SIEMENS
Ingenuity for life

Chances in the Glass Industry through Digitalization

VDMA gtl-Symposium
glasstec Düsseldorf – September 21, 2016

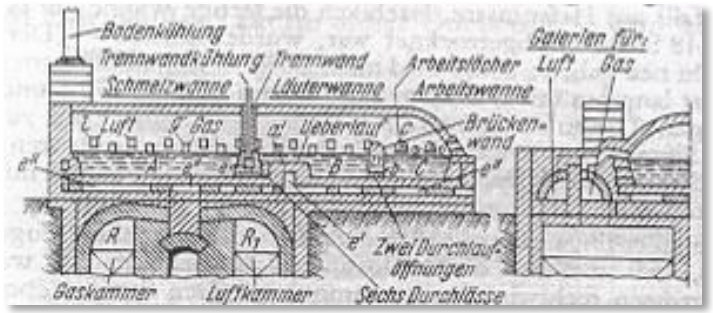
Unrestricted © Siemens AG 2016

Siemens in glass – tradition and expertise since 1856

1856

Friedrich von Siemens invents and patents the regenerative furnace.

This invention marks the **beginning of the industrial revolution** in the glass industry.



1862-1957

Siemens is a **hollow glass producer** with plants in Dresden, Wirges, Berlin employing around 7.000 workers.

Siemens is the **leader** in the **Euopean glass industry**.

since 1987

With a **dedicated team** Siemens is focussing on the glass industry and its specific requirements regarding **electrical and automation technology**.

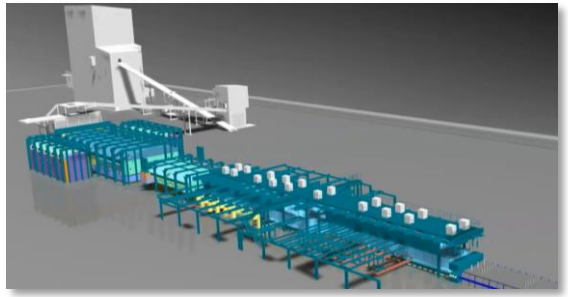
Siemens‘ global presence is leveraged in order to **develop** and support **international projects**.

2011

Driven by feedback from the market „**Plant-wide Automation**“ is specifically being developed as wholistic approach for the glass industry.

2015

Concepts and ideas for the **digitalization** in the glass industry are being developed based on **Industry 4.0**.



Unrestricted © Siemens AG 2016

How is Industry 4.0 perceived today?

SIEMENS

"We are very effective already and Industry 4.0 won't help us to improve our business."
Operations manager of a global glass producer, 2015

"Our systems are fully automated…, therefore we live Industry 4.0 right now."
Automation lead engineer, 2015

"The IT infrastructre Industry 4.0 is based on is not secure enough for industrial applications."
IT security officer, 2015

"I don‘t see the benefits of a common automation platform in the glass industry."
Procurement manager of a global glass producer, 2014

Unrestricted © Siemens AG 2016

A forecast is difficult, …
… especially if it is related to the future …

SIEMENS

"I think there is a world market for maybe five computers."
Thomas Watson, CEO of IBM, 1943

"Computers in the future may weigh no more than 1.5 tons."
US-Magazine Popular Mechanics, 1949

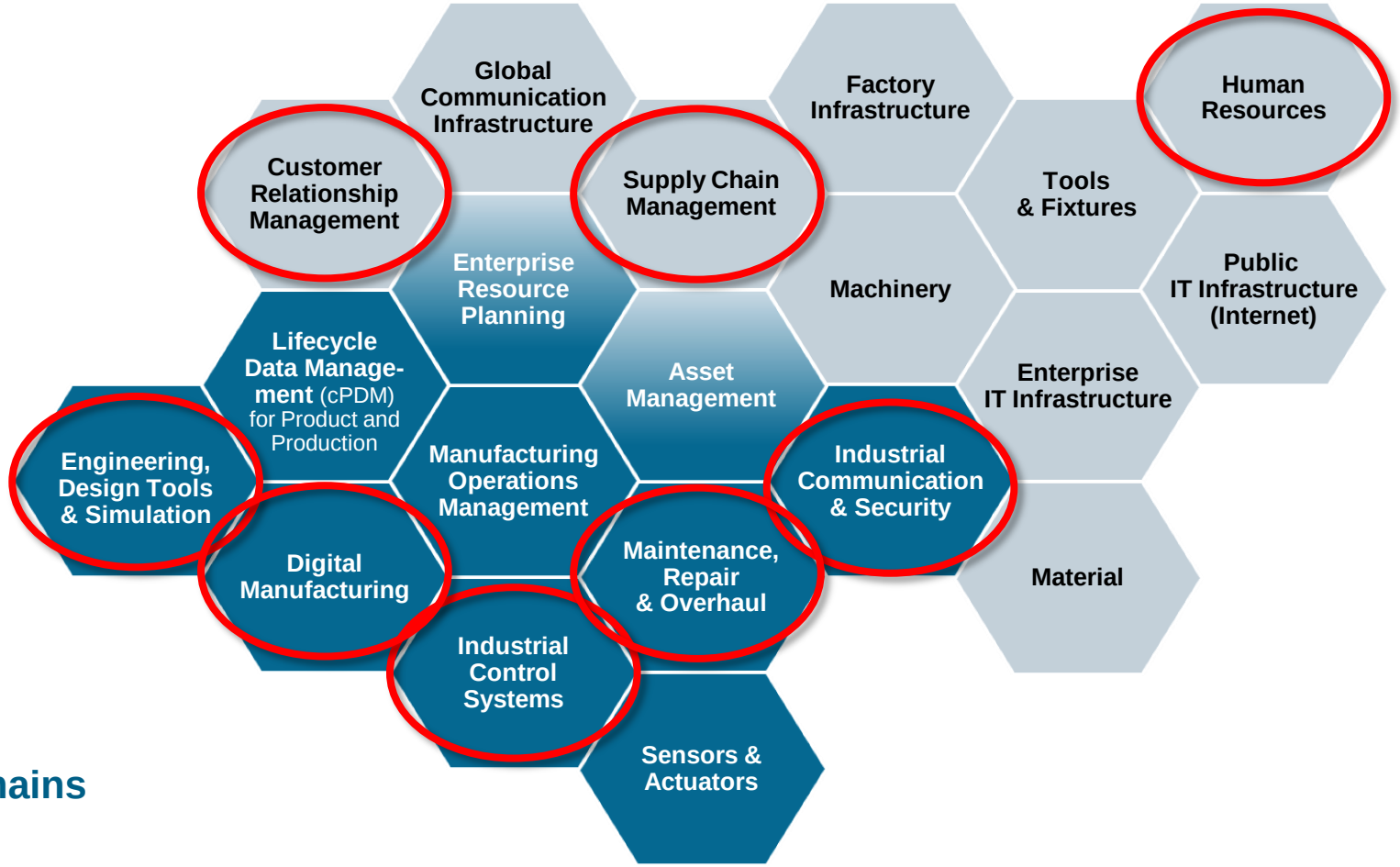
"There is no reason for any individual to have a computer in his home."
Ken Olson, President of Digital Equipment Corp., 1977

"640 k should be enough for everyone."

Bill Gates, 1981

Unrestricted © Siemens AG 2016

Industry 4.0 is related to all elements of the value chain



Siemens domains

Unrestricted © Siemens AG 2016

All industries face the same challenges
Manufacturing is changing faster than ever before

