


Siemens Digital Industries Webinari

FA2: Energy Management System

Siemens Digital Industries Webinar 1/2



Datum	Tema	Predavač
14.04. / 19.05.	FA1: Motion Control	<i>Darko Živković, Jelena Đukić</i>
 15.04. / 14.05.	FA2: Energy Management System	<i>Zoran Jovanović</i>
22.04. / 21.05.	FA3: Redundantni kontroleri serije S7-1500R/H	<i>Mirko Milovanović</i>
05.05. / 26.05.	FA4: WinCC Unified	<i>Mirko Milovanović</i>
15.04. / 13.05.	MC1: DT konfigurator	<i>Nenad Bakal, Pavle Dragišić</i>
23.04. / 22.05.	MC2: Sizer, large drives	<i>Miloš Marković, Pavle Dragišić</i>
06.05. / 26.05.	MC3: Sizer, motion drives	<i>Miloš Marković, Pavle Dragišić</i>
21.04. / 21.05.	CI1: Industrial Networks	<i>Jelena Đukić</i>

Siemens Digital Industries Webinari 2/2



Datum	Tema	Predavač
16.04. / 15.05.	PI1: PI Academy world	Andrijana Popara, Miljan Miljanić, Marko Marić
24.04. / 22.05.	PI2: PI workshop for specialist	Andrijana Popara, Miljan Miljanić, Marko Marić
08.05. / 29.05.	PI3: #New@PI	Andrijana Popara, Miljan Miljanić, Marko Marić
30.04. / 29.05.	AE1: Digitalna rešenja u procesnoj industriji	Jelena Đukić, Marko Milenković
29.04.	CP1: Control Panel Online Symposium	Siemens worldwide webinar
22.04. / 27.05.	CP2: Clever engineering in the control panel	Tijana Džodžo
28.04. / 12.05.	CP3: New series of signaling devices 3SU	Tijana Džodžo
21.04. / 20.05.	CP4: SIRIUS 3RW Soft starters	Bojan Janković
07.05. / 28.05.	DE1: Siemens Digital Enterprise	Zoran Jovanović

Današnji predavač



**Zoran
Jovanović**

Responsibility

Area Sales Manager
Factory Automation
Energy Management Systems
Digital Enterprise

Contact

✉ zoran.jovanovic@siemens.com

🏭 DI FA +381 60 8170 156

🏠 Beograd, Srbija



PRO2 Masch3 EnO

SIMATIC Energy Management

Beograd 14.05.2020.

There are numerous requirements for company-wide energy analysis

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1 | Fulfill legal requirements efficiently

... by means of TÜV-tested energy management system in accordance with ISO 50001



2 | Secure competitive advantages & meet sustainability targets

... by means of the sustainable use of energy and resources with reduced CO₂ emissions



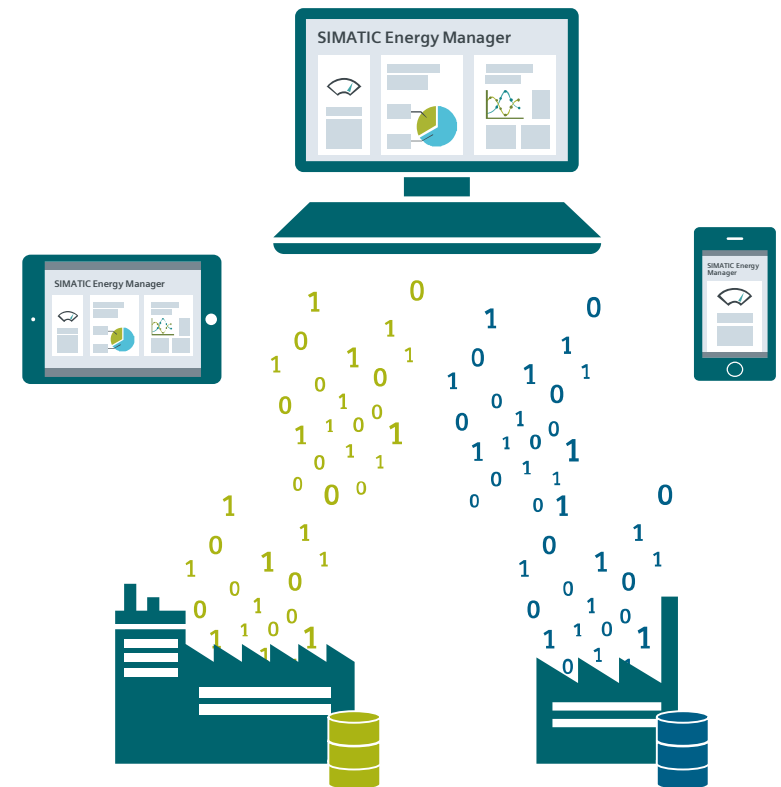
3 | Exploit results and potential

... by utilizing transparency to identify and implement potential for optimization and to track the resulting measures



4 | Exploit changes in the energy price

... by optimizing purchasing through reliable energy forecasts



SIMATIC Energy Manager PRO – Energy Efficiency starts with Transparency



Plant operator



1 | Monitoring

- Display of consumption and costs
- Display of all relevant company data on a single dashboard

2 | Controlling

- Determination of performance indicator values with direct reference to production batches
- Benchmarking of various plants or sites

3 | Cost-center-oriented accounting

- Freely configurable accounting of the energy flows of different media such as electricity, gas, or steam, from the main supply down to sub-distribution systems

4 | Energy forecast

- Generation of requirement forecasts based on production-dependent factors (production planning)

5 | Management of energy efficiency measures

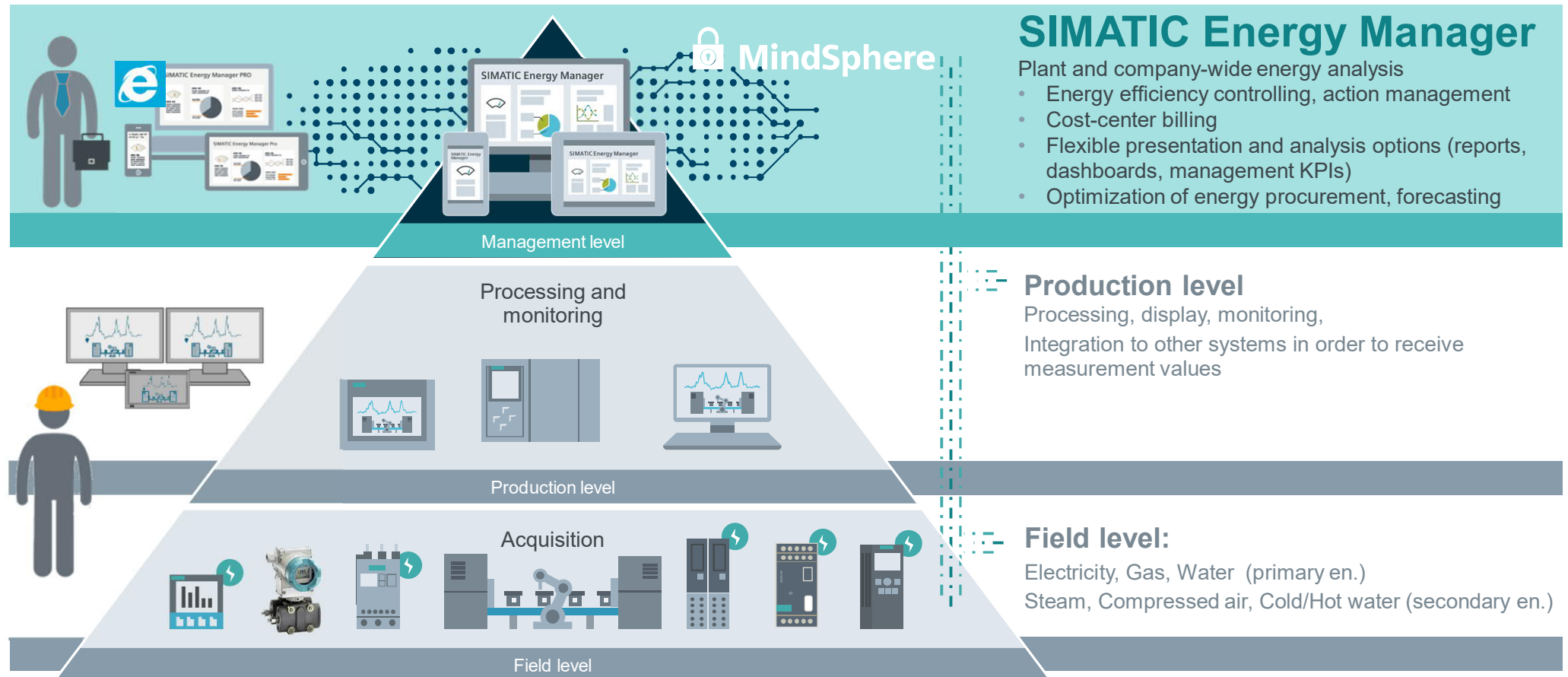
- All of a site's energy efficiency measures are recorded centrally
- Automatic calculation of efficiency based on potential savings and costs of each energy efficiency measure

