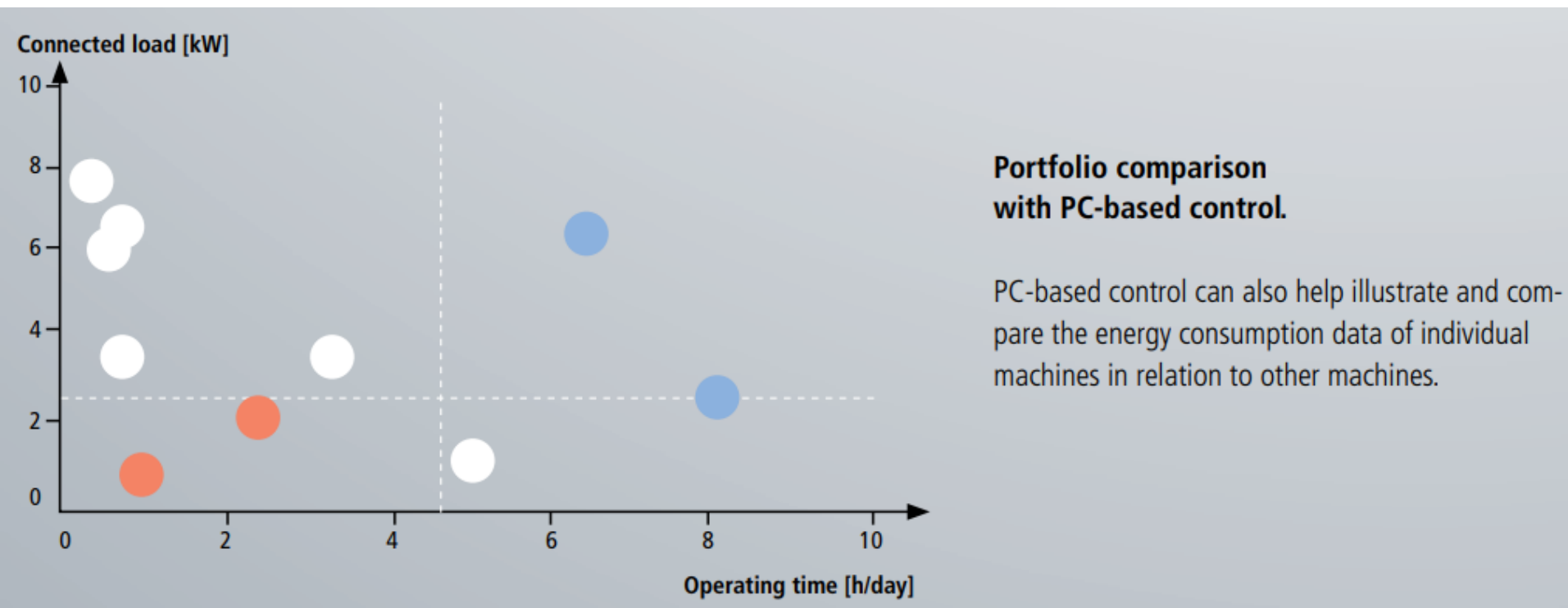
**Operation during analysis with PC-based control.**

PC-based control supplies data on the basis of how to best determine the percentage of total load attributable to each individual load as well as the basic and mean loads.