SIEMENS

Competitiveness

Profitability

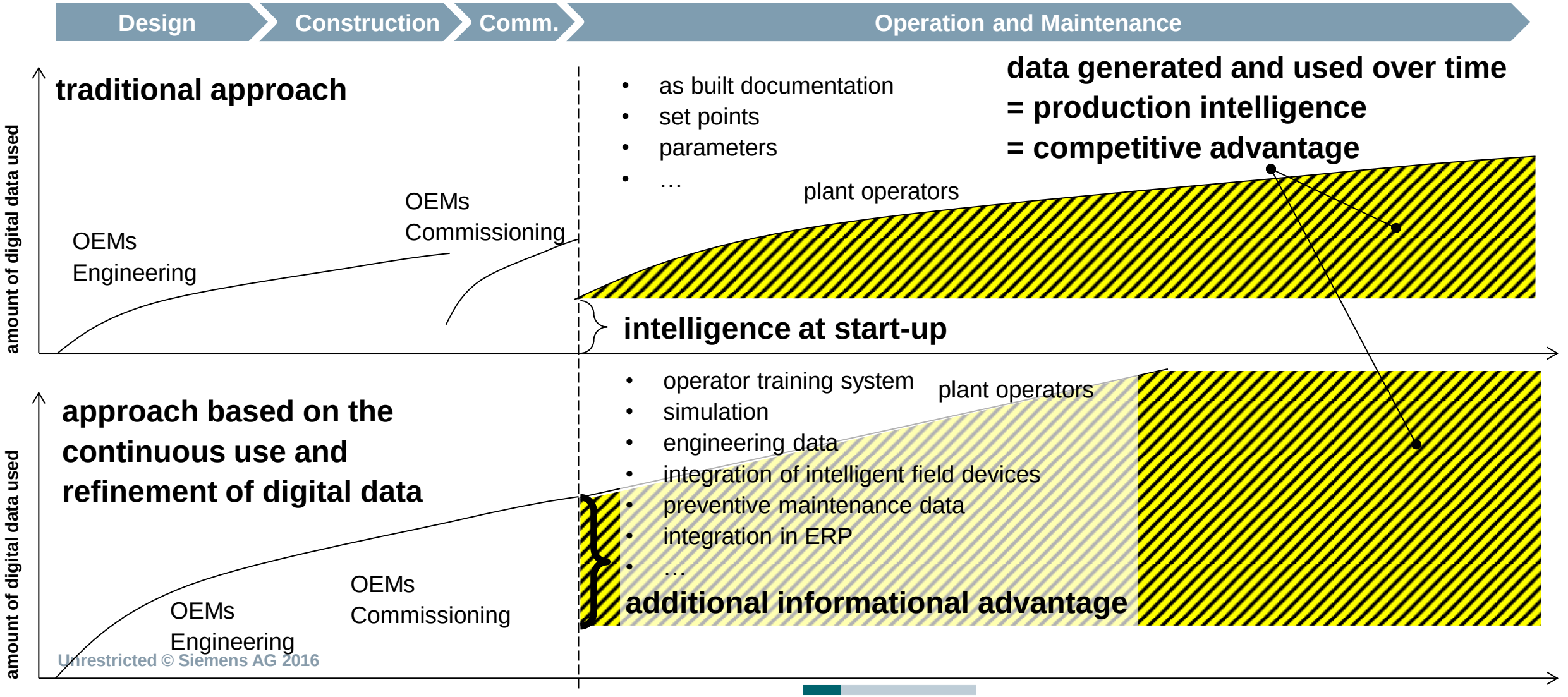
Shorten time to market	Increase flexibility	Boost efficiency
• Shorter innovation cycles • More complex products	• Individualized mass production • Volatile markets	• Energy and resource efficiency • High productivity, no down times

Realizable through digitalization by

• Integrated engineering • Simulation, digital twin	• Standardized interfaces • Tracking & tracing, serialization	• Big data ➔ Smart data • Additive manufacturing