6 | Energy reporting

- Fully automated reporting, email dispatch and document management
- Energy Manager web client for company-wide viewing of dashboards, reports and results
- Information about discrepancies from specified parameters through KPI warning system

SIMATIC Energy Management – transparency and efficiency from the field level through to the entire company

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SITRANS Process instrumentation

Designed for excellence in flow measurement

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Steam, Compressed air, Gas



FC330

Coriolis flowmeter
DN15...DN150
Accuracy 0,2...1%
Profibus / HART / Modbus
RTU / 4...20mA



FX300

Vortex flowmeter
DN15...DN300
Profibus / HART / 4...20mA

Heat / cold meters

FUS380

electromagnetic
flowmeter
DN50...DN1200
15...18000 m3/h



FUE950

Calculator
Pulse / M-bus /
4...20mA



UH50

Pulse / M-bus /
4...20mA

Water flow

FS220

Clamp-on
ultrasonic
flowmeter
For pipes 0,5...360"
Pulse / Modbus
RTU / 4...20mA



MAG5100W

electromagnetic
flowmeter
DN15...DN1200
Profibus / HART / Modbus
RTU / 4...20mA



SETRON and SIMATIC Electrical energy meters

Scalable solution, suitable for many applications

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SETRON PAC devices

7KM PAC3100 – 1,0S

480V, MODBUS RTU, 2DI, 2DO



7KM PAC3200 – 0,5S

690V, Modbus TCP, THD, 1DI, 1DO,
Expansion Modules Profibus, Profinet,
Modbus RTU, THD



7KM PAC4200 – 0,2S

Modbus TCP, / Gateway, 2DI, 2DO, cos
Phi, 31st.harm, Load profile



SIMATIC Energy Meters

ET 200SP AI Energy Meter 480VAC HF

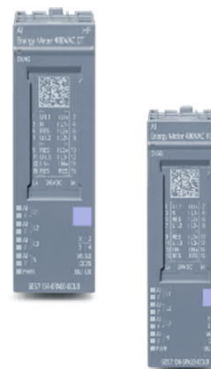
Engineering with STEP 7 TIA Portal, STEP7
v5.6

Values: U, I, P, Q, S, f, cosFI, harmonics

Class: 0,2...1,0

Diagnostic messages, LED indication

Energy Meter for recording up to 200 electrical
variables



SM 1238 Energy Meter 480 V AC analog input modules S7-1200

Engineering with STEP 7 TIA Portal

Values: U, I, P, Q, S, f

Class: 0,2...1,0

Data backup of measurement data in the event of a power
failure



SIMATIC PLCs, SCALANCE communication

Acquisition, processing, data transferring

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SIMATIC PLCs



BASIC controller

SIMATIC S7-1200

* CPU1214C DC/DC/DC



ADVANCED controller

SIMATIC S7-1500

* CPU1516-3PN/DP



DISTRIBUTED controller

SIMATIC ET200sp CPU

* CPU1512SP



SCALANCE communication



UNMANAGED switches

X-000, XB-000

X-100, XB-100, XC-100



MANAGED switches

X-200, XB-200, XC-200

X-300, XR-300

XM-400, XR-500 (Layer 3)



Network components



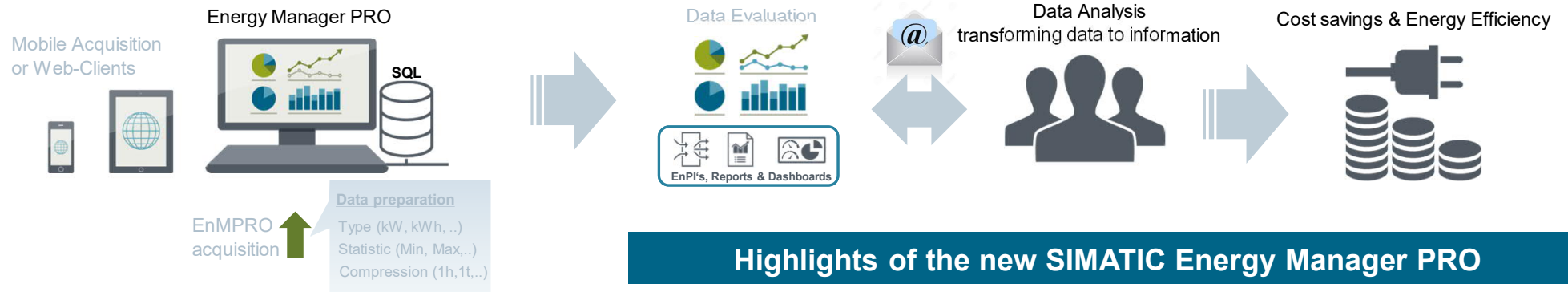
Profinet cables

Optical single/multi mode

SIMATIC Energy Manager PRO V7.2

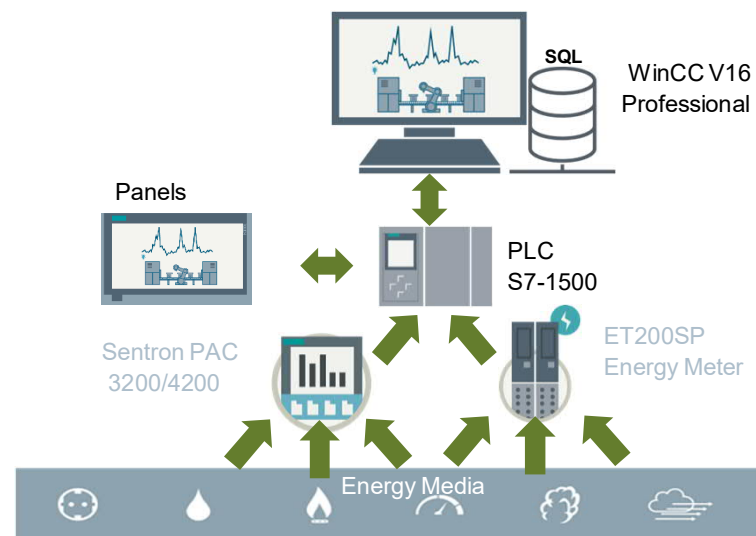
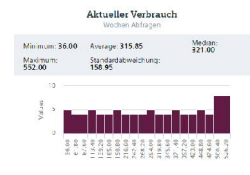
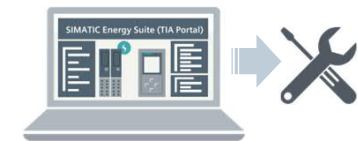
The easy way from measure to optimization

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Highlights of the new SIMATIC Energy Manager PRO

- Connectivity to MindSphere
- New system database **Microsoft® SQL Server®**
- Interface standards: S7, WinCC, OPC UA, OPC DA (DA, HA), OPC HDA, MODBUS TCP, ODBC, ASCII and XML
- Easy creation of Web-Dashboards (Widget-Technology)
- Integrated analysis function to recognize optimization potential
- Simatic Energy Manager Basic



