BOSCH DRESDEN – A DIGITAL PLANT

SEMICON - SMART MANUFACTURING

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Munich, 2021-11-17

Robert Bosch Semiconductor Manufacturing Dresden GmbH
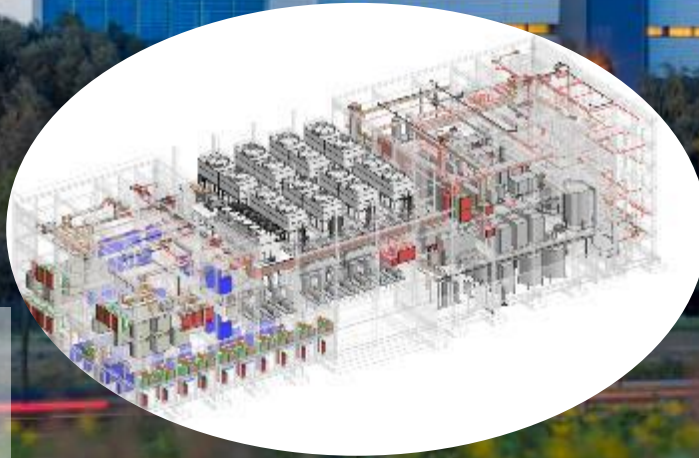Robert-Bosch-Ring 1, 01109 Dresden

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Dresden – a digital AIoT plant

Sensors but Eyes:
no direct labor, full automation

Data driven fab release:
Faster production process
stabilization through digitalization

Compensate small(er) Scale:
Smart Data Management as differentiator
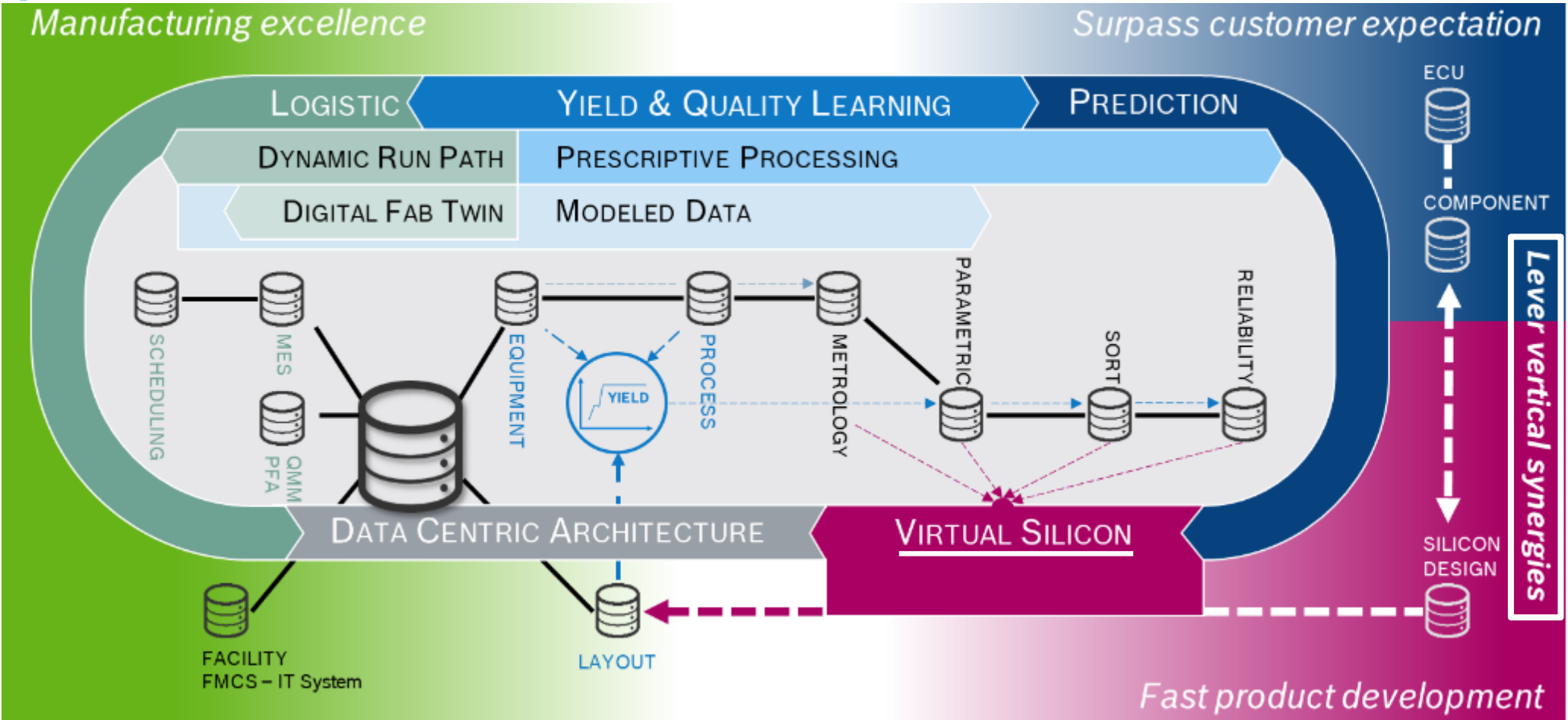against fabs with scale advantage