Unrestricted © Siemens AG 2016

Life cycle of a plant with usable data generated over time

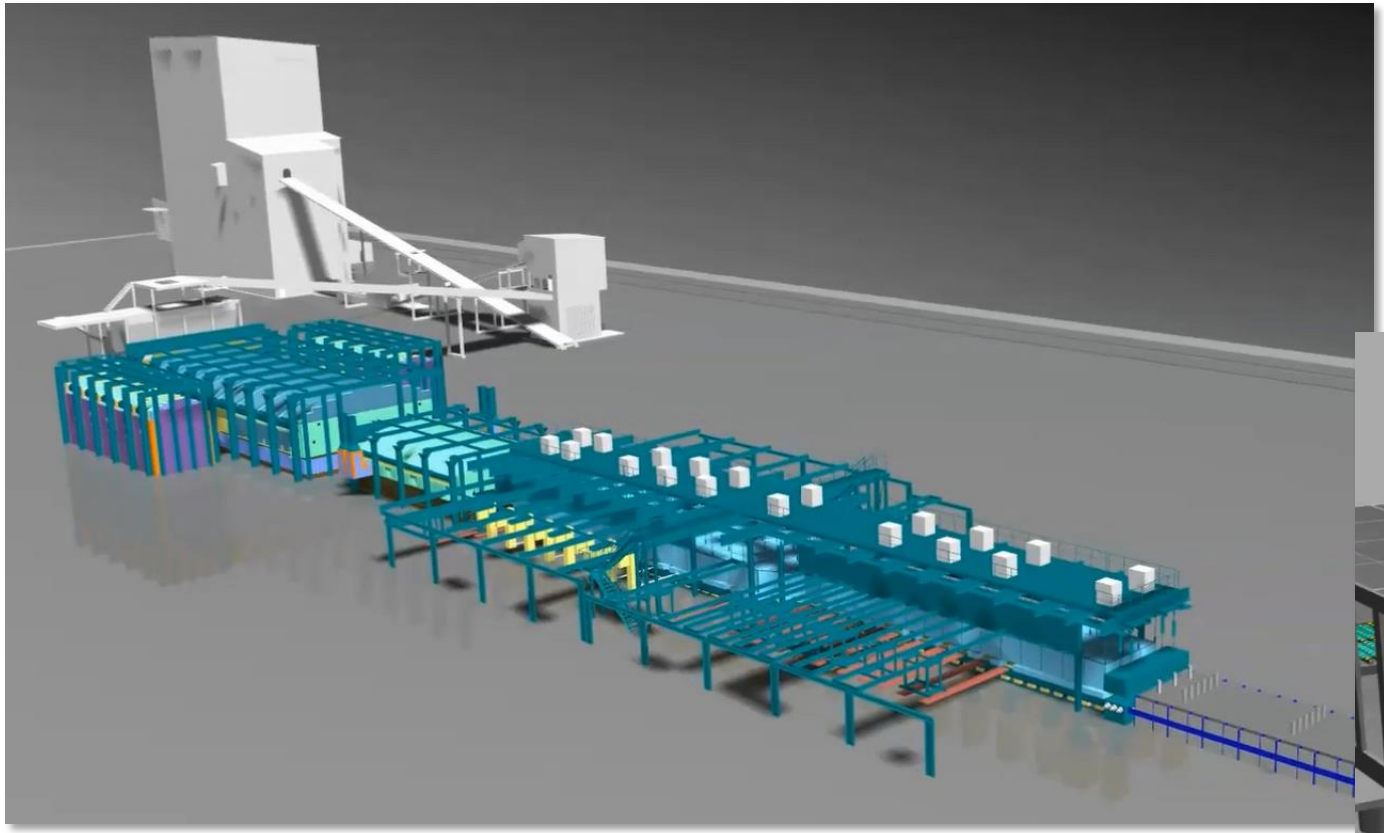


Unrestricted © Siemens AG 2016

Simulation
Simulating the entire line helps to build the right size plant

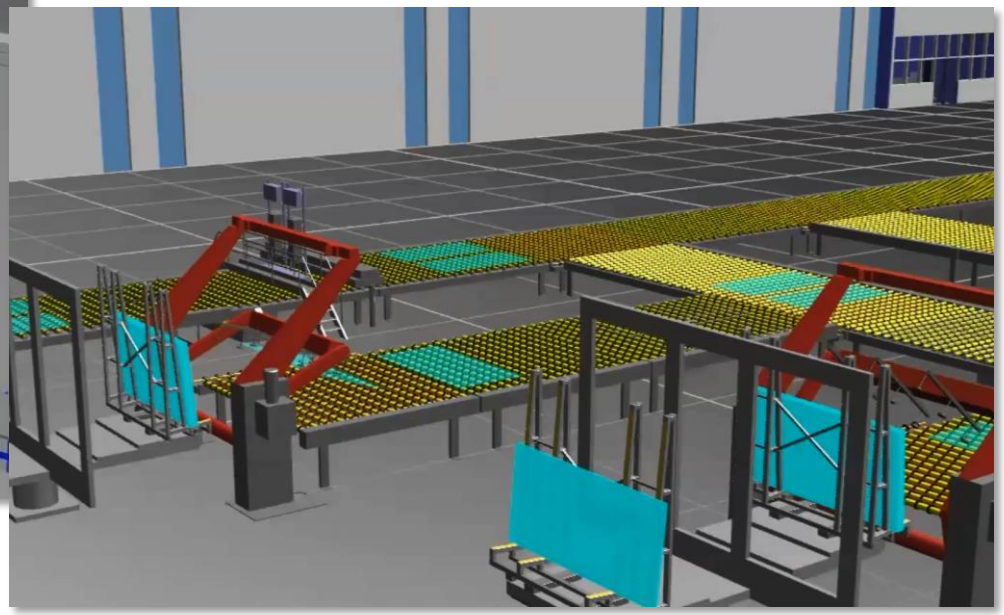
SIEMENS

Design | Construction | Comm. | Operation and Maintenance



Plant simulation software Tecnomatix

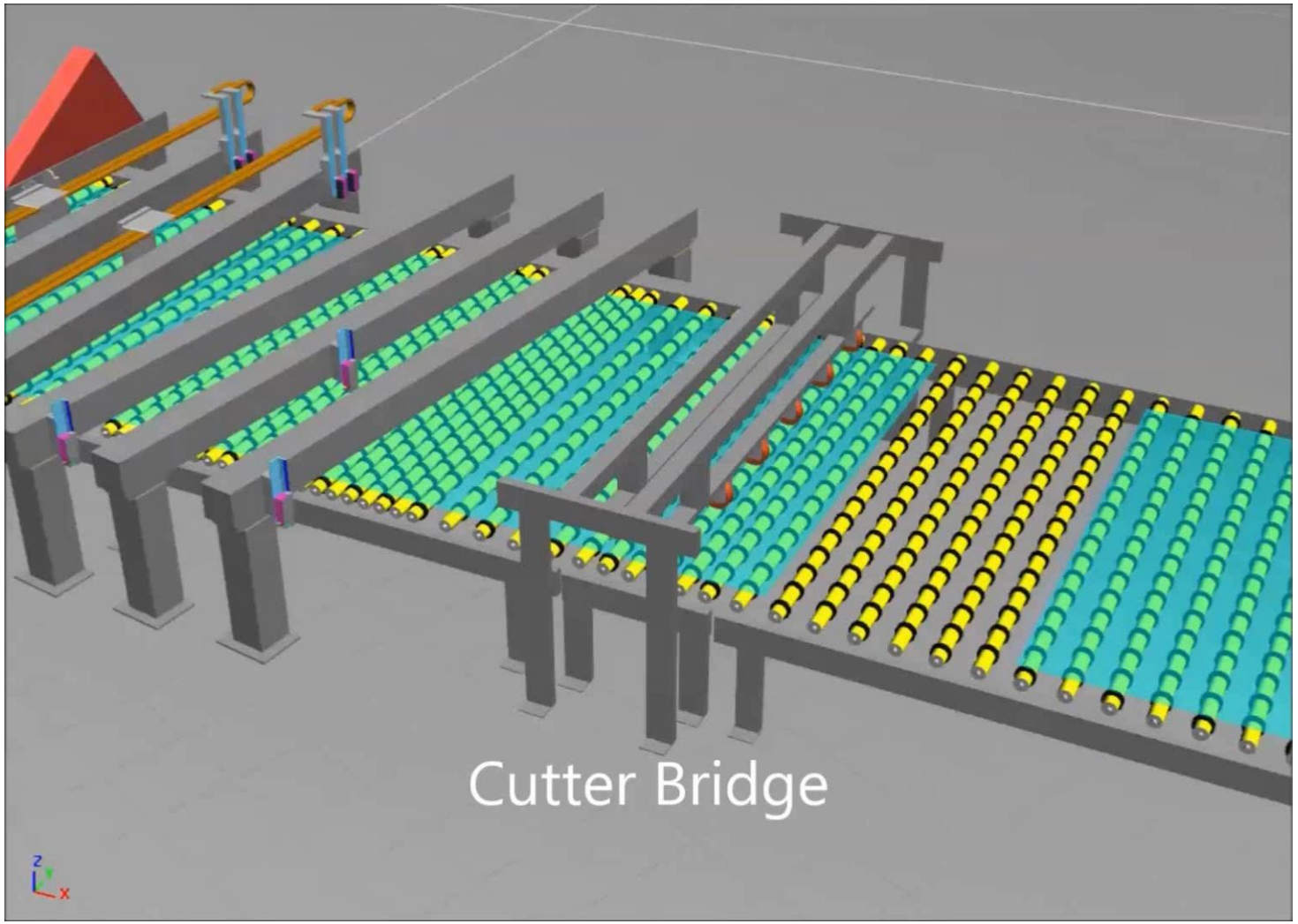
- Avoid overcapacities
- Avoid bottle necks
- Optimize storage, shipping/ receiving
- Answer to the question “Is the investment worthwhile?”
- …