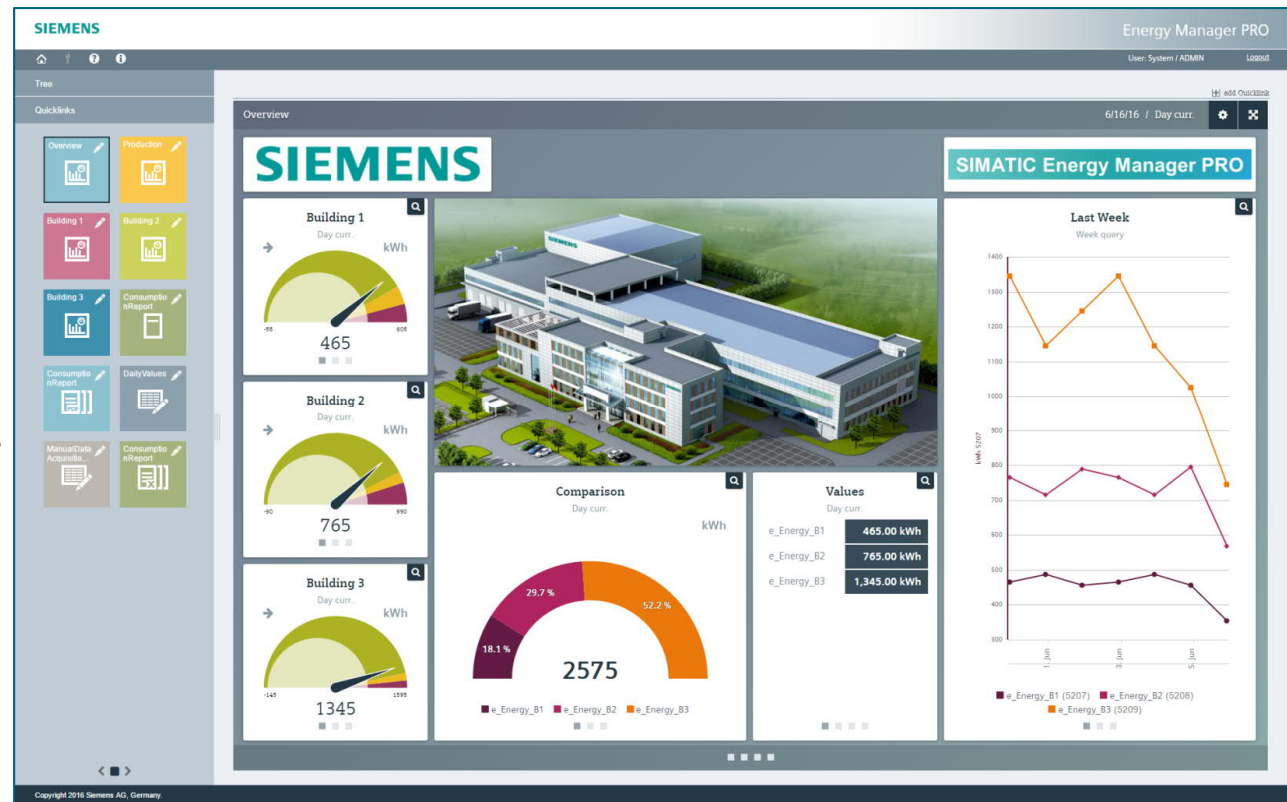
SIMATIC Energy Manager PRO V7.2

Widget-based Web Dashboard

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Widget-based Web Dashboard

- Full flexibility in creation of Web Dashboards during runtime
- Intuitive and Easy-To-Use widget-based concept
 - Free scalable and placeable on base grid
 - Quick addition and deletion of widgets
- Automatic parameterization of visualization elements (Minimum, Maximum, Warning Levels,...)
- Availability of a very flexible web dashboard
 - Charts like pie, line, bar
 - Gauge, traffic light, Text, Image,
 - Sankey, Heat map, Map, Alarms
- Integrated statistic and analysis functionalities



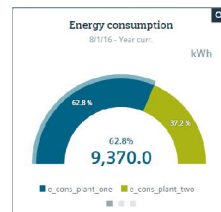
SIMATIC Energy Manager PRO V7.2

Widget-based Web Dashboard



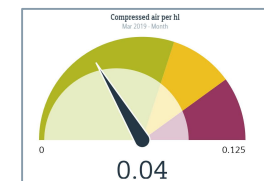
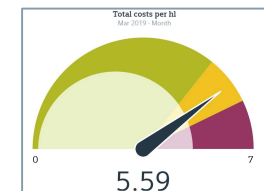
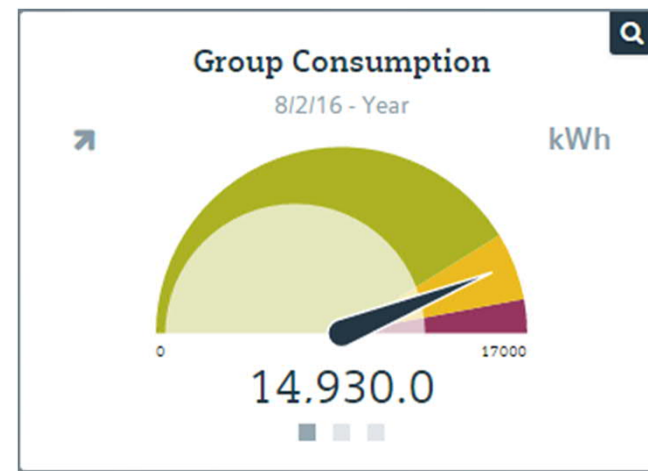
Pie Chart - Widget

- max 10 data points connectable
- percentage of each data point and time summary
- Single measurement value with mouse click selection
- Additional tab with histogram for frequency distribution (minimum, maximum, median,...)



Gauge - Widget

- Summary or average – depends on type
- Unit/limits from data point configuration
- Little arrow object show data trend
- Additional tab with histogram for frequency distribution (minimum, maximum, median,...)