Digital ecosystem:
AIoT-centric process landscape,
AIoT mindset of employees

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Bosch Dresden – A Digital Plant
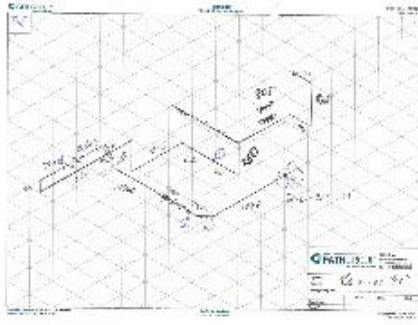## Digitalization as Enabler

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Digitalization Use Case: Digital Twin of Building (3D-BIM)
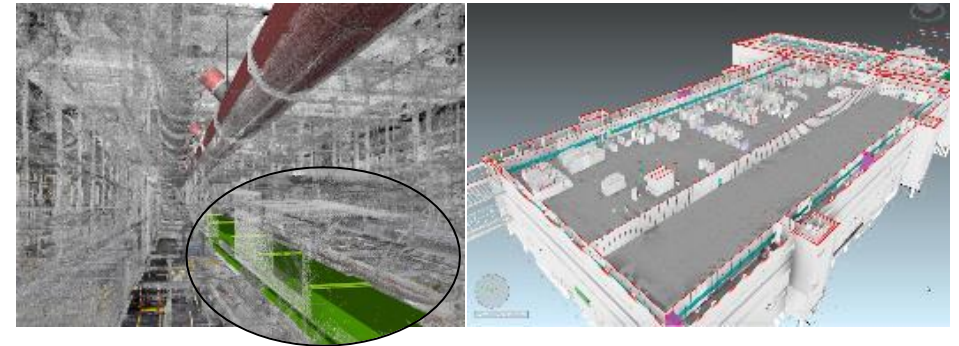
State of the Art

1. As built model based on drawings, images and measurements on site
2. Conversion to Revit @ designer

<u>Challenges</u>: Errors in isometry creation due to incorrect measurements, human errors or poor accessibility

New Standard

1. As built documentation with 3D laser scanning
2. Accuracy of 3 mm at 4m

<u>Benefits</u>: Better alignment to installations above and below clean room (sub Fab, plenum)

Enables tool hookup with ~20% less cost and 30% time saving during installation* and enables the complete digitalization even down to installation

DrP/MFE | 2021-11-17

*medium complex semiconductor equipment

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Bosch Dresden – A Digital Plant
Digitalization Use Case: Connected Infrastructure