Unrestricted © Siemens AG 2016

Simulation
Cold end of a float glass line based on real OEM data

SIEMENS

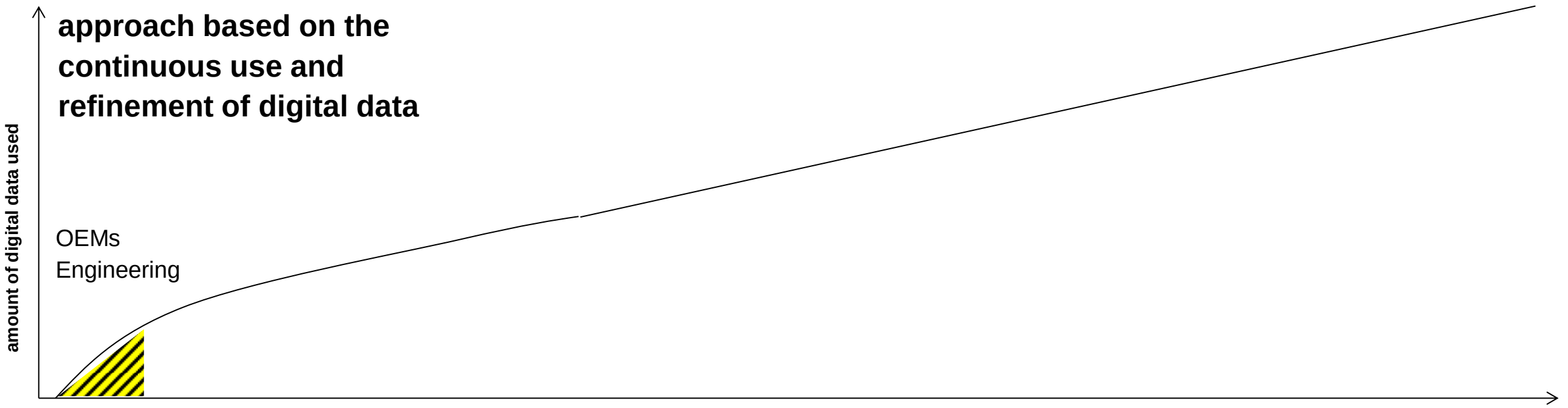


Unrestricted © Siemens AG 2016

Life cycle of a plant with usable data generated over time

SIEMENS

Design | Construction | Comm. | Operation and Maintenance



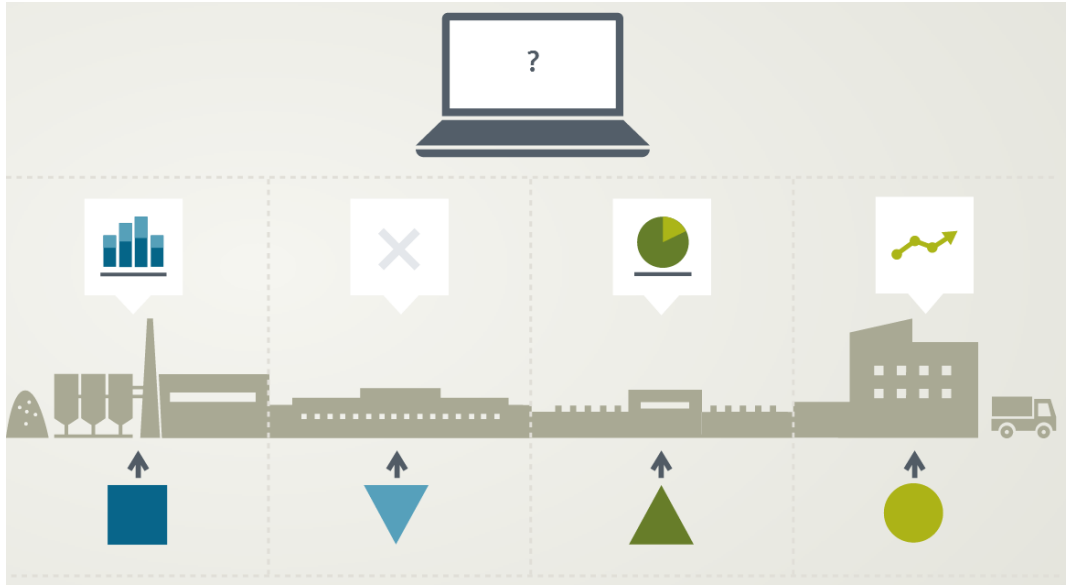
Unrestricted © Siemens AG 2016

Standardized interfaces plant wide automation

SIEMENS

Design | Construction | Comm. | Operation and Maintenance

Stringing systems together



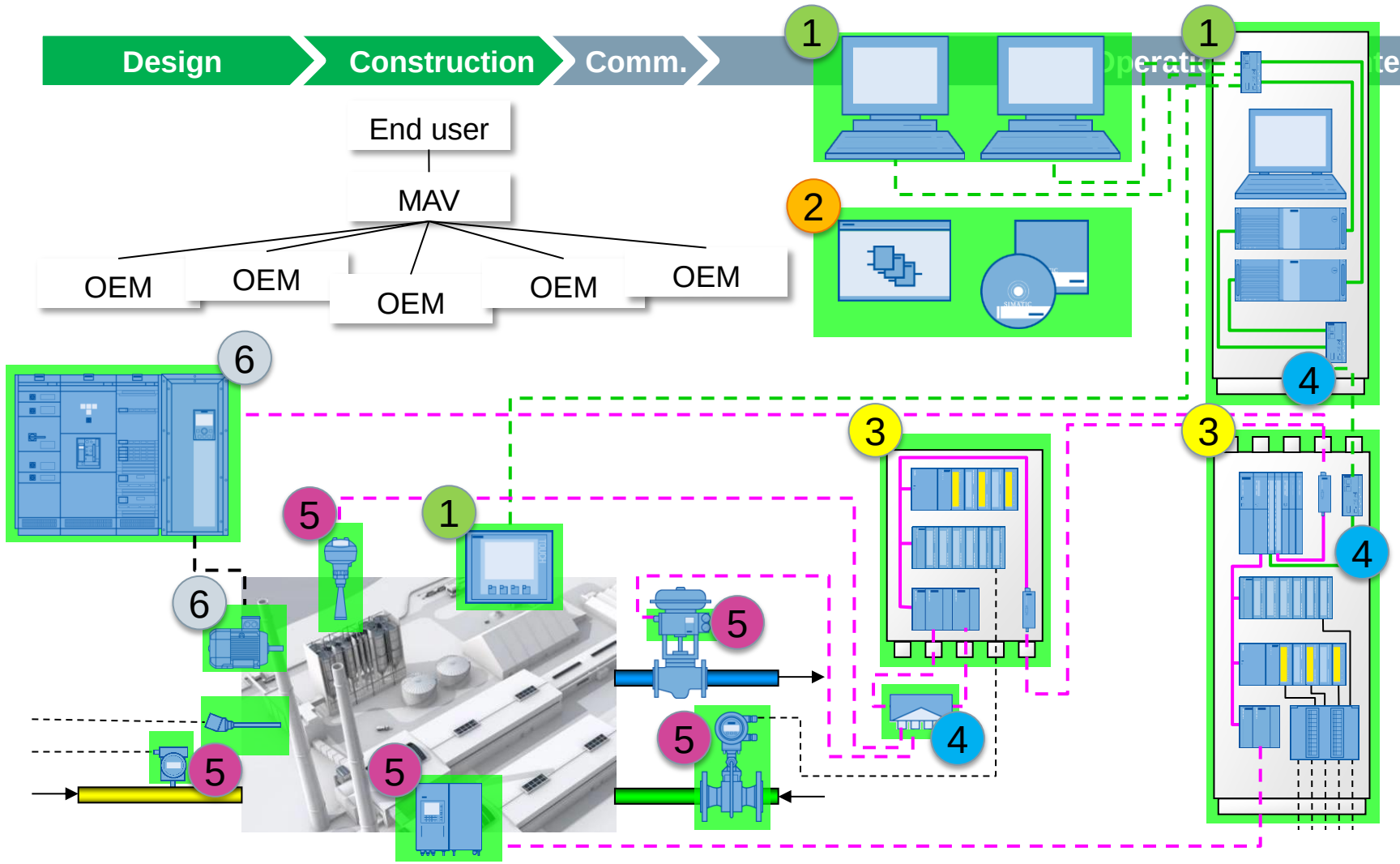
Plant wide automation

- Linking of „intelligences“ like machines, sensors, actors, etc. (e.g. power controllers, transportation)
- Common database as basis for transparency (KPIs)
- Monitoring and preventive maintenance
- Reduced training and operational effort

Unrestricted © Siemens AG 2016

Standardized interfaces
Specification binding for all suppliers

SIEMENS



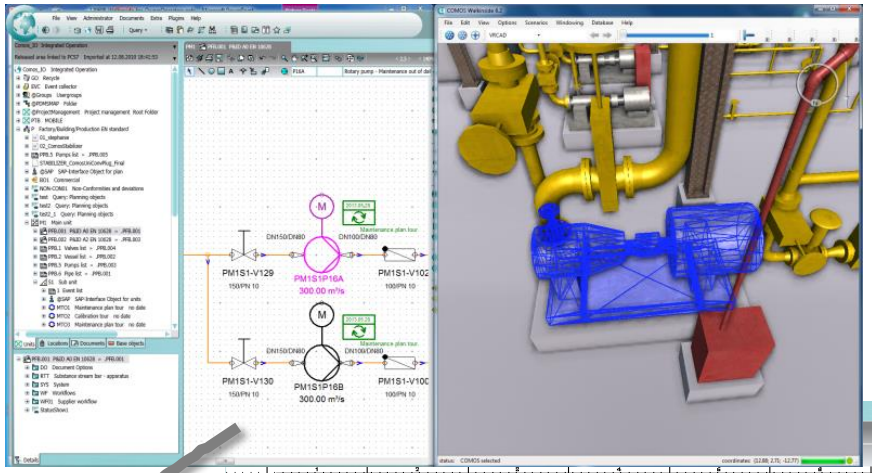
1. **HMI, engineering system**
   - Terminal, server PCs
   - Cabinet layout
   - Local HMI panels
2. **Engineering environment**
   - Engineering for automation, HMI, drives
   - Library of function blocks
   - Style guide
3. **Control system**
   - Automation components
   - Power supplies
   - Control components
4. **Network Components**
   - Switches
   - Connectors
   - Field distibutors
5. **Instrumentation and analytics**
   - Temperature, pressure, flow, level, etc.
   - Valve positioner
   - Analytics
6. **Drives, motors, motion control**
   - MCCs
   - Frequency inverters
   - Motors

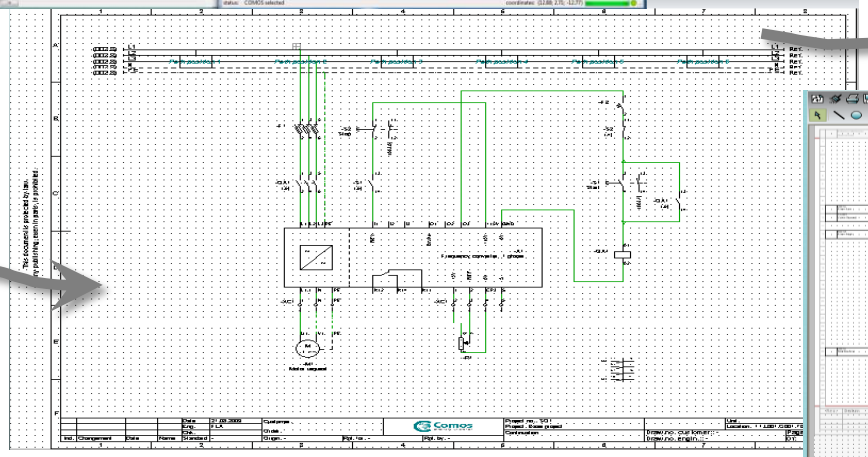
Unrestricted © Siemens AG 2016

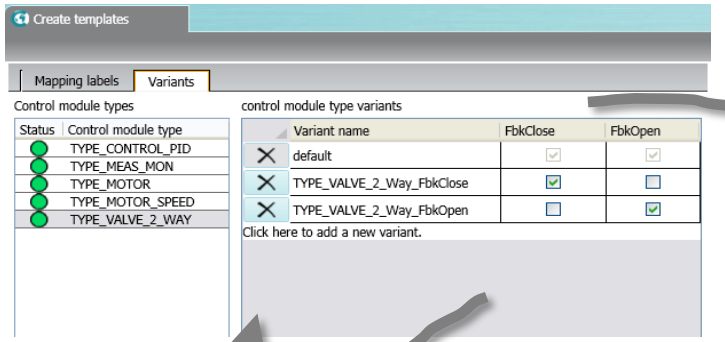
Integrated engineering
From P&ID to automation code and plant maintenance

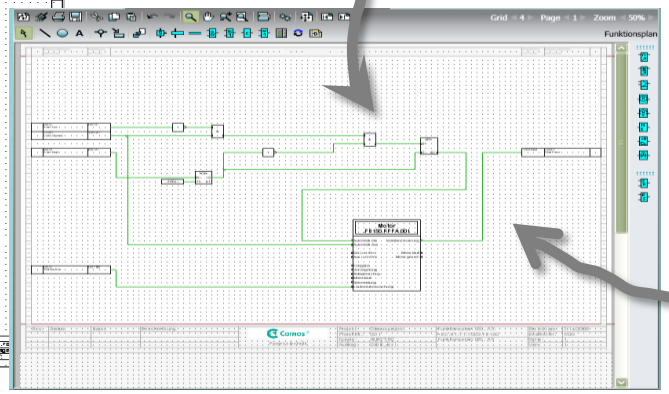
SIEMENS

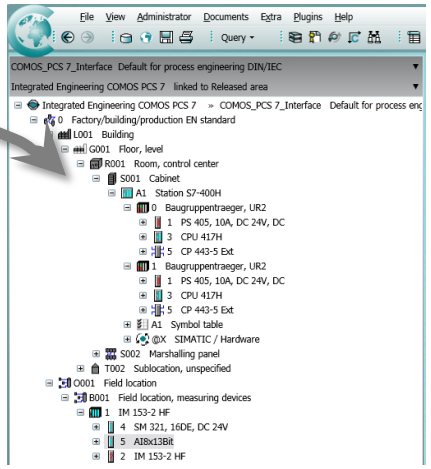
Design | Construction | Comm. | Operation and Maintenance