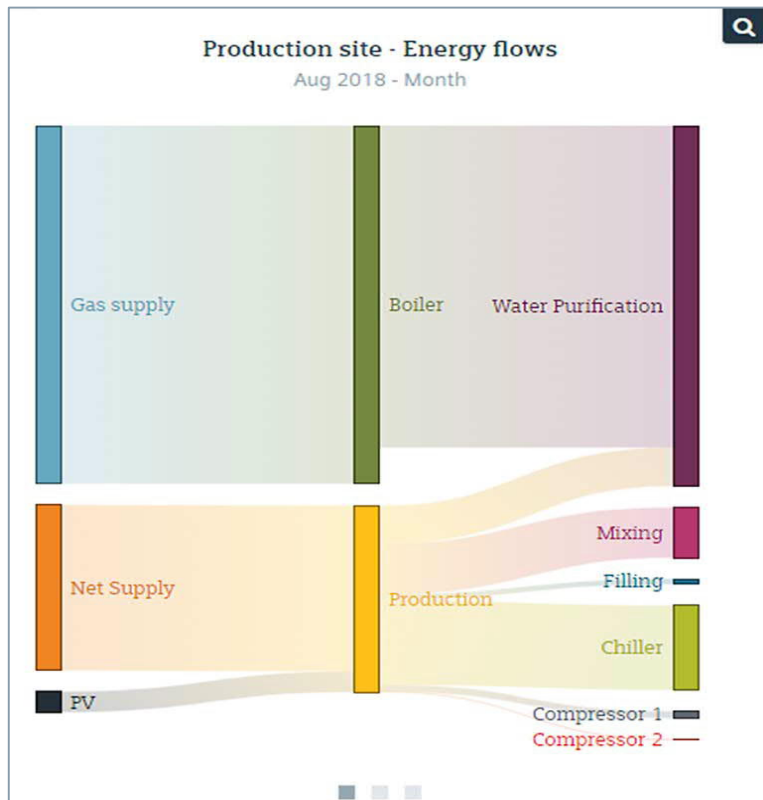


SIMATIC Energy Manager PRO V7.2

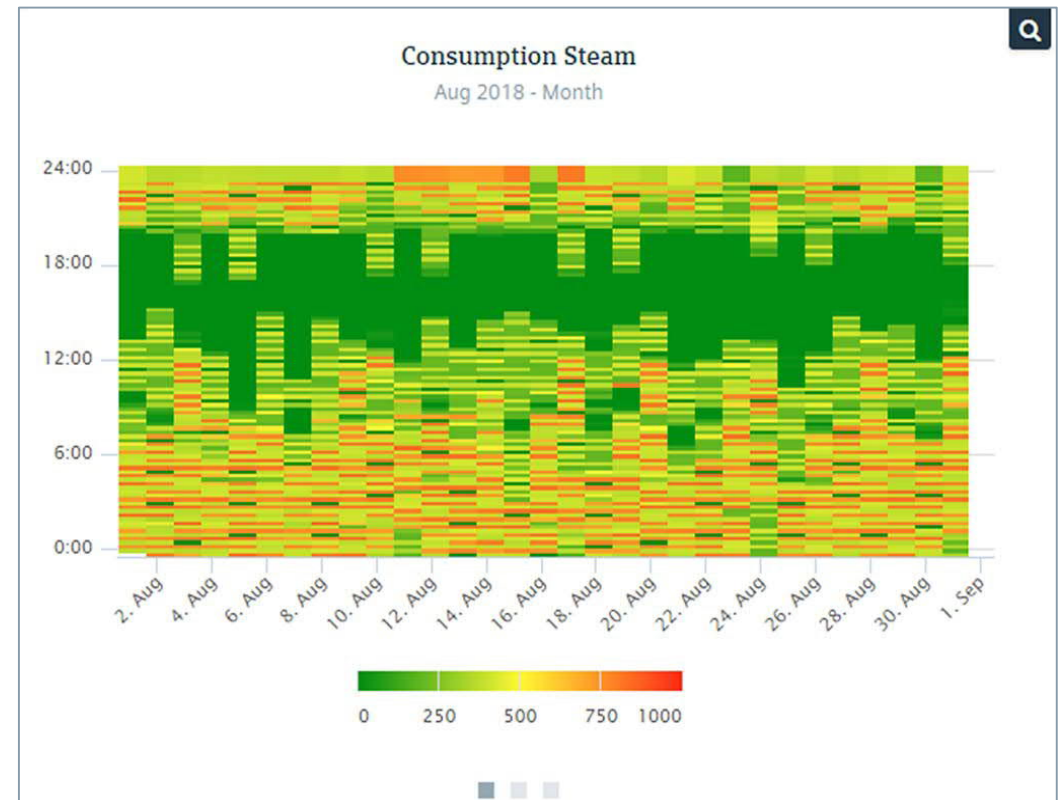
Widget-based Web Dashboard

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Sankey diagram - Widget



Heat Map - Widget



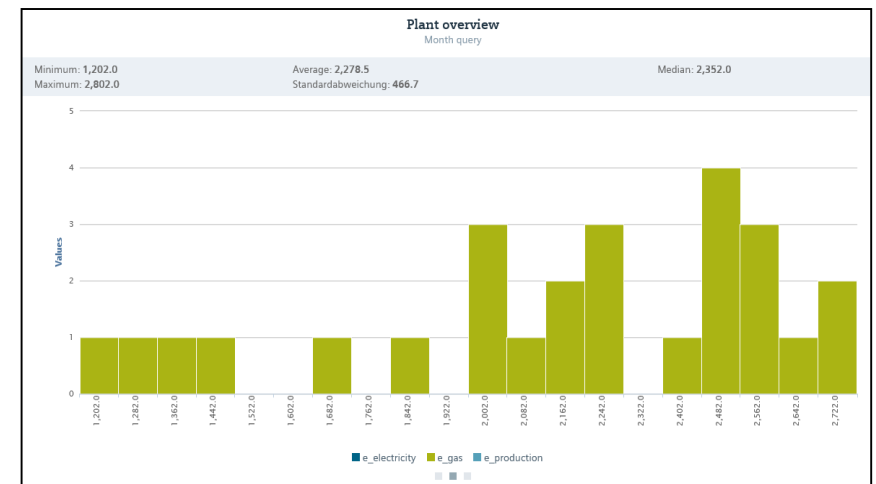
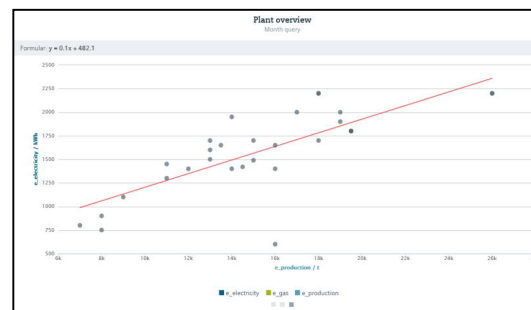
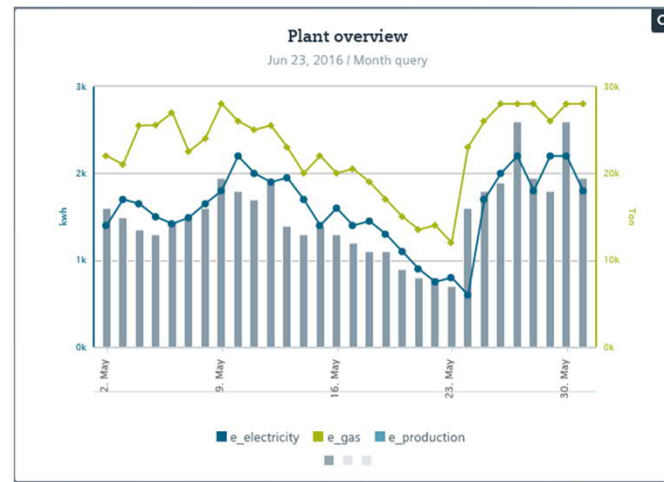
SIMATIC Energy Manager PRO V7.2

Widget-based Web Dashboard



Line Chart - Widget

- 5 different Y-Axis
- Value compare by time shifting (2 different X-axis)
- Area, line, bar, points and spline type for each data point available
- Additional chart tab with histogram for frequency distribution (minimum, maximum, median,...)
- Additional chart tab with regression analysis (reference data points selection by legend click)



SIMATIC Energy Manager PRO V7.2

Widget-based Web Dashboard



Traffic light - Widget

- Summary or average – depends on type
- Unit/limits from data point configuration
- Little arrow object show data trend
- Additional tab with line chart
- Additional tab with histogram for frequency distribution (minimum, maximum, median,...)



Value - Widget

- max 10 data points connectable
- Additional tab with histogram for frequency distribution (minimum, maximum, median,...)
- Additional tab with regression analysis (reference data points selection by legend click)

e_cons_group	14,930.0 kWh
e_cons_plant_one	9,370.0 kWh
e_cons_plant_two	5,560.0 kWh

SIMATIC Energy Manager PRO V7.2

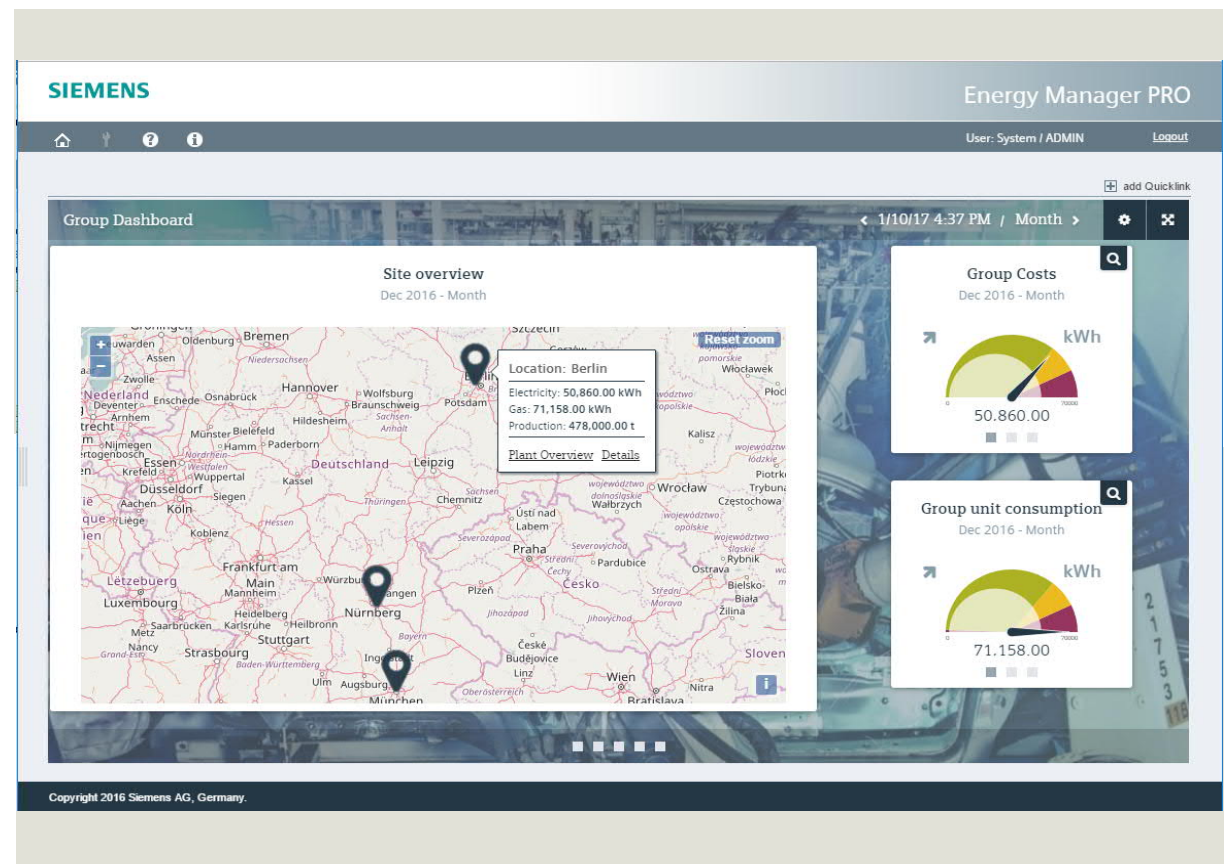
Dashboard across several sites



From high level views to the details

Map - Widget

- The map widget supports
 - Geographical position of the site
 - Important EnPIs for this site
 - Direct navigation to the e.g. plant dashboard



SIMATIC Energy Manager PRO V7.2

Widget-based Web Dashboard: Alarm lists



e_Electricity_01 Electricity						
Acknowledge	Alarm class	Value	Value timestamp	Message	Insert timestamp	Generation timestamp
✓	⚠	2,500	12/22/2017 00:00:00	Value of 2500 violates Upper Limit of 2000.	01/23/2017 16:29:52	01/23/2017 16:29:52
✓	⚠	2,200	12/24/2017 00:00:00	Value of 2200 violates Upper Limit of 2000.	01/23/2017 16:29:52	01/23/2017 16:29:52
✓	⚠	2,000	12/27/2017 00:00:00	Value of 2000 exceeds warning Upper Limit of 1800.	01/23/2017 16:29:52	01/23/2017 16:29:52
✓	⚠	2,200	12/28/2017 00:00:00	Value of 2200 violates Upper Limit of 2000.	01/23/2017 16:29:52	01/23/2017 16:29:52
✓	⚠	2,200	12/30/2017 00:00:00	Value of 2200 violates Upper Limit of 2000.	01/23/2017 16:29:52	01/23/2017 16:29:52
✓	⚠	2,300	12/31/2017 00:00:00	Value of 2300 violates Upper Limit of 2000.	01/23/2017 16:29:52	01/23/2017 16:29:52
✓	⚠	2,500	01/01/2018 00:00:00	Value of 2500 violates Upper Limit of 2000.	01/23/2017 16:29:52	01/23/2017 16:29:52