— Energy consumption

...creating the basis for extensive and actionable analyses

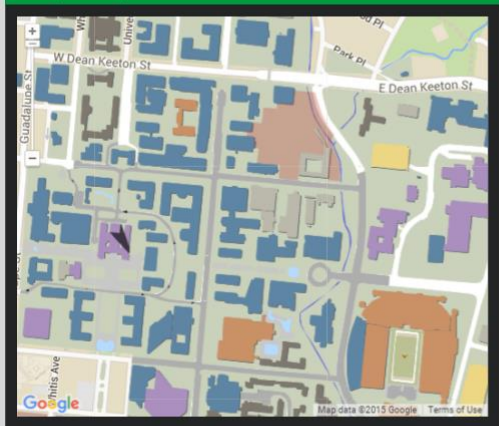
ENERGIE





# Energy monitoring sample page

### Campus Map



### Current Weather

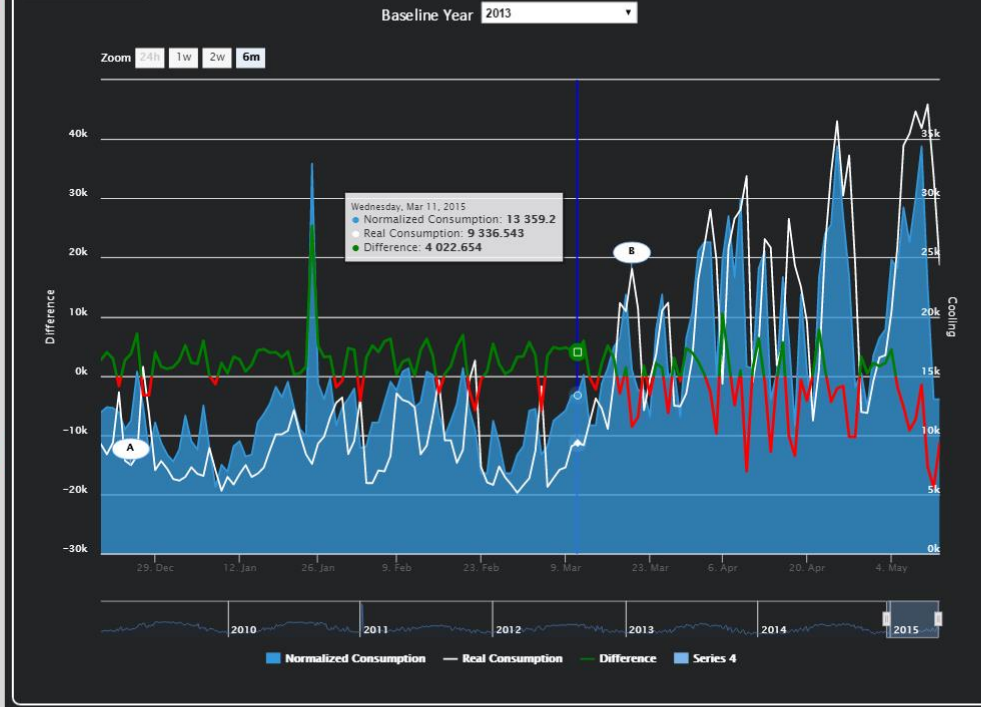
69°F | 86°F

# 87°F

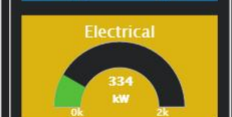
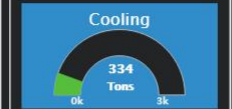
BP: 29.82 in  
RH: 43%  
DPT: 62°F  
Wind: 9 mph, NE

Last Updated on September 28, 1:51 PM CDT

### Deviation Analysis



WEL - ROBERT A. WELCH HALL  
428647 sq.ft.  
Current Building Demand



#### Water

(Data not available)

- Overview
- Building Energy
- Baseline Analysis**
- Compare Buildings
- Deviation Analysis
- Energy Forecast

# Energy monitoring sample page



# Energy monitoring sample page



  
Menu

  
Summary

  
Scheduler

  
Events

  
Alarms

  
Setting

  
Log On

User: Steve  
 Schedule Profile: BAS Barat

08/17/2011  
 15:37:31  
 Wednesday

### COOLING TOWER & WATER PUMP

CT-CWP PULAD INTAN	CT-CWP E-CENTER	CT-CWP ZONE 2
CT-CWP ZONE 3A	CT-CWP ZONE 3B	CT-CWP ZONE 3C
CT-CWP ZONE 4	CT-CWP ZONE 5	CT-CWP ZONE 6
SPARE	SPARE	SPARE

### ELECTRICAL

MDB BASEMENT	MCC BASEMENT
TRAFO BASEMENT	GENERATOR BASEMENT
SPARE	SPARE
SPARE	SPARE

### LIGHTING DB-FDB

FDB B1-B2 CAR PARK	FDB FIRST FLOOR	DB GROUND FLOOR
FDB B3-B4 CAR PARK	FDB E-CENTER LG-UG-1FL	DB FIRST FLOOR
FDB GROUND FLOOR	OUTDOOR EXT SITE PLAN	ACU-DS-WALL AREA ROOF
SPARE	SPARE	SPARE

### WATER COOLED PACKED

WCP E-CENTER	WCP DEBERHAMAS	WCP RETAIL TIBORI
WCP HYPERMART	WCP MALL PUBLIC	WCP E-CITY
WCP ACE HWY	WCP FOOD COURT AREA	WCP COCO WALK
WCP CELEBRITY FITNESS	WCP RETAIL BARAT	WCP BASEMENT BARAT

### FAN

INTAKE FAN CARPARK	EXHAUST FAN CARPARK
INTAKE FAN RESTORANT	EXHAUST FAN RESTORANT
INTAKE FAN AIRCONDITION	EXHAUST FAN TOILET
INTAKE FAN MATAHARI	SPARE