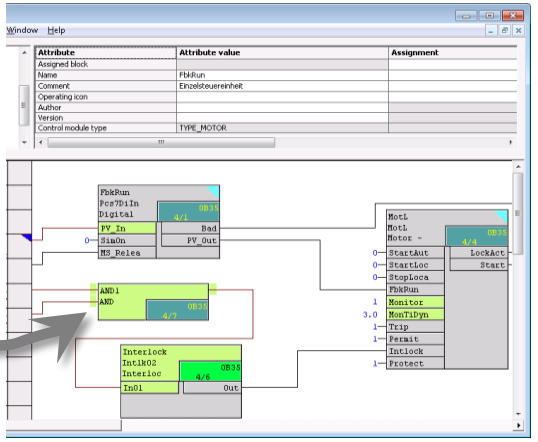










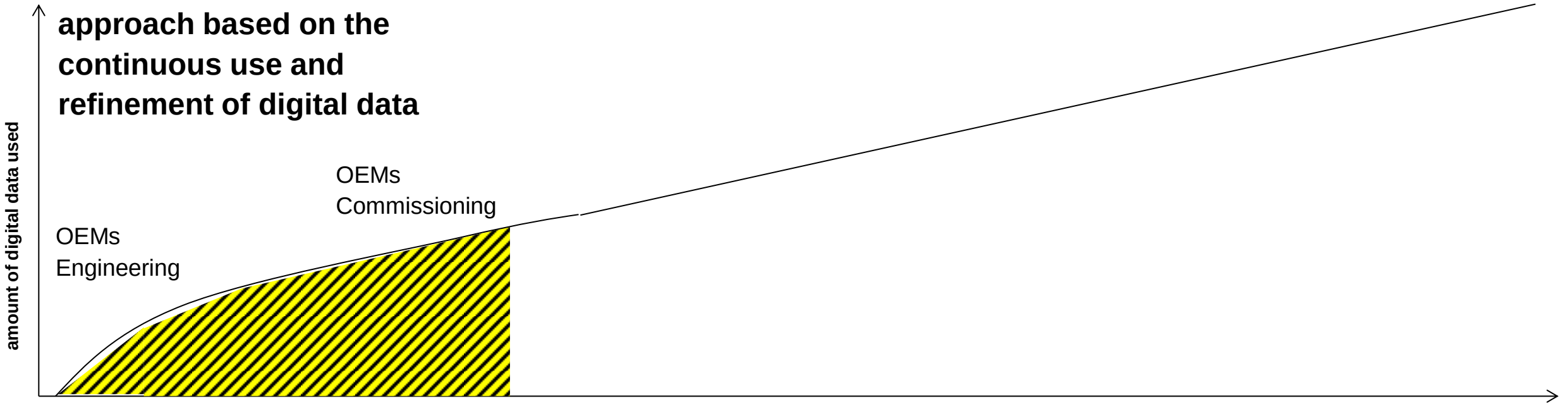


Unrestricted © Siemens AG 2016

Life cycle of a plant with usable data generated over time

SIEMENS

Design | Construction | Comm. | Operation and Maintenance

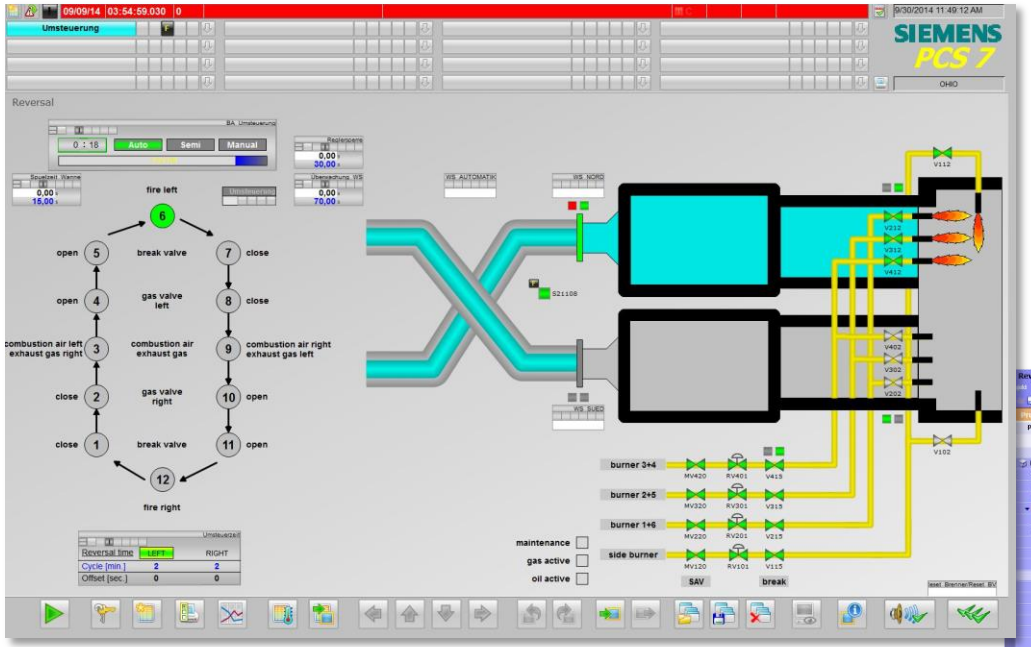


Unrestricted © Siemens AG 2016

Simulation
Simulation of the production process, testing of automation functionality

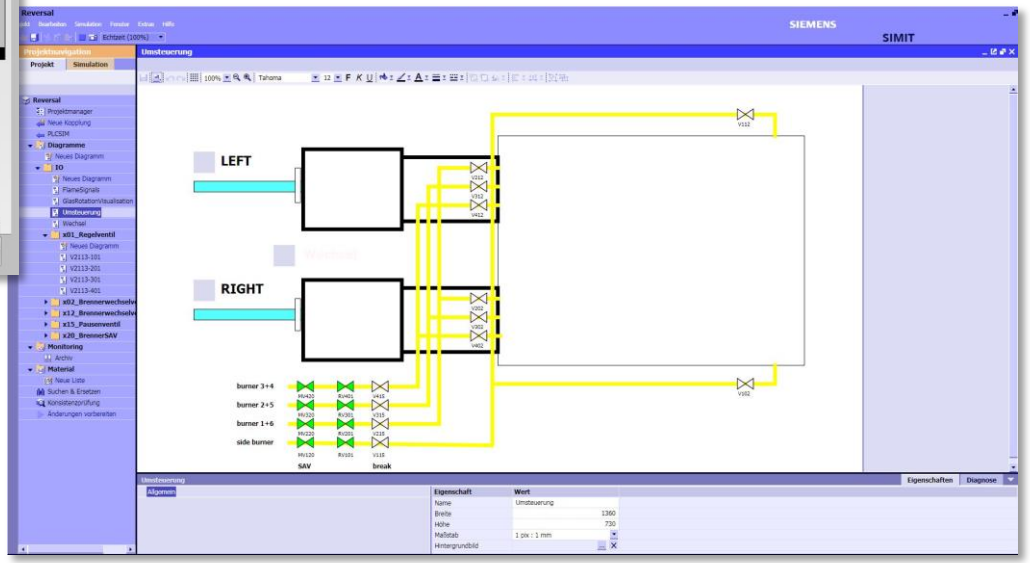
SIEMENS

Design | Construction | Comm. | Operation and Maintenance



DCS PCS 7

- Commissioning, testing, debugging independent of the progress of the overall project
- Communication testing across multiple controllers
- Operator training system
- Process optimization
- …