Respective Utility and number of FMCS data sources

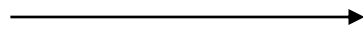Electrical supply
435

Process Gases
2.500

UPW / WWT
3500

Chemicals
7500

HVAC
7.534
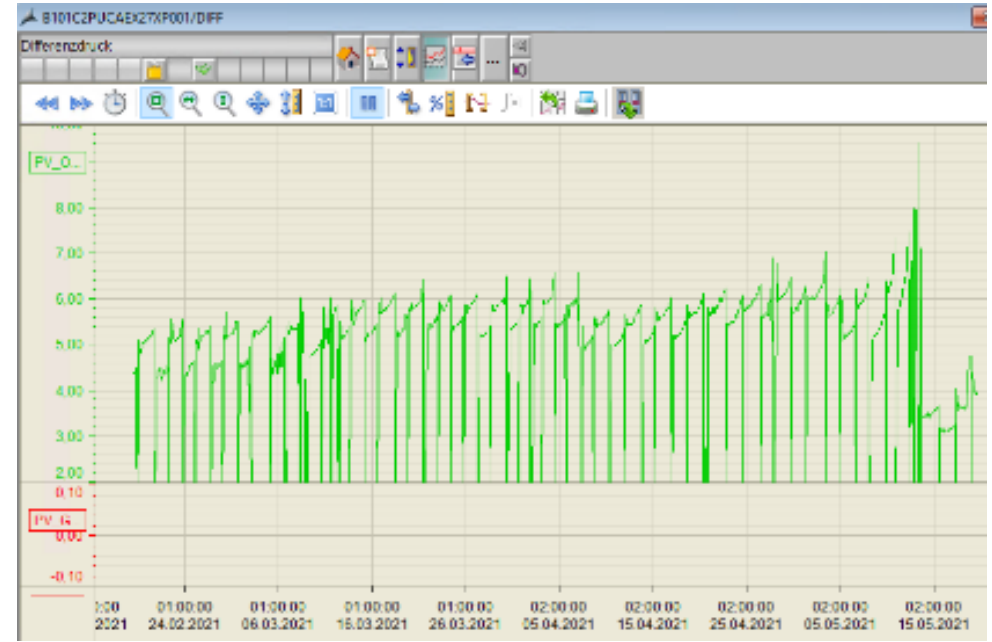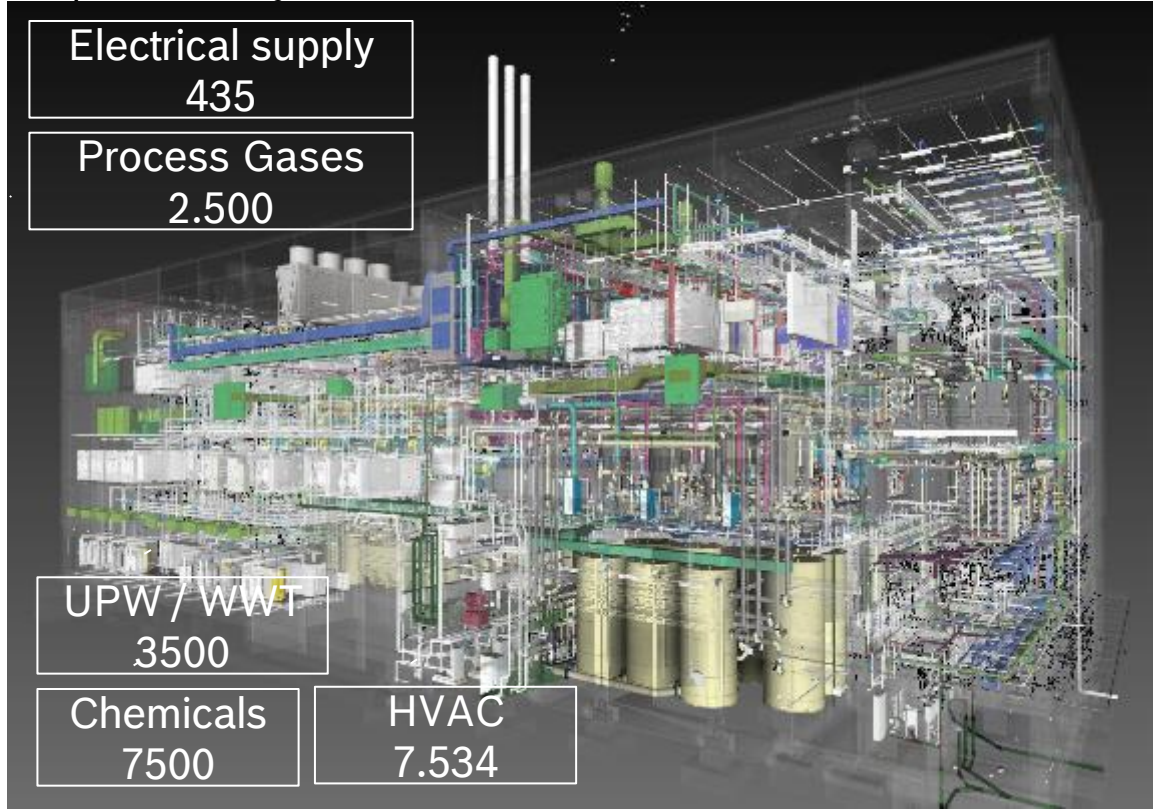
Effective Supplier Management based on data transparency.