### PUMP

PUMP BASEMENT
CIRC PUMP BASEMENT
SUMPIT PUMP
SPARE

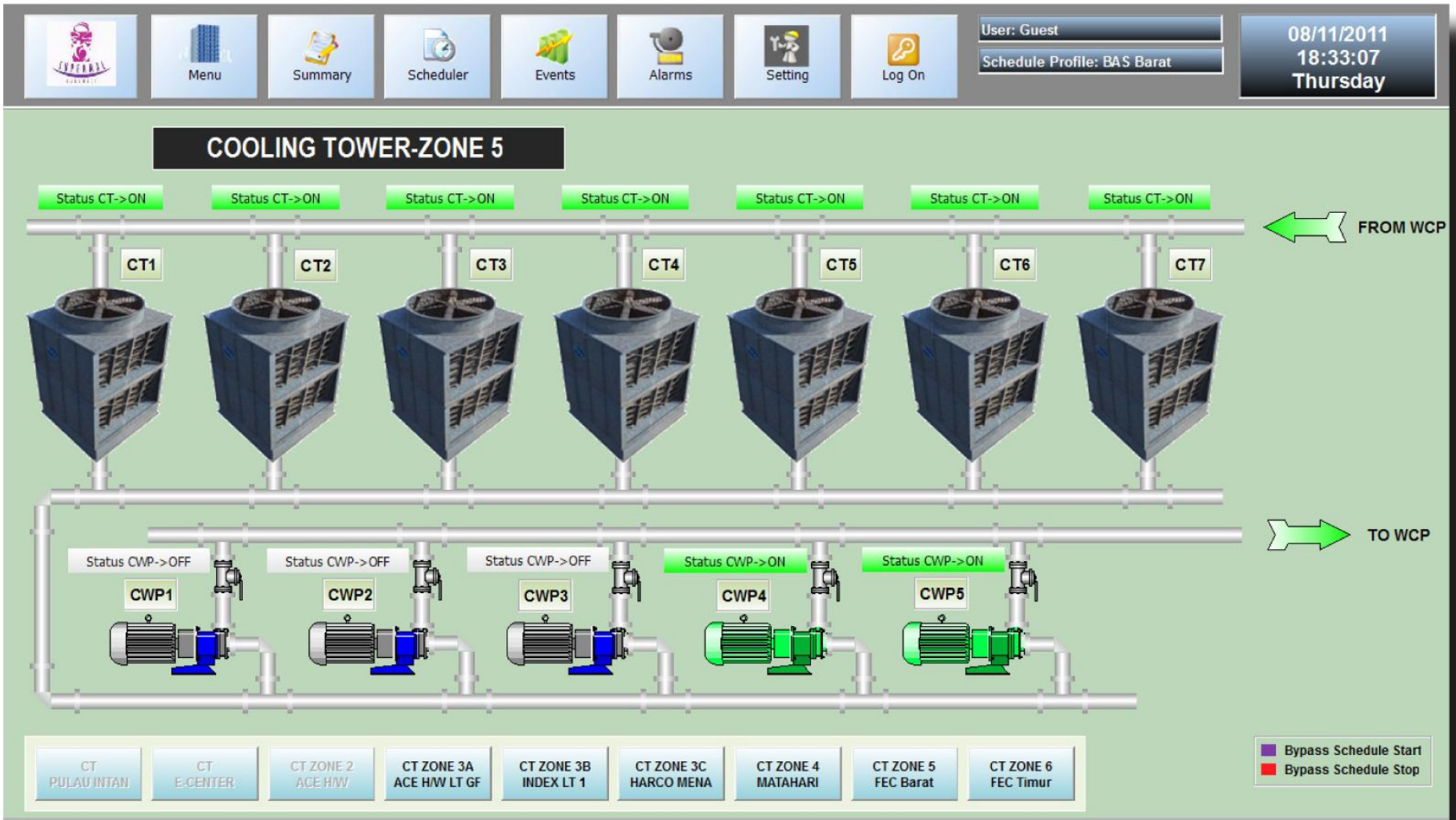
### ESCALATOR & ELEVATOR

ESCALATOR	ELEVATOR
SPARE	SPARE
SPARE	SPARE
SPARE	SPARE

# Energy monitoring sample page

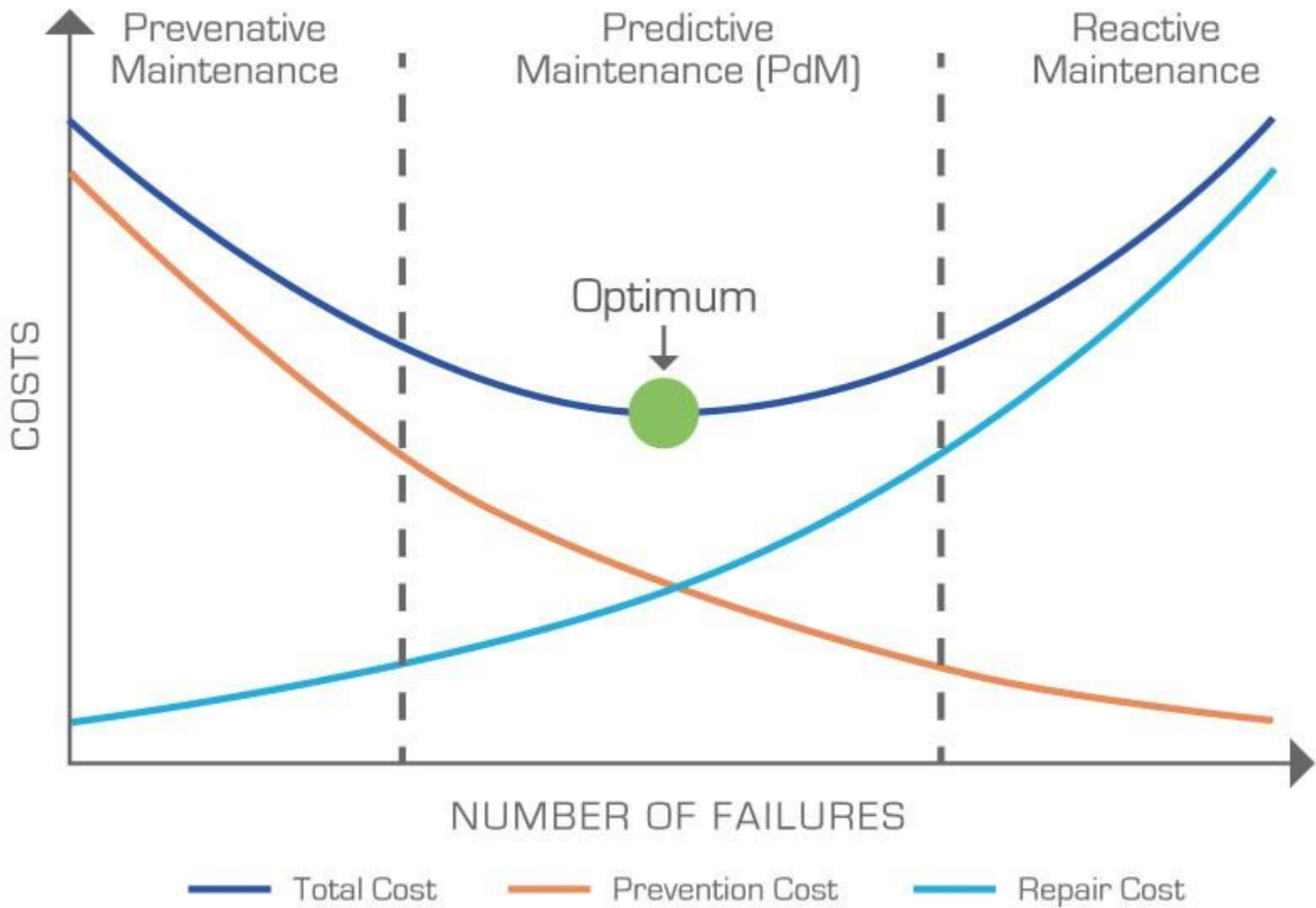


# Energy monitoring sample page



# PC-based Control: Machine diagnostics and predictive maintenance

# Motivation



# Predictive vs Preventive maintenance

## Predictive vs. preventive maintenance

Though the best maintenance programs include a balance of both, preventive maintenance and predictive maintenance are different strategies. Preventive maintenance is determined using the average or expected life cycle of an asset, whereas predictive maintenance is identified based on the condition of equipment.

While predictive maintenance is more complex to establish than a preventive maintenance schedule based on manufacturer recommendations, it can be more effective for a business to save time and money. For example, taking vibration measurements on an electric engine at recommended intervals more accurately detects bearing wear and allows organizations to take action such as replacing a bearing before total failure occurs.

While the **investment** into a predictive maintenance program can be costly to install, it results in reduced maintenance costs and downtime and delivers 10 times the ROI for the oil and gas industry alone, according to research strategy consulting firm Roland Berger. For example, predictive maintenance is often used for wind turbines since wind farms often traditionally have high operational costs. And **field service** software can be used along with predictive maintenance tools to make sure your machinery keeps running efficiently.



# Predictive Maintenance

## **Predictive Maintenance and the Internet of Things**

With the increased networking of machines and manufacturing facilities in the **Internet of Things**, predictive maintenance is becoming more and more important. Sensors facilitate the easy monitoring of machine conditions, cloud storage systems and data bases enable the long-time archiving and analysis of machine data for diagnostic and maintenance purposes.

By means of real-time monitoring, a comprehensive data pool, and state-of-the-art analytical methods, machine-specific malfunctions can be predicted by 70 %. This enables field service technicians to intervene in time to effectively prevent failures as well as unnecessary maintenance measures, downtimes, and costs.

However, the benefits of the Internet of Things and predictive maintenance are not confined to new facilities. Older machines with life cycles of 50 or 60 years can also easily be integrated into predictive maintenance schemes by means of targeted retrofit measures.