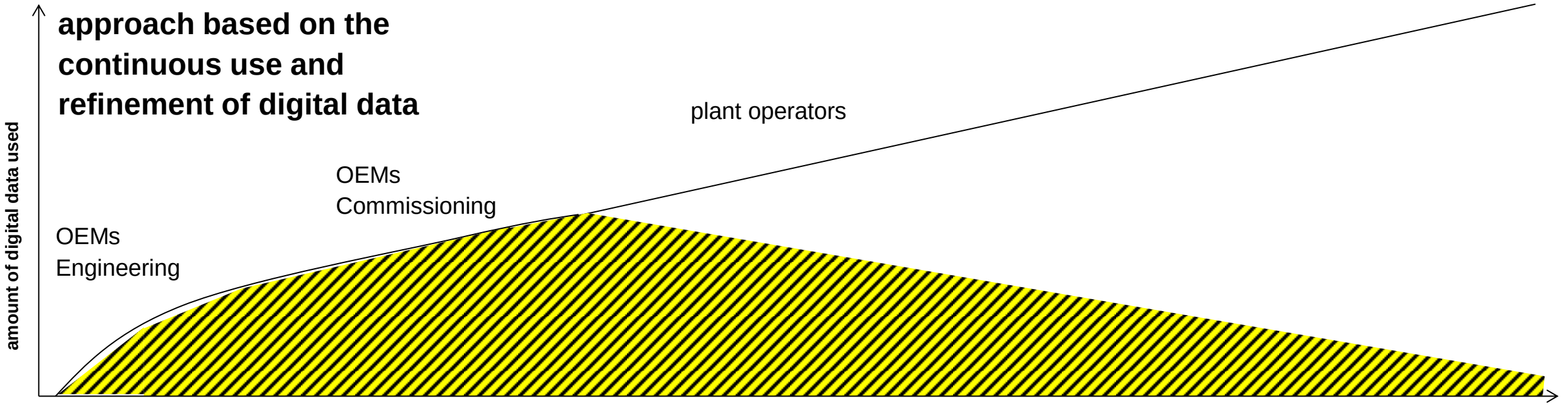
Simulation framework SIMIT

Unrestricted © Siemens AG 2016

Life cycle of a plant with usable data generated over time

SIEMENS

Design | Construction | Comm. | Operation and Maintenance

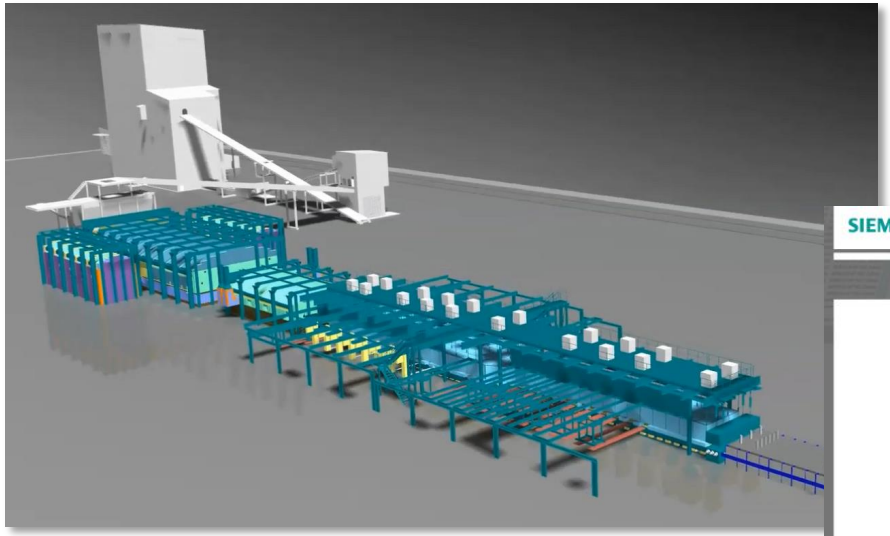


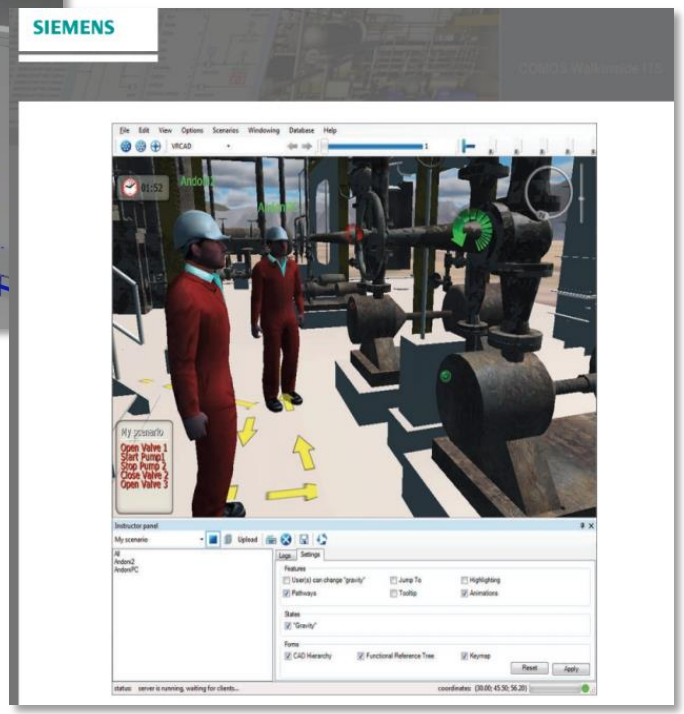
Unrestricted © Siemens AG 2016

Simulation
Digital twin to simulate and optimize the entire plant during production

SIEMENS

Design | Construction | Comm. | Operation and Maintenance





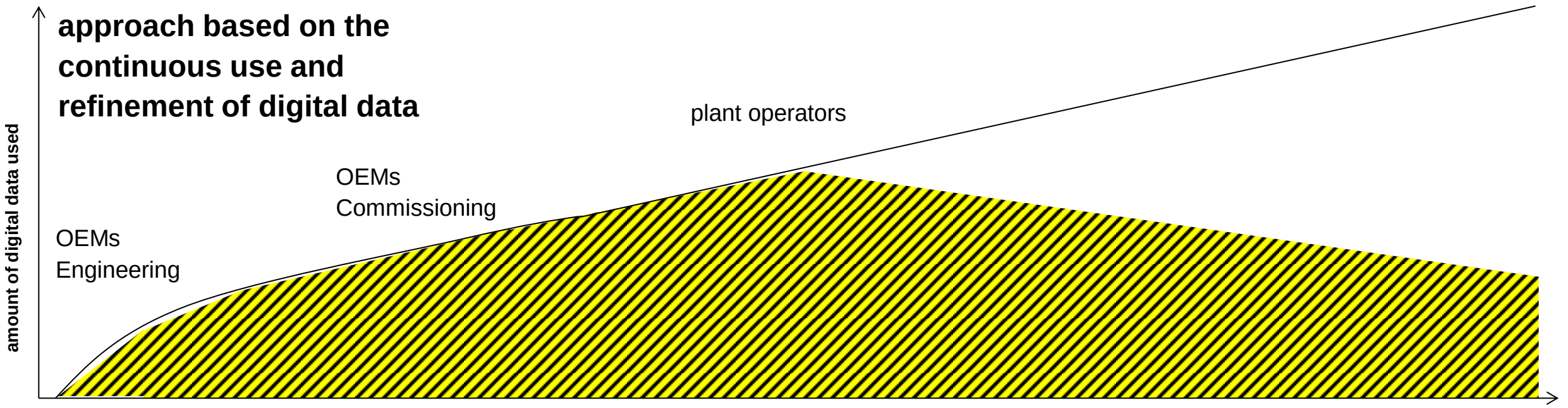
- Process analytics with real time data
- Simulation of product changes
- Simulation of defects and impact on production
- Performance forecast
- Operator training
- Investment protection
- …

Unrestricted © Siemens AG 2016

Life cycle of a plant with usable data generated over time

SIEMENS

Design | Construction | Comm. | Operation and Maintenance



Unrestricted © Siemens AG 2016

Use of collected data to improve production
Real time data for production forecast and model predictive control

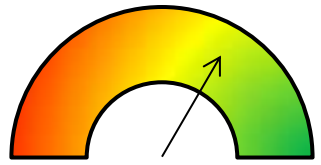
SIEMENS

Design | Construction | Comm. | Operation and Maintenance

Linking the plant together

- Online reporting of KPIs across the overall plant
- Forecast of production data

➔ **Secure profitability**



Profitability

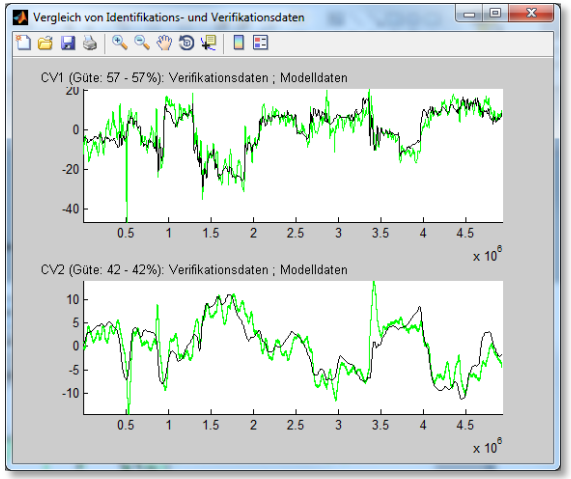
- Uptime [%, h/a]
- Energy consumption [kWh/t]
- Raw material consumption [t/t]
- OPEX [h/t], [€/t]
- …

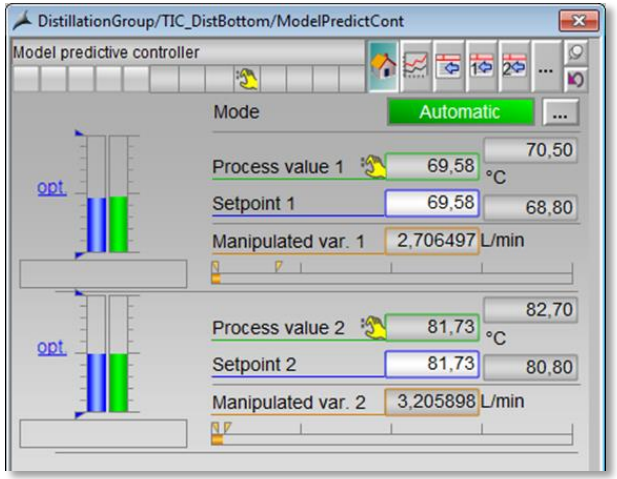
Model Predictive Control (MPC) integrated in DCS

- Optimized closed loop control, e.g. furnace heating
- Self tuning controller based on historic AND current information

➔ Increase energy efficiency

➔ Decrease wear and tear





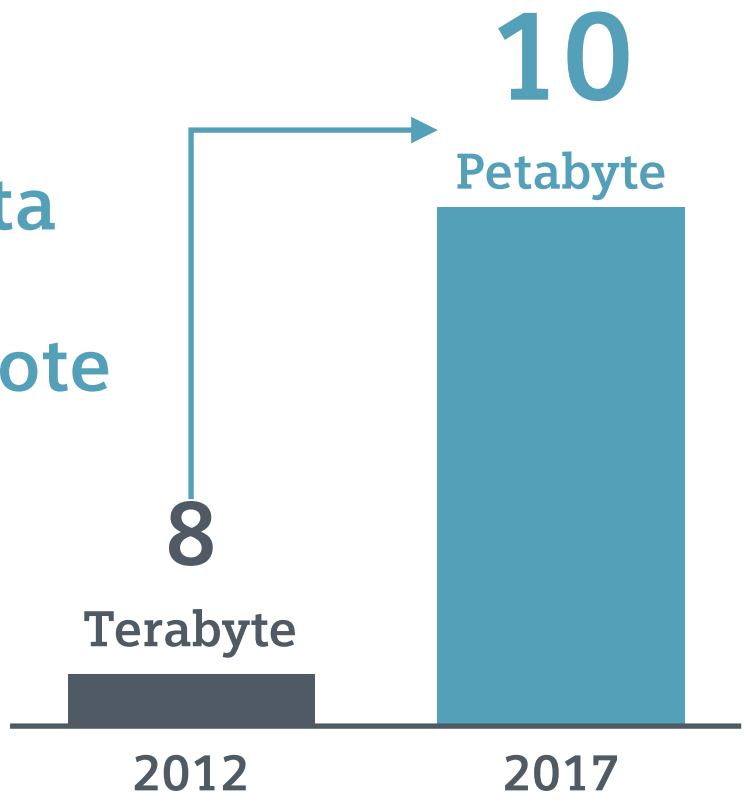
Unrestricted © Siemens AG 2016

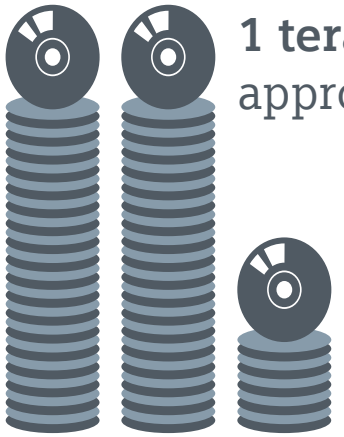
Use of collected data to improve production
From big data to smart data