UPW – Ultra Pure Water
WWT – Waste Water Treatment

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Digitalization Use Case: Remote Assist

Activities in Dresden →

Use cases at other sites

Dresden

Suzhou

Braga

- Major equipment suppliers located **outside EU**
- **Covid** related travel restrictions critical during fab commissioning
- Dresden piloted **a *proof of concept*** *(Safety, Security, Reliability) for HoloLens application*

Use case examples in whole value stream: remote commissioning of equipment, remote specialist support in unscheduled down events, conduction of remote training

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Digitalization Use Case: APC

FDC-based **waferfine** feedforward & feedback control AI-enabled

R2R

Multivariate feedforward & feedback control to improve within wafer uniformity

FDC

Advanced/ **FD-eCAP**, fleet matching

Lotbased feedforward & feedback control

ML based multivariate fault detection & classification

Feedback R2R control only

Univariate fault detection & classification

Tool and subfab data collection

1st example (CD* measurement B0)

CpK Improvement

2021

2022
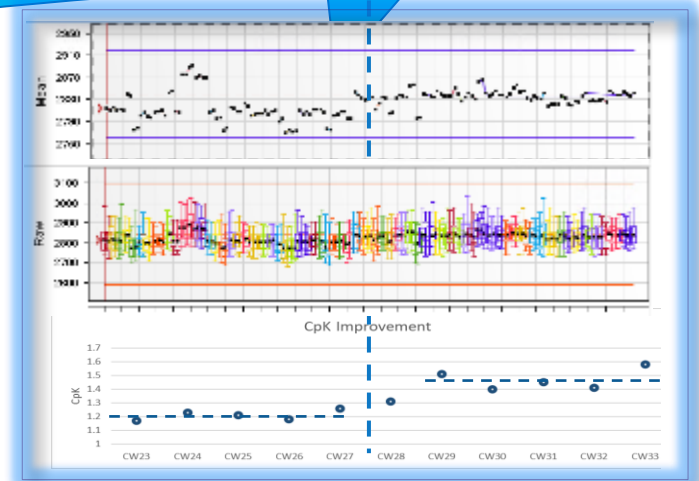
Adaptive Control across multiple connected equipments for improved capabilities.

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*CD critical dimension

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Skilled People Matter

Skills for the future of manufacturing ⟶

I A	Digital literacy as a holistic skill to interact with, understand, enable, and even develop new digital manufacturing systems, technologies, applications, and tools

2	Ability to use and design new AI and data analytics solutions while critically interpreting results

3	Creative problem solving in times of abundant data and technological opportunities in smart manufacturing systems

4	A strong entrepreneurial mindset including proactiveness and the ability to think outside the box

5	Ability to work physically and psychologically safely and effectively with new technologies

6	Inter-cultural and -disciplinary, inclusive, and diversity-oriented mindset to address new challenges arising from a more diverse manufacturing workforce

7	Cybersecurity, privacy, and data/information mindfulness to reflect the rapidly increasing digital footprint of the manufacturing value chain

8	Ability to handle increasing complexity of multiple requirements and simultaneous tasks

9	Effective communication skills with humans, IT, and AI systems through different platforms and technologies

10	Open-mindedness towards constant change, and transformation skills that constantly question the status quo and initiate knowledge transfer from other domains

... **at least 6** of the top ten skills **refer to digital skills**!

- "digital literacy" (1)
- "AI and data analytics" (2)
- "Creativity and abundance of data" (3)
- "cybersecurity and privacy" (7)
- "complexity management" (8)
- "Effective Communication with humans, IT and AI" (9)

Roles at Dresden Plant

BIM Coordinator	SCRUM Master
Data Engineer	Workflow Expert
Expert Augmented Reality	Data Scientist
Expert Visual Analytics	DevOps Engineer

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Virtual Fab Tour

Please join a virtual fab tour

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Bosch Dresden – A Digital Plant
Data Driven & Human Centric

Mission Statement

... AIOT Smart Factory und Smart People

Wafer Fab RB300
www.bosch-semiconductors.com

Bosch 300-mm-Halbleiterwerk Dresden
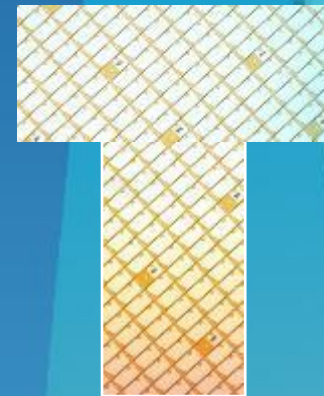
We work jointly with smart machines – together we are stronger.

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Bosch Semiconductors.
We make the world safe, smart and accessible.

Thank you for your attention

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Invented for life