# Data acquisition scenarios for predictive maintenance

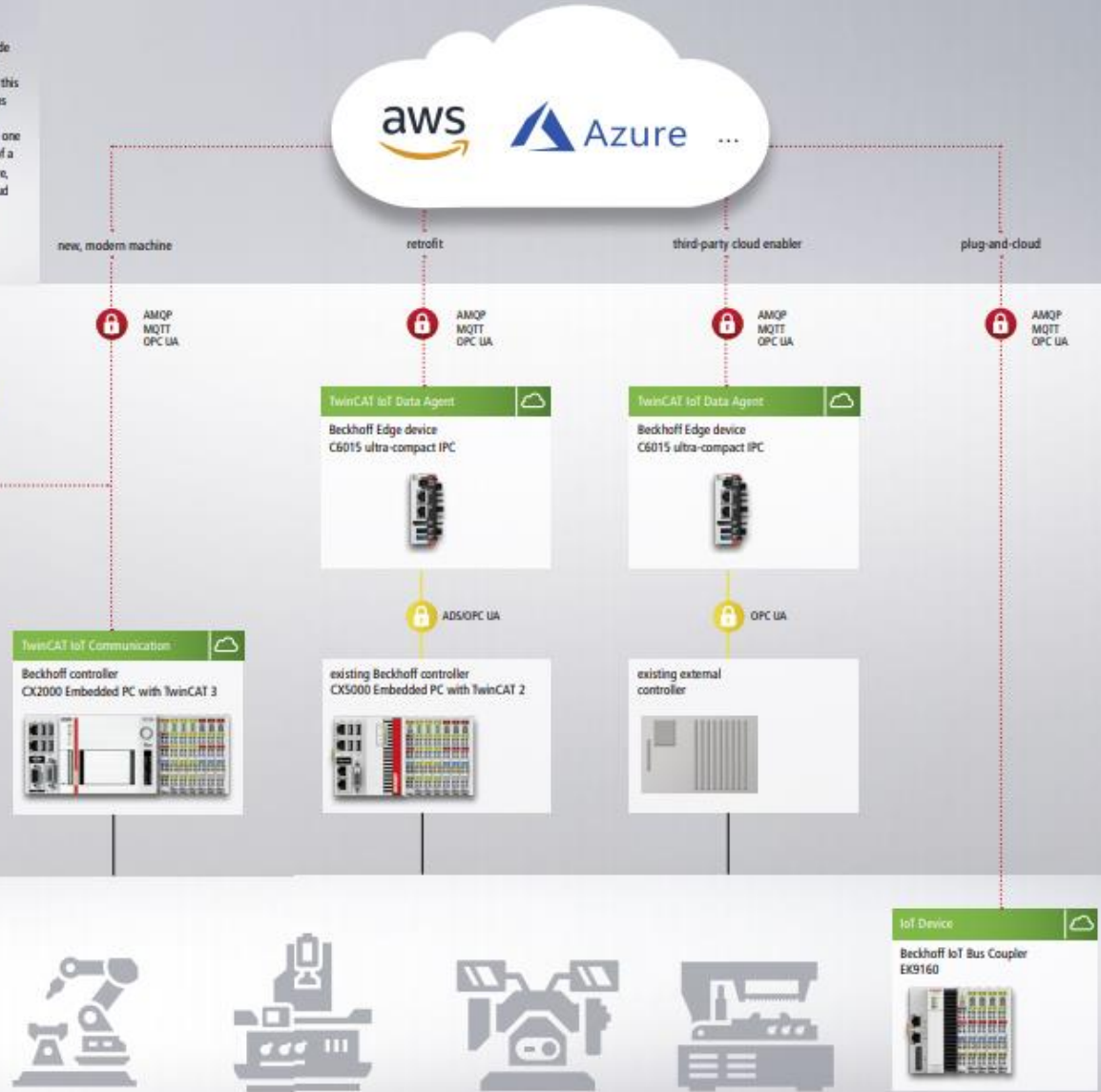
## IoT: products and scenarios

From a technical perspective, the Internet of Things (IoT) consists of a rapidly growing number of sensors worldwide that collect and transmit data. The term IoT also refers in this context, however, to the rules and actions applied to this data in order to optimise technical systems. Cloud systems serve as a technological basis for the Internet and as a central end point for devices so as to network these with one another and aggregate and analyse their data. In terms of a system automated with the TwinCAT automation software, the sensor and process data can be connected to the cloud via the TwinCAT IoT products not only in the case of newer but also older machine applications or even third-party systems.