SIEMENS

Design | Construction | Comm. | Operation and Maintenance

Estimated Data volume from Siemens Remote Services





1 terabyte equals approximatly **210 DVDs**

Unrestricted © Siemens AG 2016

Use of collected data to improve production
From big data to smart data

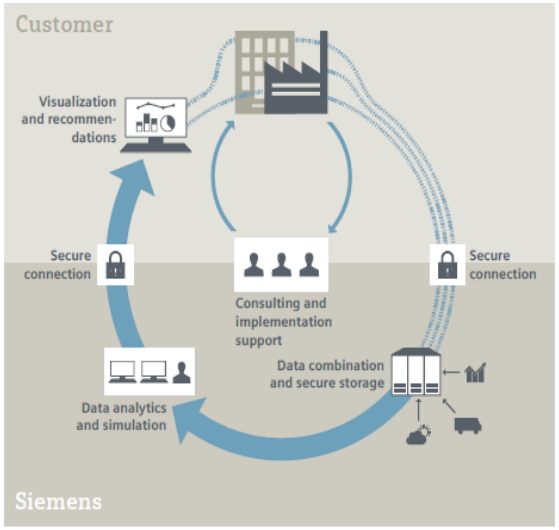
SIEMENS

Design | Construction | Comm. | Operation and Maintenance

Have you ever asked yourself whether your production machinery is really tapping its full potential? Did you know that your assets continuously produce data that can help you to realize exactly this?

Imagine a **managed service** that collects and analyzes data of your automation system, log-file or single device to provide you with actionable insights into your production system. Siemens can offer you this service!

With **Plant Data Services** we support you to transform your data into better business decisions – for more efficiency and improved performance to tap your full potential. **We turn data into value!**



So does it work: „Smart" data for faster and better decisions

- Master asset uptime
- Maximize process efficiency
- Optimize energy performance
- Enhance industrial security
- …

Master Asset Uptime
Achieve machine and plant availability of 99%

- Industrial Network Validation and Analytics
- Drive Train Analytics
- Machine Tool Analytics

Maximize Process Efficiency
Efficient plant optimization through automated control loop analysis

- Control Performance Analytics

Optimize Energy Performance
Achieve energy savings of up to 22%

- Energy Analytics

Enhance Industrial Security
Continuous protection to reduce risk and maintain production availability

- Security Essentials
- Security Enhancements
- Security Program

Most customers are yet to figure out how to capture the value:

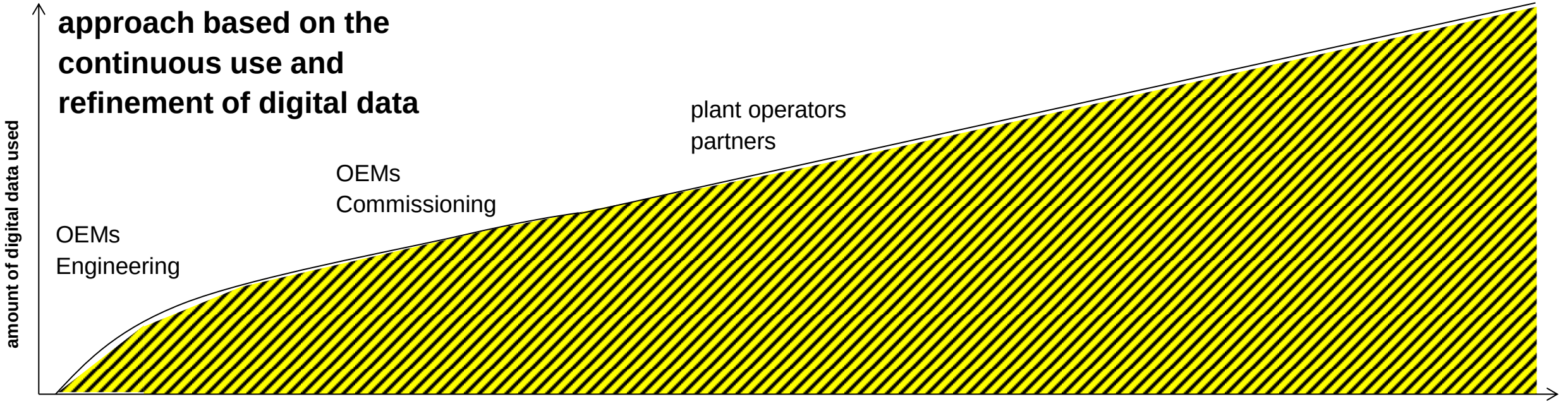
- 87% say big data analytics among top 3 priorities
- 42% say big data analytics is # 1 priority
- But only 5% have implemented a big data strategy!