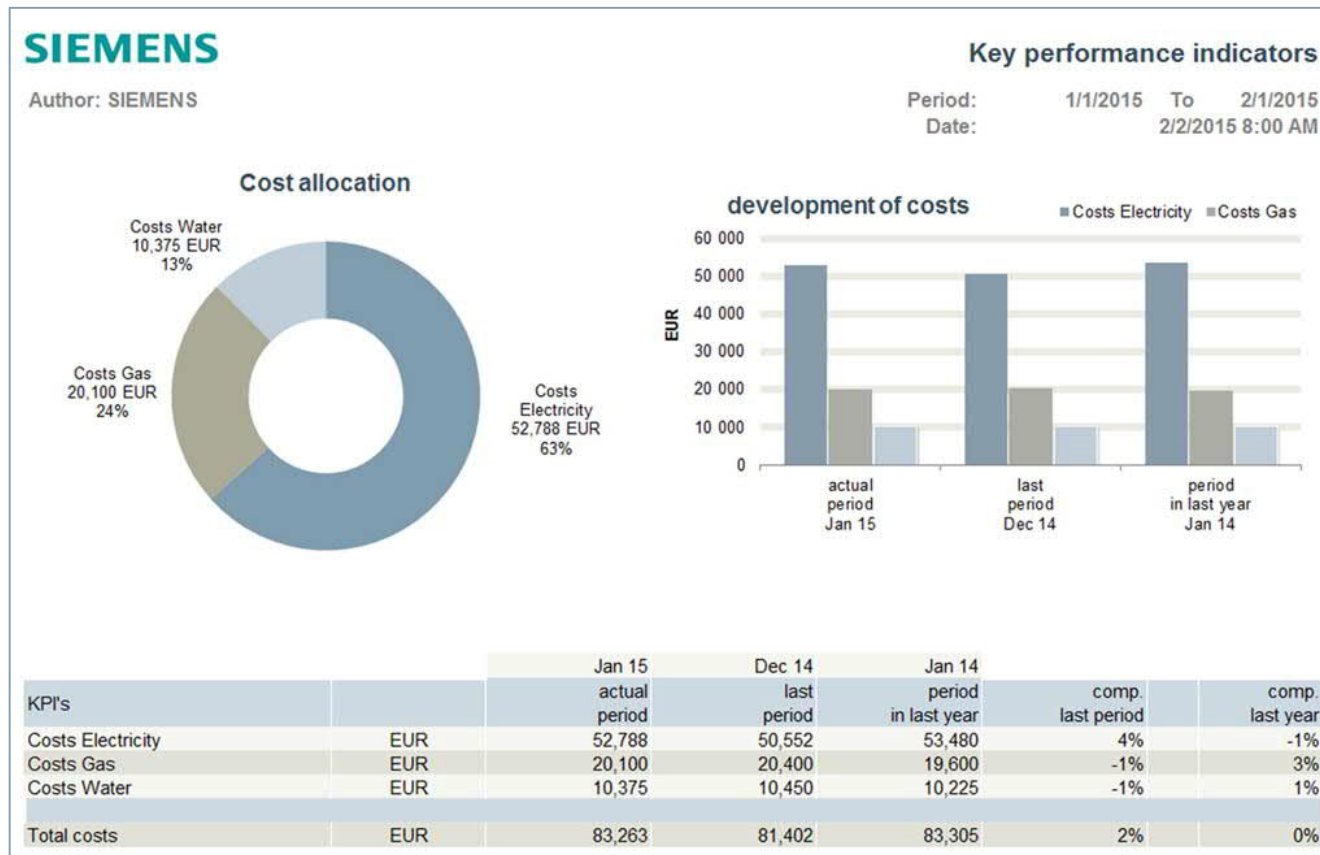
✕ Cancel
✓ Acknowledge all

Plant Alarms
2017 - Year

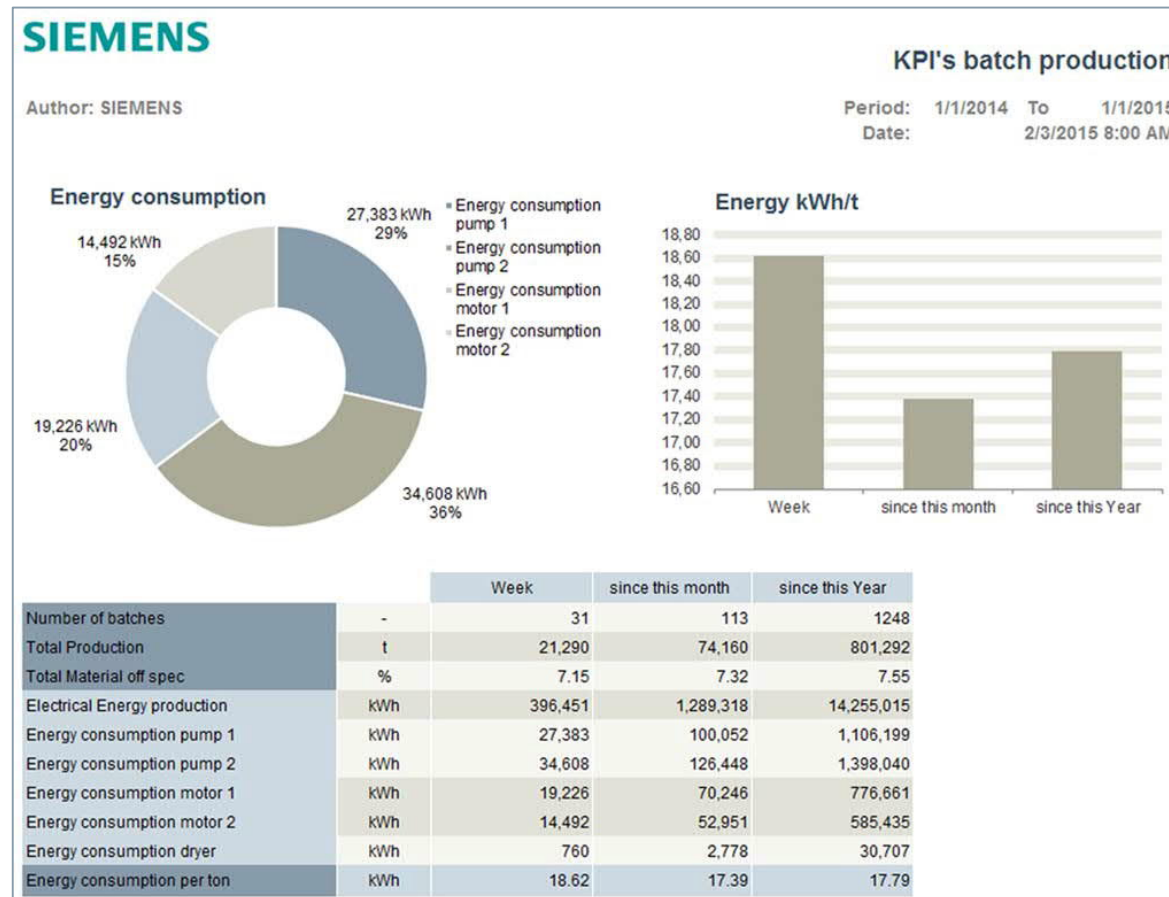
Name	Violation:	Warning:
d_PR_amount_ST_Water_Treatment	40029	
d_PR_cons_F_Water_Purification		3056
a_PR_compressor1_Eff	14	
e_Electricity_01	6	1
e_Gas_01	3	4
e_Electricity_02	4	1
e_Gas_02	3	4

✓ Acknowledge all

Examples of typical controlling reports: monthly report that compares the costs of the current period with those of the last period



Examples of typical controlling reports: monthly report that shows energy consumption per production



Energy Manager PRO

Batch Analyses



Data analysis on batch, product, or equipment level

- Data analysis based on equipment or materials
- Comparison of products produced by different lines
- Batch related energy balance across the production process

EnMPRO9143929716 - Report-Open - Batch Analyses Report - von: 2016.11.01

File Home Insert Page Layout Formulas Data Review View Tell me what you want to do...