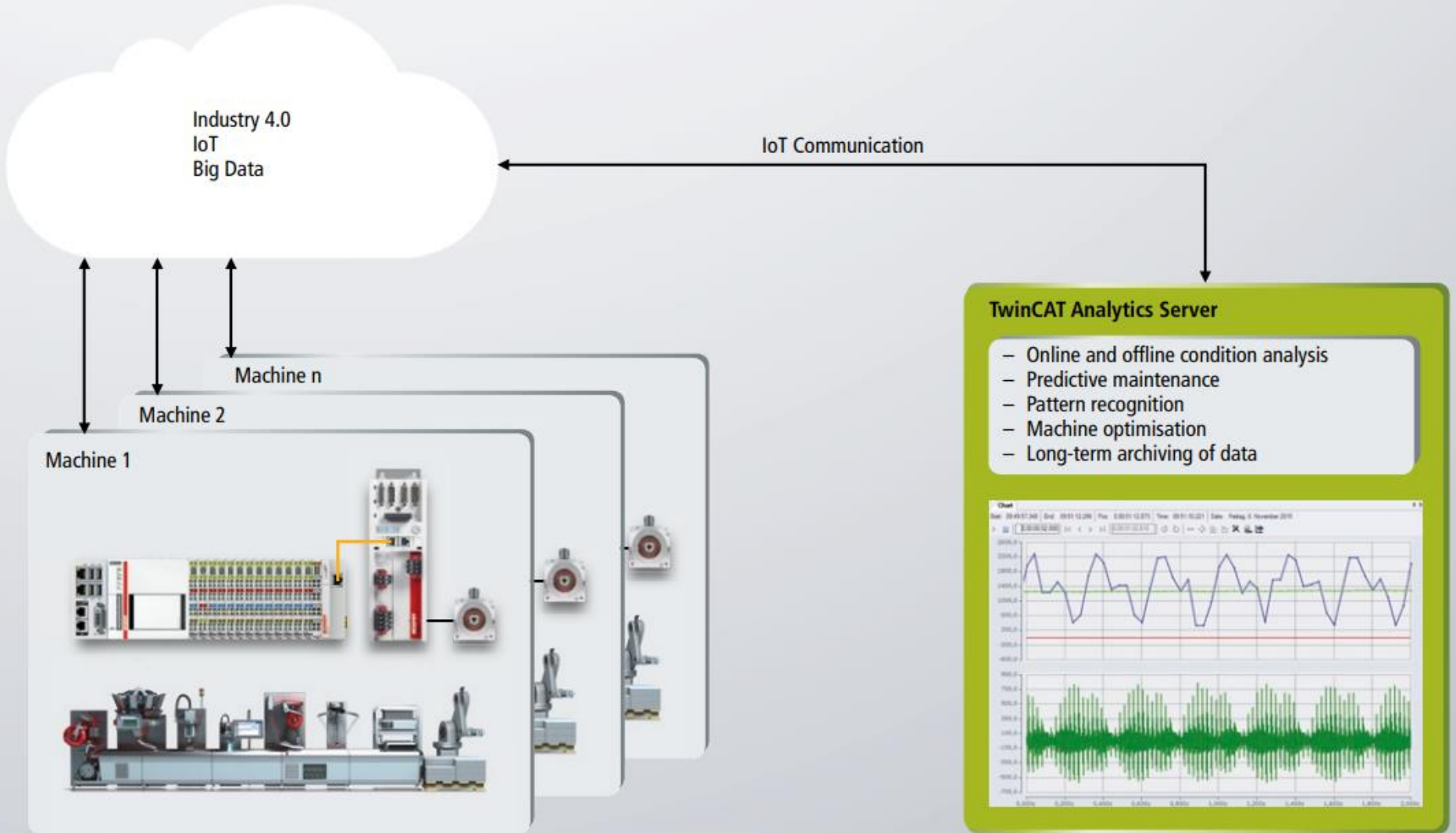
Communication



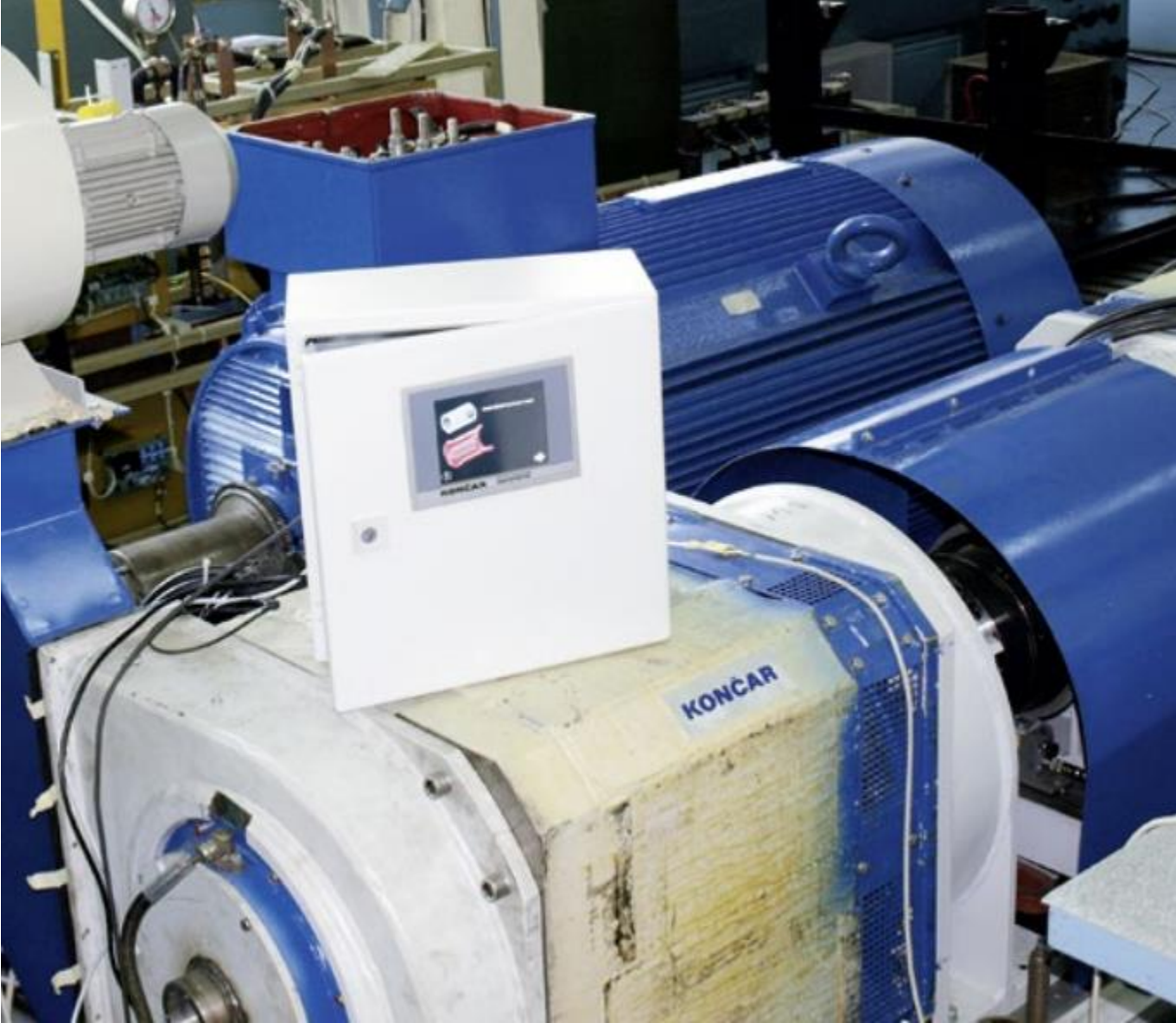
Data logging/  
machine



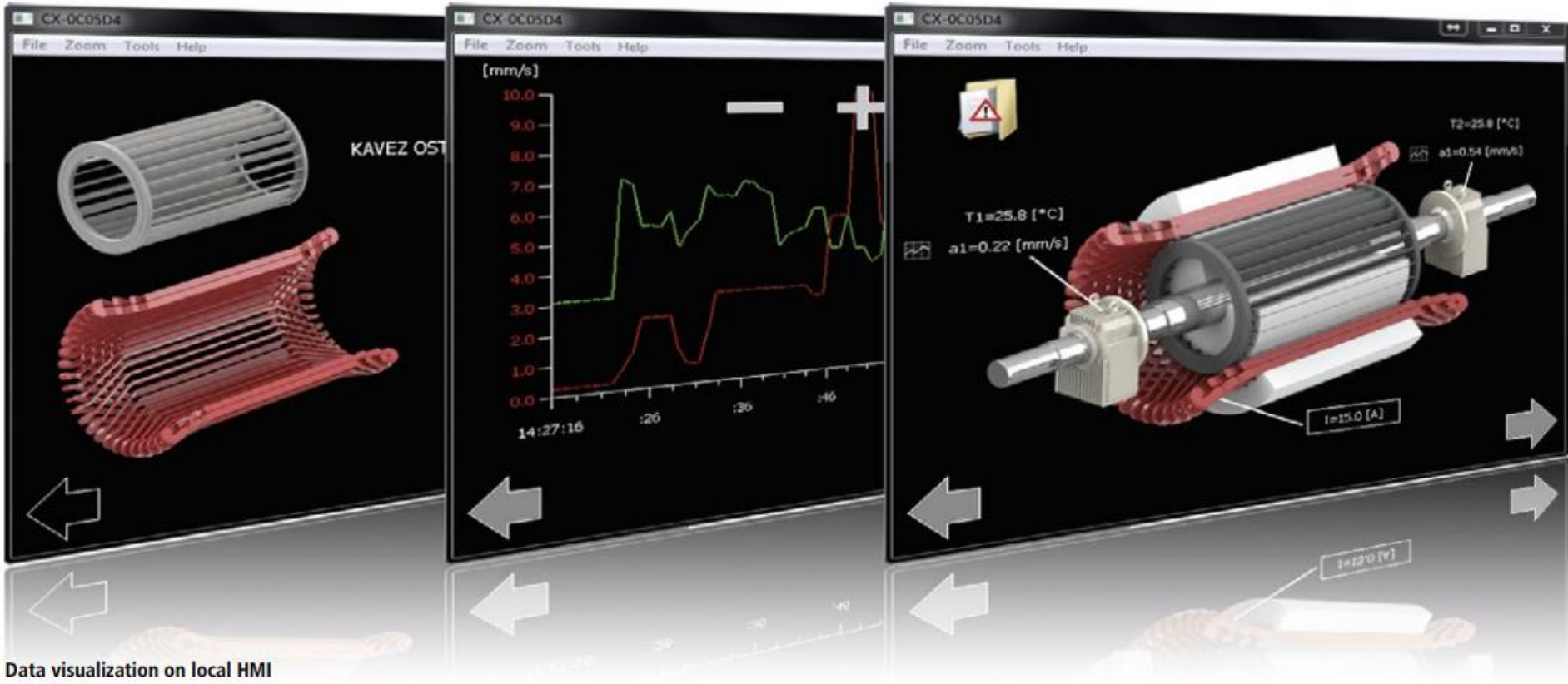
# Industrie 4.0 enables real time seamless data collection



# Case study - The KONČAR – Electrical Engineering Institute, Inc Expert Motor Condition Monitoring (EMCM) system

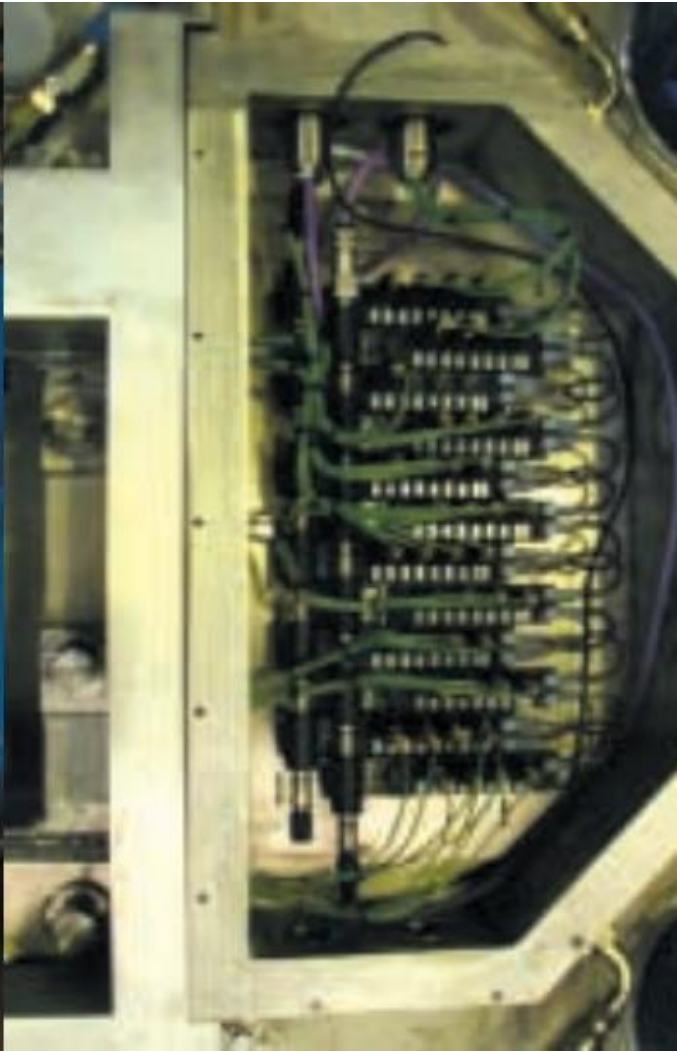


# Case study - The KONČAR – Electrical Engineering Institute, Inc Expert Motor Condition Monitoring (EMCM) system



Data visualization on local HMI

Case study  
SMS Demag – Breakout prediction systems



Case study  
SMS Demag – Breakout prediction systems



# Case study

## TAR Automation – Condition Monitoring System (CMS)





## Case study

# TAR Automation – Condition Monitoring System (CMS)



The condition monitoring system is supplied ready for operation, installed in a compact terminal box.

### **Industry 4.0: Communication standards for vertical and horizontal networking**

The wide range of Embedded PCs are scalable in terms of performance and I/O configuration while offering diverse networking options. This offers many degrees of freedom when implementing control architectures and, as a result, optimum solutions for the tasks at hand. "Whether we are dealing with a small, stand-alone solution, networking of decentralized, intelligent controllers or a high-performance central solution – anything is possible," concludes TAR's Managing Director. "In combination with support for OPC UA as the universal standard for vertical networking, it is also possible to integrate ERP systems, both within a site and across sites."