Unrestricted © Siemens AG 2016

Life cycle of a plant with usable data generated over time

SIEMENS

Design | Construction | Comm. | Operation and Maintenance



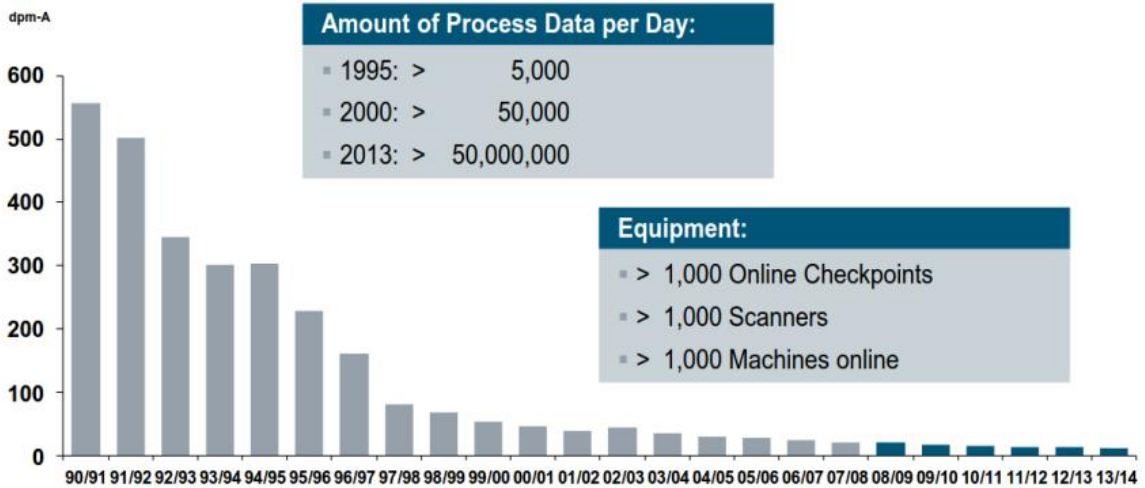
Unrestricted © Siemens AG 2016

Proof of concept: Siemens Electronics Works Amberg – The digital factory

Siemens Electronics Works Amberg
The Digital Factory

Realizing a Vision of Perfection

Industrial Automation Systems

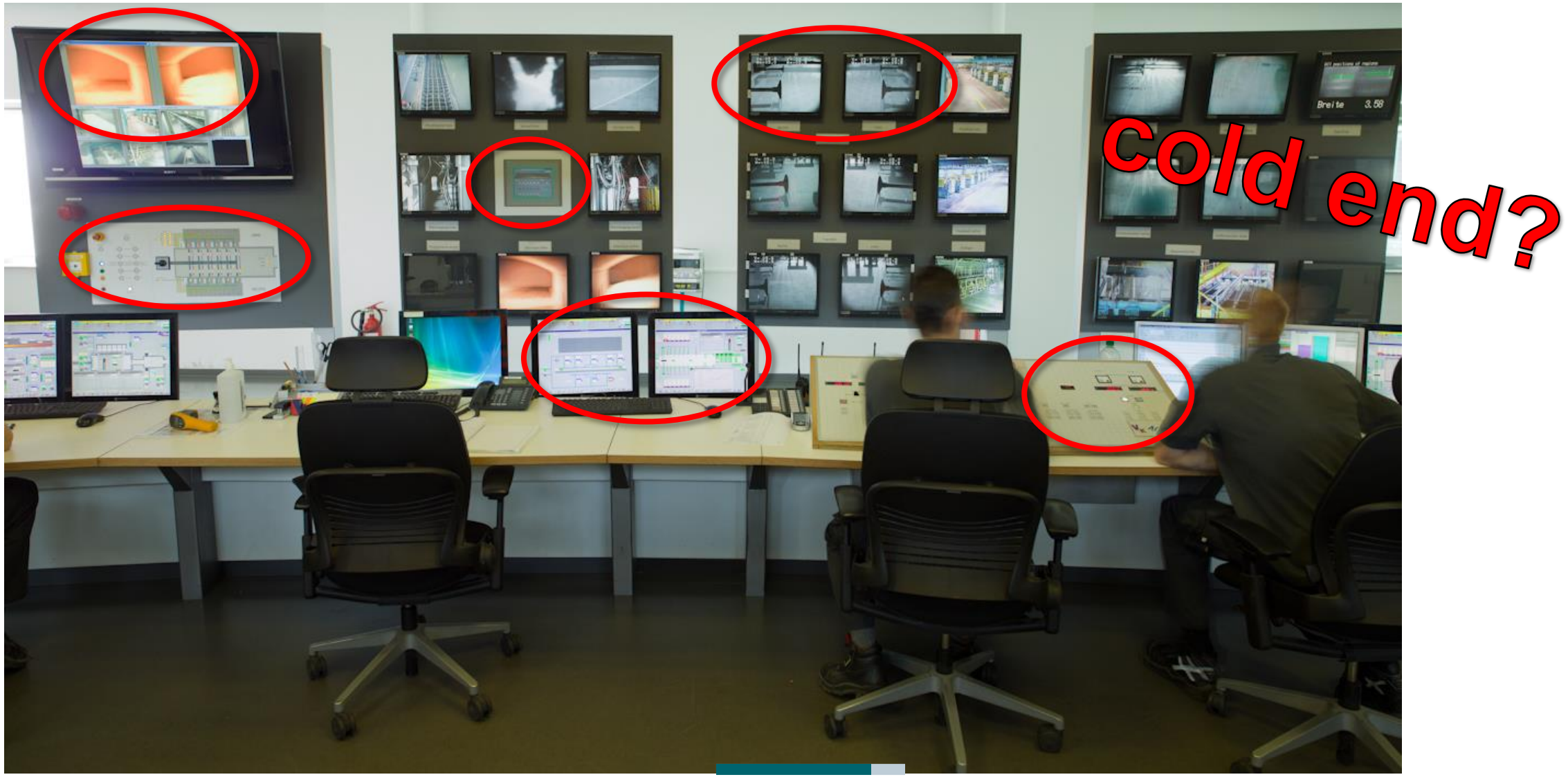


- You can only improve what you know
- …

Unrestricted © Siemens AG 2016

A modern control room – really state of the art?

SIEMENS



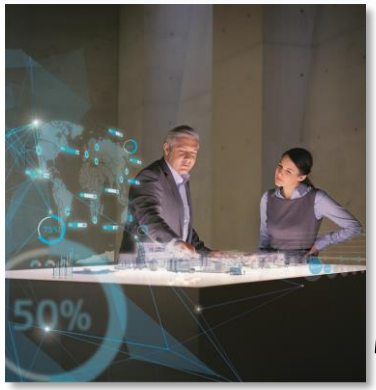
Why does the human play a major role in Industry 4.0?

SIEMENS

Top Management

- What is the market expecting from my company?
- Where do we need to be in 1, 5, 10, 20 years from now?

➔ Defines the company's path forward together with the different stake holders



Procurement

- Needs to be informed about the company's strategy
- Implements the company's strategy during the procurement process

➔ Stake holder

Customers

Suppliers

Engineering

- Generate the initial digital data of and for the plant
- Leverage the technology in order to decrease time to market

➔ Stake holder

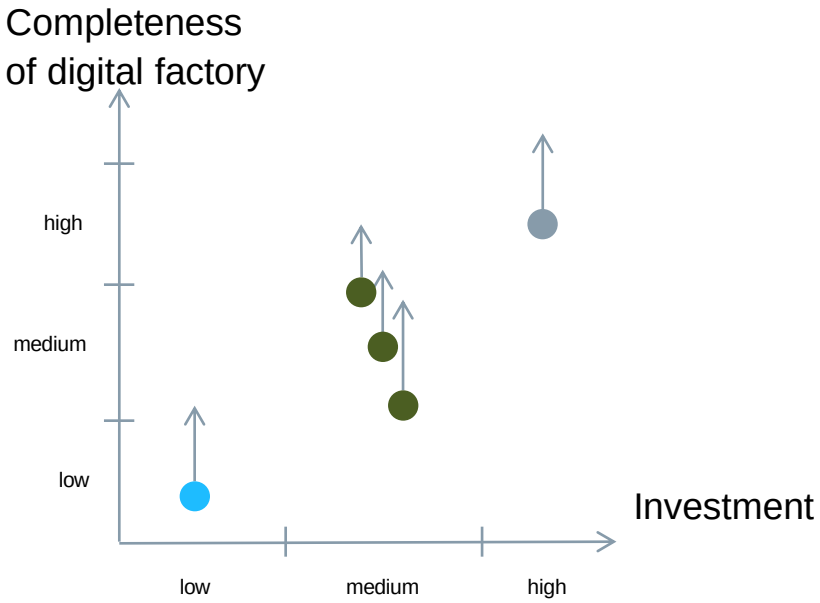
Operating Staff

- Exposed to the new technology during the life cycle of the plant
- Leverages the technology in order to increase flexibility and efficiency

➔ Stake holder

Unrestricted © Siemens AG 2016

The way to digitalization
When and where do I start?

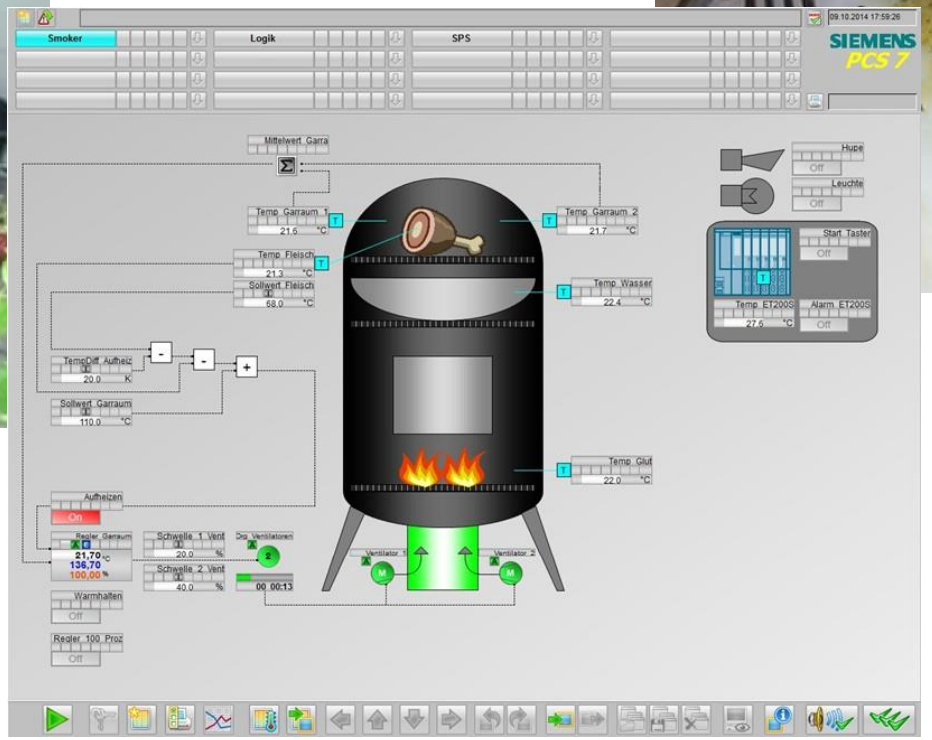


- New plant
- Revamp of an existing plant
- Try to solve old problems with new technology

- Where does the company have to be in future, in 5 years, in 10 years, in 20 years?
- What do our customers expect from us, what will the market require?
- Do I want to implement a strategy myself or will I partner with an expert?
- Do I invest in new plants or do I mostly revamp existing plants?
- …

Unrestricted © Siemens AG 2016

Digitalization in the backyard – for that perfect brisket



Unrestricted © Siemens AG 2016

Resume, vision

SIEMENS

Prerequisites to start with digitalization

- Willingness to get into the new technology ➔ human factor
- Establish a plant wide network and organize a central data base
- Early involvement of all suppliers
- Standardized interfaces and automation platform
- Use of internet/ cloud services without neglecting cyber security
- Use of already existing tools and concepts
- A partner with the appropriate portfolio and expertise

Digitalization enables

- Holistic engineering
- Use of digital data to generate automation software
- Virtual commissioning to reduce start up time
- Training and simulation with the digital twin
- Automatic generation of models to optimize the plant
- Predictive maintenance, condition based, not time driven
- Assessment of KPIs in real time to optimize production

Digitalization helps you to achieve your targets and to be ahead of your competition

Unrestricted © Siemens AG 2016

Many thanks for your attention. Questions, please!

SIEMENS

Oliver Krapp
Head of Account Development
Siemens AG, PD PA AE C&G

Siemensallee 84
76187 Karlsruhe/ Germany

Phone: +49 (721) 595 85788
Mobile: +49 (172) 723 0849

Email: oliver.krapp@siemens.com

siemens.com/glass

Unrestricted © Siemens AG 2016