Clipboard Font Alignment Number

C23 0

Batch Analyse

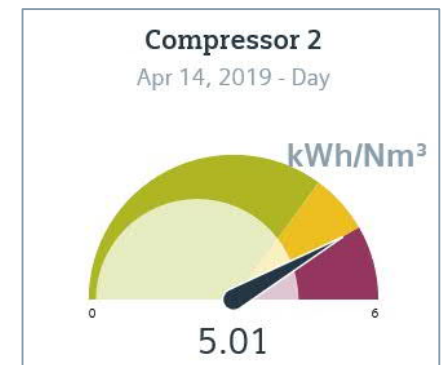
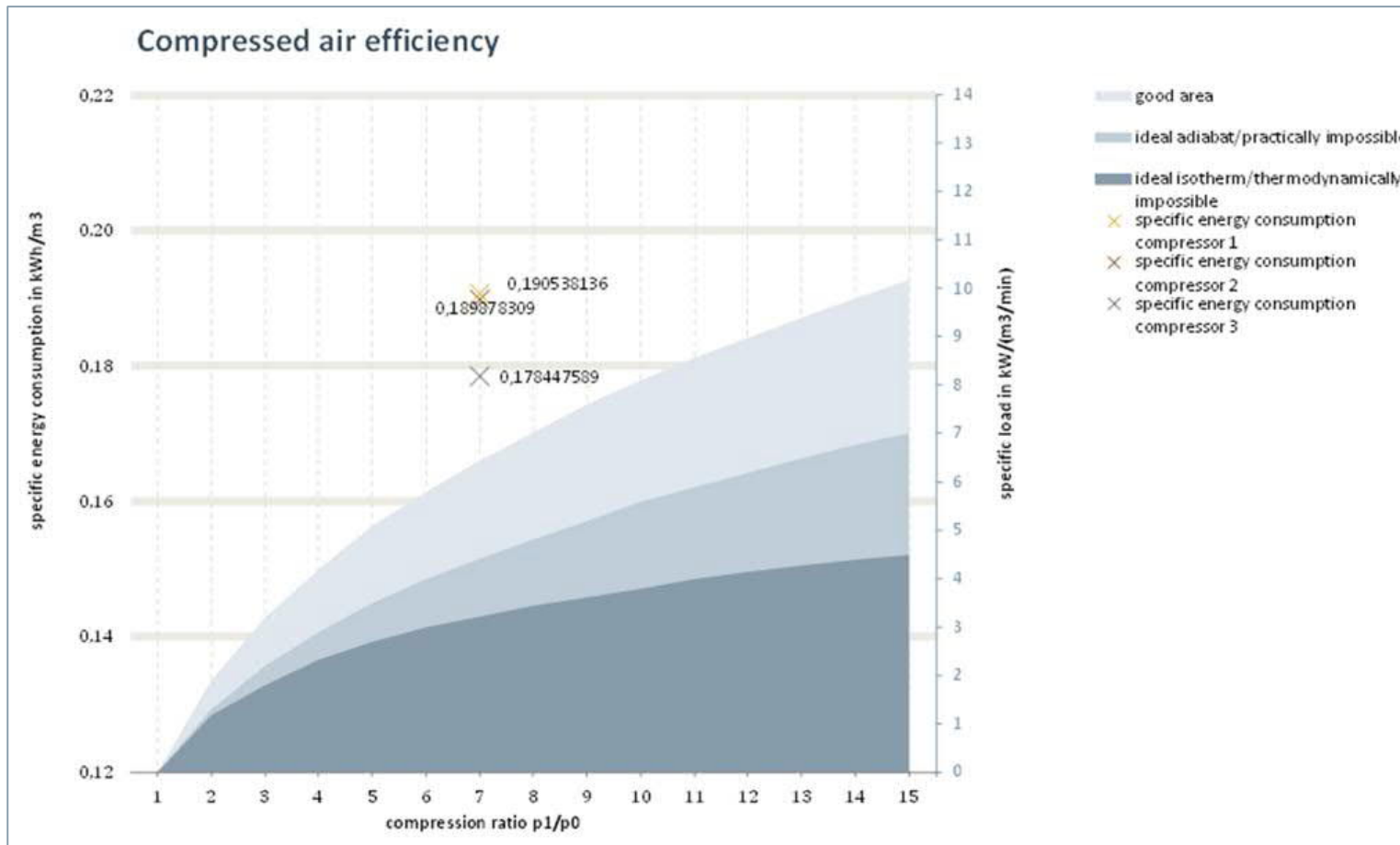
Author: ADMIN Period: 01-11-16 01-12-16
Date: 29-12-16 07:12

Batch and Material related analyses

Anlage	Material	Batch ID	von	bis	hh:mm:ss	Electricity	Production
Filling line 01	Soft drink2	200567	01-11-16 00:00	01-11-16 03:30	3:30:0	145.08	28,013.00
Filling line 01	Soft drink3	300567	01-11-16 03:30	01-11-16 08:00	4:30:0	142.45	27,220.00
Filling line 01	Soft drink1	100568	01-11-16 08:00	01-11-16 10:15	2:15:0	115.79	22,533.00
Filling line 01	No material	0	01-11-16 10:15	01-11-16 11:15	1:0:0	0.24	0.00
Filling line 01	Soft drink2	200568	01-11-16 11:15	01-11-16 14:15	3:0:0	123.27	23,946.00
Filling line 01	No material	0	01-11-16 14:15	01-11-16 15:15	1:0:0	0.24	0.00
Filling line 01	Soft drink3	300568	01-11-16 15:15	01-11-16 18:45	3:30:0	110.44	21,040.00
Filling line 01	No material	0	01-11-16 18:45	01-11-16 19:45	1:0:0	0.24	0.00
Filling line 01	Soft drink1	100569	01-11-16 19:45	01-11-16 22:00	2:15:0	116.96	22,541.00
Filling line 01	No material	0	01-11-16 22:00	01-11-16 23:00	1:0:0	0.24	0.00
Filling line 01	Soft drink2	200569	01-11-16 23:00	02-11-16 02:00	3:0:0	125.77	23,904.00
Filling line 01	No material	0	02-11-16 02:00	02-11-16 03:00	1:0:0	0.23	0.00
Filling line 01	Soft drink3	300569	02-11-16 03:00	02-11-16 06:30	3:30:0	112.20	21,112.00
Filling line 01	No material	0	02-11-16 06:30	02-11-16 07:30	1:0:0	0.23	0.00
Filling line 01	Soft drink1	100570	02-11-16 07:30	02-11-16 09:45	2:15:0	117.02	22,579.00

Calculation of Plant Efficiency: efficiency of air compressors in plant

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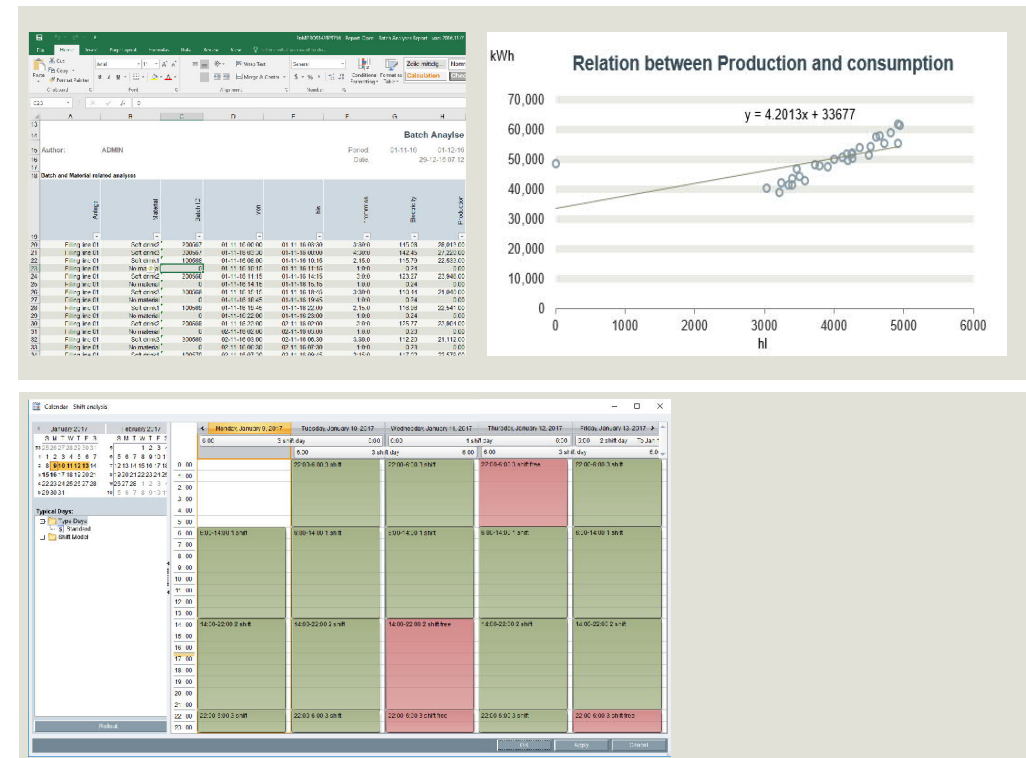


Energy Manager PRO Forecast and Planning



The view to the future with EnMPRO

- The several prediction models can be combined according the requirements
 - Regression analysis
 - Typical day method
 - Production plan based prediction
- The automatic generated energy schedule can be handed over to the energy supplier