# Preventive Maintenance sample page

Wednesday, December 03, 2014

[See Additional Dashboards](#)

## PREVENTIVE MAINTENANCE

Filter: Any time

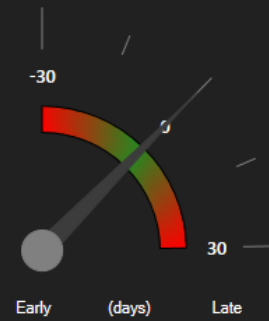
### PM Scheduled

This month

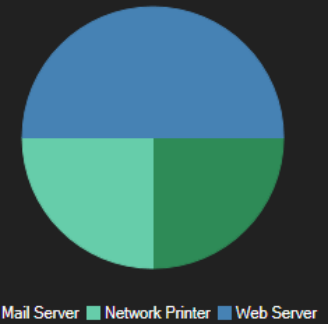
Drag a column header here to group by that column

Asset Type	Title	Frequency	Owned By	Last Performed	Next Due
Mail Server	Archive E-mail	Every 2 Weeks	Henri Bryce		12/14/2014
Web Server	Perform SCAP Audit (RedHat Linux)	Every 6 Months	Henri Bryce		12/28/2014

### PM Timeliness



### PM Tasks by Asset Type



### Overdue PM Tasks

0

### On Hold PM Tasks

0

### New PM Tasks

5

### Acknowledged

0

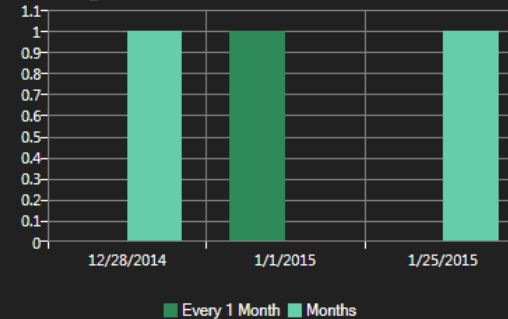
### In Progress

0

### Average Duration

0

### Recurring PM Task Load



### PM Log

Drag a column header here to group by that column

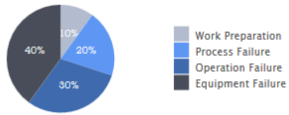
Created By Date Performed Details

No records found

# Predictive Maintenance sample page

2023-05-17 10:00

## Operation Shutdown Time



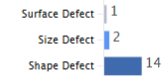
## Overall Equipment Health Score



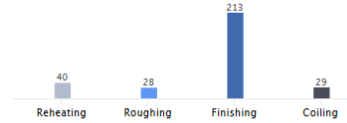
## Production Output with Target(Day)

365/800(EA)

## Product Defect Count(Day)



## Equipment Anomaly Count(Month)



### Reheating



### Roughing



### Finishing



### Coiling



### Equipment Profile

FM4

FinishingMill4  
Mill Stand  
Yoido

### Overall Health Score

54

### Failure Probability

84

### Anomaly Count

29

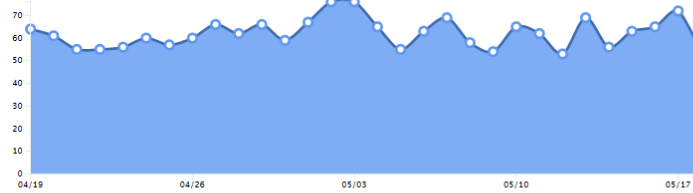
### Work Order Overdue

1

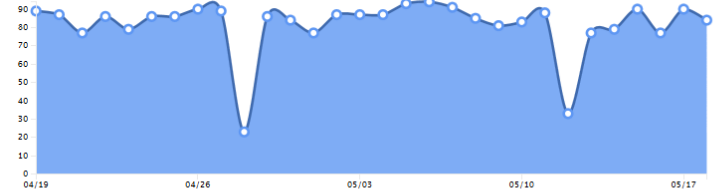
### Failure Count

4

### Healthy Score Trend



### Equipment Availability Trend



### Measurement Profile

Measurement Type	Min	Max	Average	Last Value
Current on the load	458.50	476.00	466.05	469.95
Current on the no load	43.20	44.70	44.15	44.10
Cylinder position difference	7.20	8.30	7.85	11.75
Roll Force difference between WS and DS	133.10	145.10	137.90	141.80
Roll Speed Variance on the no load	763.40	839.00	800.00	803.90
Roll Speed difference between plan and actual	180.00	198.20	187.90	191.80

### Event Log

Time	Event Type	Comment
10:00:00	INSPECTION	Delayed Fueling
13:30:00	ALARM	State Check OK - Wear state, vibration
14:00:00	ALARM	Discover small crack on the mill spindle
11:20:00	ALARM	OIL Inspection Missing
10:00:00	INSPECTION	Occurred Unplanned Roll Change

# Creating value: IoT and Data Analytics from Beckhoff

The simple route  
from data  
recording to  
the dashboard

The Beckhoff principle is simplicity in itself. Beckhoff makes the route from data recording in the field to communication and historicisation through to data analysis in the framework of a user-specific HMI concept a comparatively simple one. IoT and data analytics scenarios can be integrated directly into existing tool landscapes and existing IT infrastructures. Sensors integrated directly with the control system are used to record data. Available fieldbuses can be used for communication, with standard protocols being used to exchange data with the cloud. Such simplicity pays off: costs, effort and training periods are reduced significantly.



# Industrie 4.0

## From factory floor to your hand



**Analysis**

Users can view data and configure their analysis in TwinCAT Engineering. Final PLC code can be generated from the implemented configuration.



**Dashboard**

An individual analysis dashboard can be designed on the basis of the PLC analytics code. The analysis can be visualised with HTML5 technologies, independently of the platform.