Prediction is a door opener for new way in energy procurement

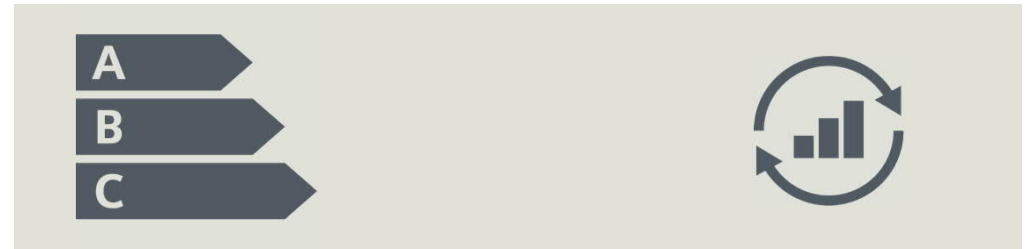
Energy Manager PRO

Energy Efficiency Measure Management



Comply to ISO 50001 Measure Management

- Comply to ISO 50001
- Overview about all energy efficiency measures
- Log real savings for each measure
- Overview about possible savings considering costs and CO2 emissions



Author:

siemens

Period:

1/1/2015

Date:

1/2/2015

2/5/2015 08:35 AM

Energy Efficiency Project Management

Energy Efficiency Measures

Project Name	Category	Savings Total Planned	Savings Total After	CO2 Reduction Total Planned	CO2 Reduction Total After	Status	Region	Business Unit	Investment	Internal Interest	ROI	NPV	Payback
		[EUR]	[EUR]	[t CO2]	[t CO2]				[EUR]				
Exchange boiler	A-Project	10,600	11,130	86.8	91.1	Realized	Linz	IA	50,000	0.1%	4.25	94,756	4.70
Optimization of lighting	A-Project	10,400	0	84.2	0.0	Initial	Munich	BT	36,000	0.1%	2.86	63,903	3.50
Optimization of the compressed air system	B-Project	12,000	0	97.2	0.0	Evaluate	Munich	BT	10,000	0.1%	17.25	91,273	0.87
Reduce water consumption	C-Project	15,000	0	0.0	0.0	Initial	Linz	IA	30,000	0.1%	5.00	115,826	2.00

Provides information about how much and where you should spend your money

Energy Manager PRO

Manual data collection



How data can be collected manually?

Not all data is available in an automatic way. Production figures or consumption data can also be entered manually

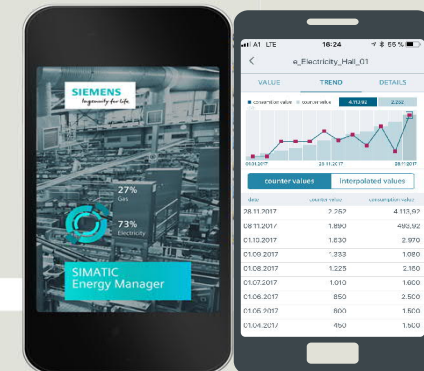
- Mobile Data Recording
- Matrix (Web, Full Client)
- Automatic data reading form MS Excel

The screenshot shows the 'Matrix: Data collection (3)' view in the Energy Manager PRO web interface. It displays a table with columns for 'Datapoint of Table', 'e_Electricity [kWh]', 'e_Gas [kWh]', and 'e_Production [t]'. The table contains data for various dates in 2017, with some values highlighted in red and yellow to indicate status or alerts. The interface also includes a sidebar with navigation options like 'Customer', 'General Sample', 'Acquisition', 'Data collection', 'e_Electricity', 'e_Gas', and 'e_Production'.

Datapoint of Table	e_Electricity [kWh]	e_Gas [kWh]	e_Production [t]
1/2/2017 12:00:00 AM	1.400	2.202	16,000
1/3/2017 12:00:00 AM	1.700	2.102	15,000
1/4/2017 12:00:00 AM	1.650	2.550	13,500
1/5/2017 12:00:00 AM	1.500	2.556	13,000
1/6/2017 12:00:00 AM	1.420	2.700	14,500
1/7/2017 12:00:00 AM	1.490	2.252	15,000
1/8/2017 12:00:00 AM	1.650	2.402	16,000
1/9/2017 12:00:00 AM	1.800	2.802	19,500
1/10/2017 12:00:00 AM	2.200	2.902	18,000
1/11/2017 12:00:00 AM	2.000	2.502	17,000

SIMATIC Energy Manager V1.0 iOS and Android app

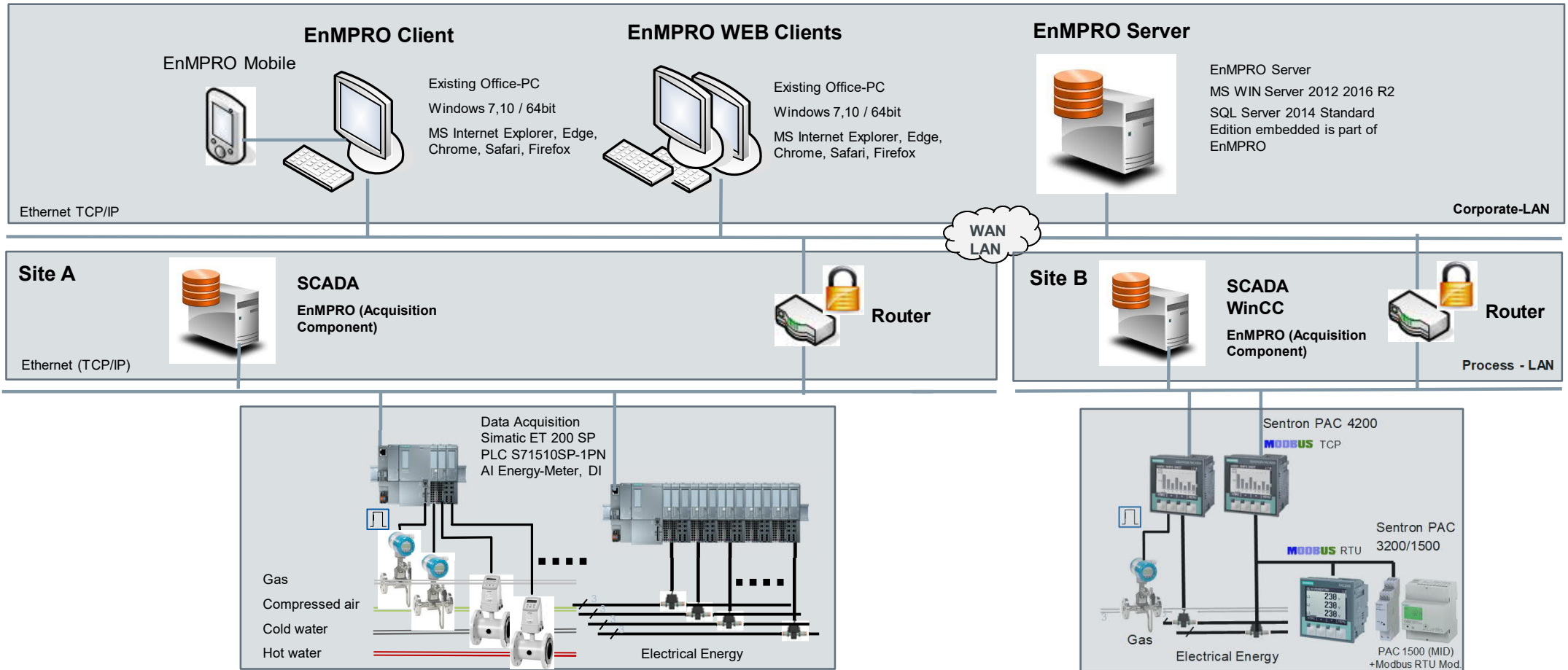
An automatic data recording is not mandatory



Energy Manager PRO: Scalable architecture

The suitable architecture for any requirement from a single station to a distributed architecture

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Energy Management System architecture example



EMS Server Station

Simatic Energy Manager PRO v7.0

EMS Client 1

EMS Client 2

EMS Web client

EMS Mobile client

Ethernet, Office LAN

CCEMS-00



PROFINET

CCEMS-01

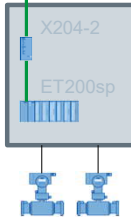
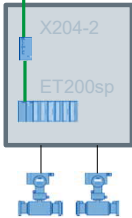
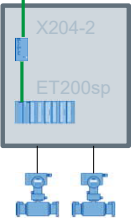
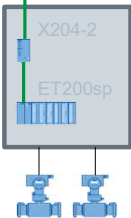
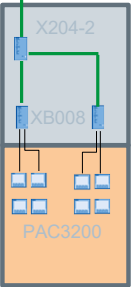
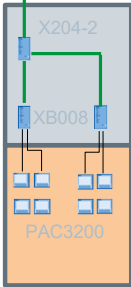
CCEMS-02

CCEMS-03

CCEMS-04

CCEMS-05

CCEMS-06



M-Bus



SIMATIC Energy Manager PRO

Licensing concept



Name	Order number
Engineering + Runtime	
SIMATIC Energy Manager PRO v7.2 including: 50 Tags, 1 x Client, 1 x Web Client, 1 x Energy Manager PRO acquisition component	6AV6372-2DF07-2AX0
SIMATIC Energy Manager Basic v7.2 including: 50 Tags, 1 x Web Client, 1 x Energy Manager PRO acquisition component	6AV6372-1DF07-2AX0
Additional tag packages:	
Tag package: 50 tags	6AV6372-2DF07-0CX0
Tag package: 100 tags	6AV6372-2DF07-0DX0
Tag package: 250 tags	6AV6372-2DF07-0EX0
Tag package: 500 tags	6AV6372-2DF07-0FX0
Tag package: 1000 tags	6AV6372-2DF07-0GX0
Tag package: 5000 tags	6AV6372-2DF07-0HX0
Tag package: 30000 tags	6AV6372-2DF07-0JX0
SIMATIC Energy Manager PRO/Basic V7.2 extensions	
SIMATIC Energy Manager Basic/PRO 3 Web Clients	6AV6372-2DF27-0AX0
SIMATIC Energy Manager Basic/PRO 20 Web Clients	6AV6372-2DF27-0BX0
SIMATIC Energy Manager PRO Client ¹⁾	6AV6372-2DF37-0AX0
SIMATIC Energy Manager PRO Planning & Forecast	6AV6372-2DF47-0AX0
SIMATIC Energy Manager PRO Acquisition component	6AV6372-2DF57-0AX0
SIMATIC Energy Manager PRO TRIAL	6AV6372-2DF17-2AX0

Comparison of Basic and PRO – the right solution for every task

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Basic

Simple **Web engineering** with standard applications

Conventional **interfaces**, such as OPC UA, Modbus, EnS, WinCC and connectivity to MindSphere

Simple KPIs & standard widgets for fast visualization

Reporting: predefined, simple **standard template**

Basic analyses, such as energy per cost center

/

PRO

Web engineering and **full client** with expanded configuration options

+ **further** Interfaces for S7, S7-EE, ASCII, OLE DB,...

+ Expanded KPIs for **more extensive analyses** e.g. for multi-variable regression analysis with Advanced Widgets

+ User-specific, **adaptable templates** with extensive functionality

+ Detailed batch and material analyses
+ **Forecasting tools** and **planning measures**

Plus: Easy data import by file upload, preprocessing by loop/prototype concept

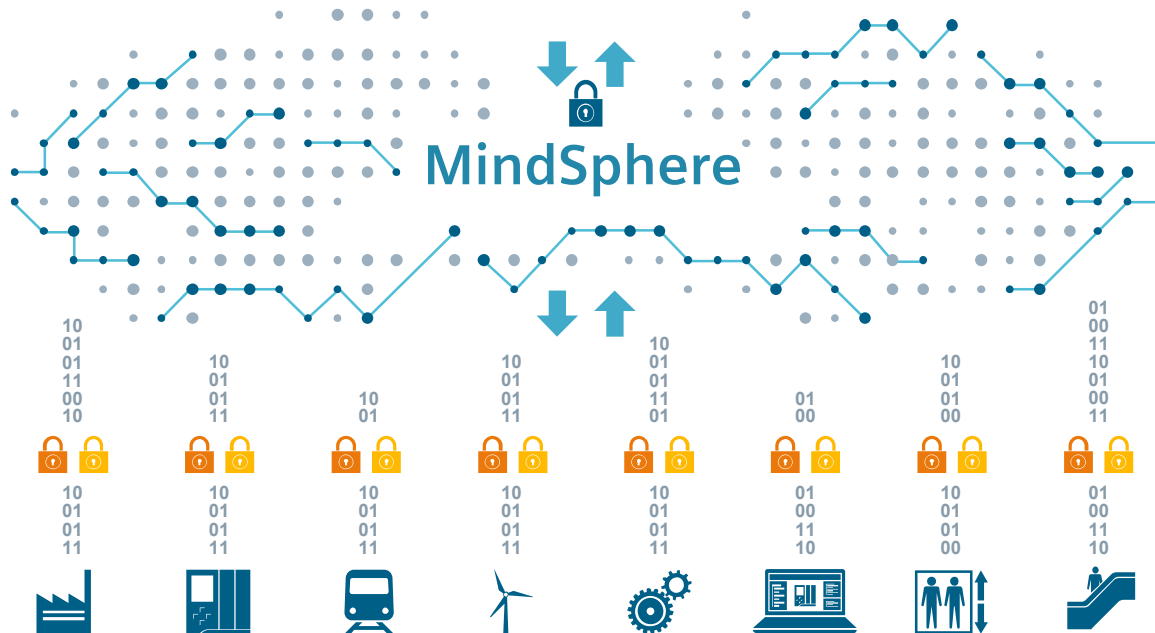
Scalable from simple applications...

...through to detailed analyses

MindSphere – the cloud-based, open IoT operating system

Energy Management System App

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MindApps

- Asset transparency and analytical insights, e.g. predictive maintenance
- Subscription based pricing model
- Fleet management

MindSphere

- Open interface for development of customer specific apps (MindApps)
- Various cloud infrastructures: Public, private or on-premise

MindConnect

- Open standards (e.g. OPC UA) for connectivity (also to 3rd party products)
- Plug and play connection of Siemens products

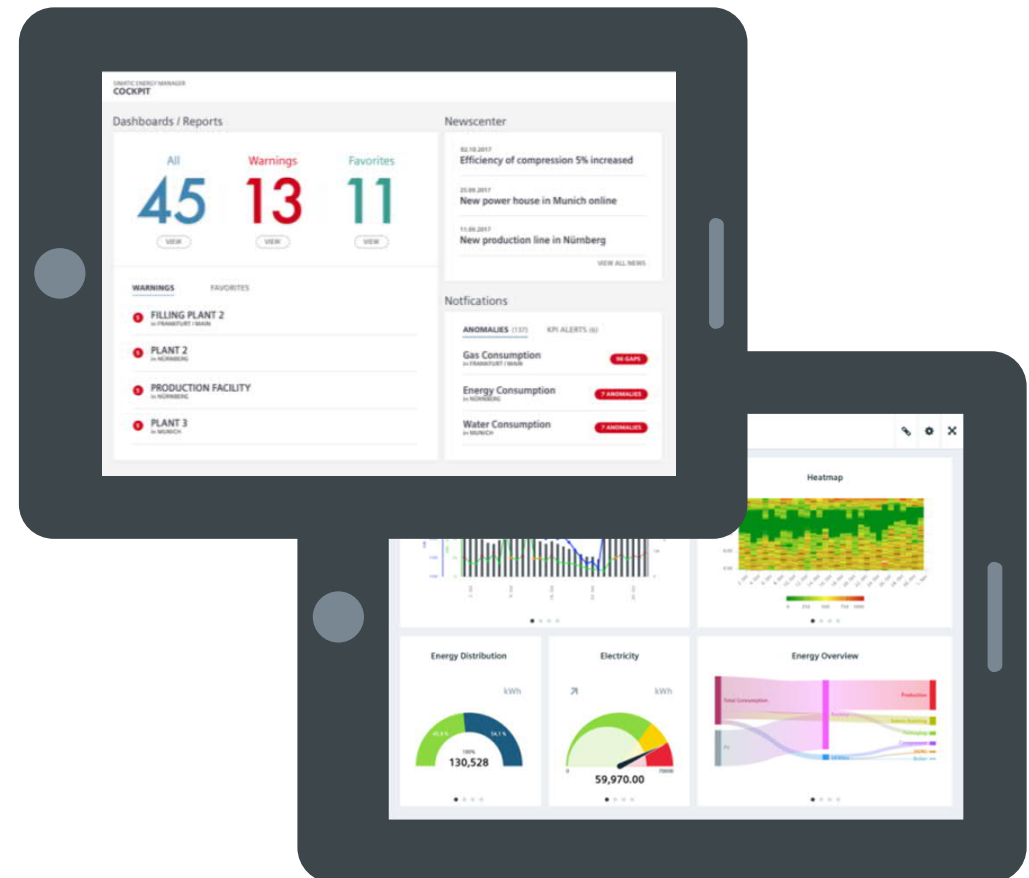


SIMATIC MindApp Energy Manager

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Energy management in the MindSphere

- Energy transparency according ISO 50001
- Derive optimization measures based on KPIs
- Transparency regarding energy costs and consumption
- Easy to use Widget-based Dashboard with integrated basic analytics
- Simple KPI definition
- Bringing energy data in relation to further context like production, weather ...



Questions and Answers

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Q

www.siemens.rs > DI Webinar

A



Thank you for your attention!



Zoran Jovanović

Sales Manager

Siemens doo Beograd, Digital industries

Omladinskih brigada 90v

11070 Beograd

Tel: +381 60 8170 156

Email: zoran.jovanovic@siemens.com

siemens.com/energymanager