INDUSTRY 4.0 @ BOSCH

Ing. Marino Crippa

Bosch-Group

▶ 70.6 billion euros in sales
▶ 374,778 associates

Mobility Solutions
▶ One of the world's largest suppliers of automotive technology

59% share of sales

Industrial Technology
▶ Leading in drive and control technology, packaging, and process technology

Energy and Building Technology
▶ Leading manufacturer of security technology
▶ Global market leader of energy-efficient heating products and hot-water solutions

41% share of sales

Consumer Goods
▶ Leading supplier of power tools and accessories
▶ Leading supplier of household appliances

BOSCH

Bosch Rexroth

▶ **Every industry has specific needs**

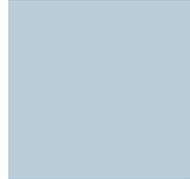| Mobile Applications	Machinery Applications and Engineering	Factory Automation

- Reflect specific needs and requirements of markets and industries
- Bundle relevant technologies, application expertise and services
- Global presence combined with local know-how
- Proximity to customer

We have deep industry knowledge

BOSCH

From large to small

We move everything

Every machine

Each project

Many applications, multiple industries

From massive to miniature

Providing life time service

With global strength to local markets
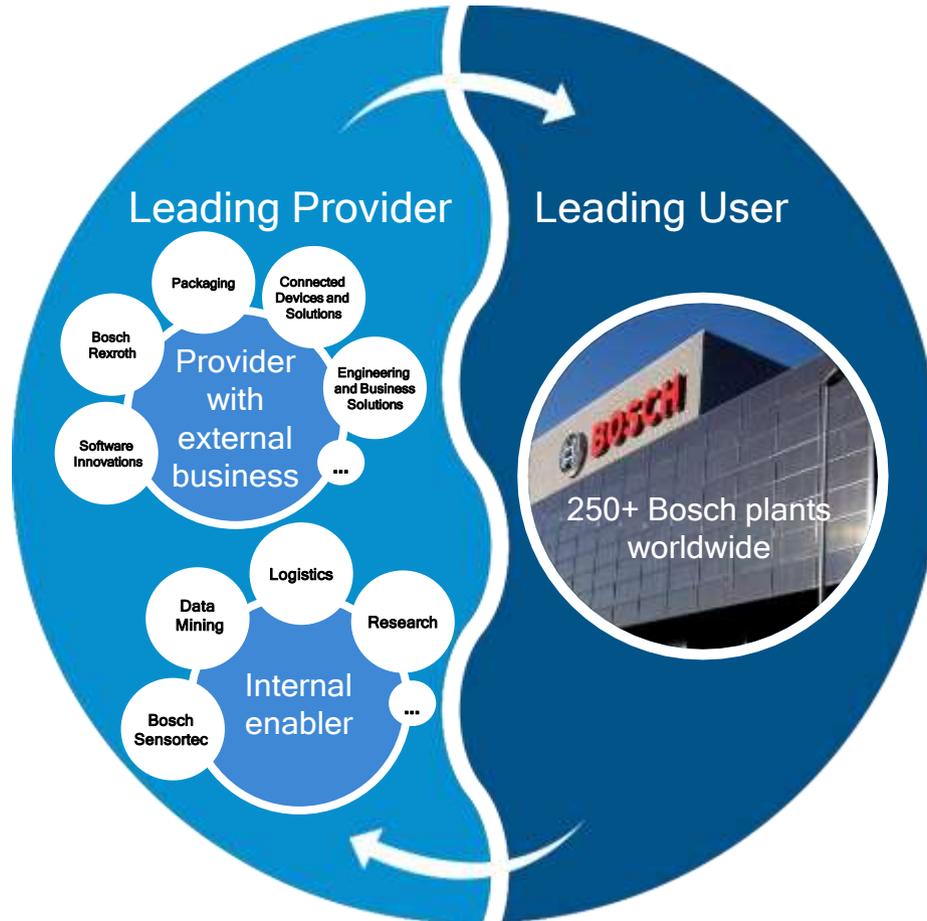
With leading edge technology

Founded on a strong team

BOSCH

Industry 4.0 live at Bosch
Dual strategy for Connected Industry

Leading Provider

- Packaging
- Connected Devices and Solutions
- Bosch Rexroth
- Engineering and Business Solutions
- Software Innovations
- ...

Provider with external business

- Logistics
- Data Mining
- Research
- Bosch Sensortec
- ...

Internal enabler

Leading User

250+ Bosch plants worldwide

BOSCH

Industry 4.0 live at Bosch
i4.0 use cases and benefits- examples

Digital Supply Chain
- ✓ stock saving
- ✓ efficiency increase
- ✓ transparency along supply chain
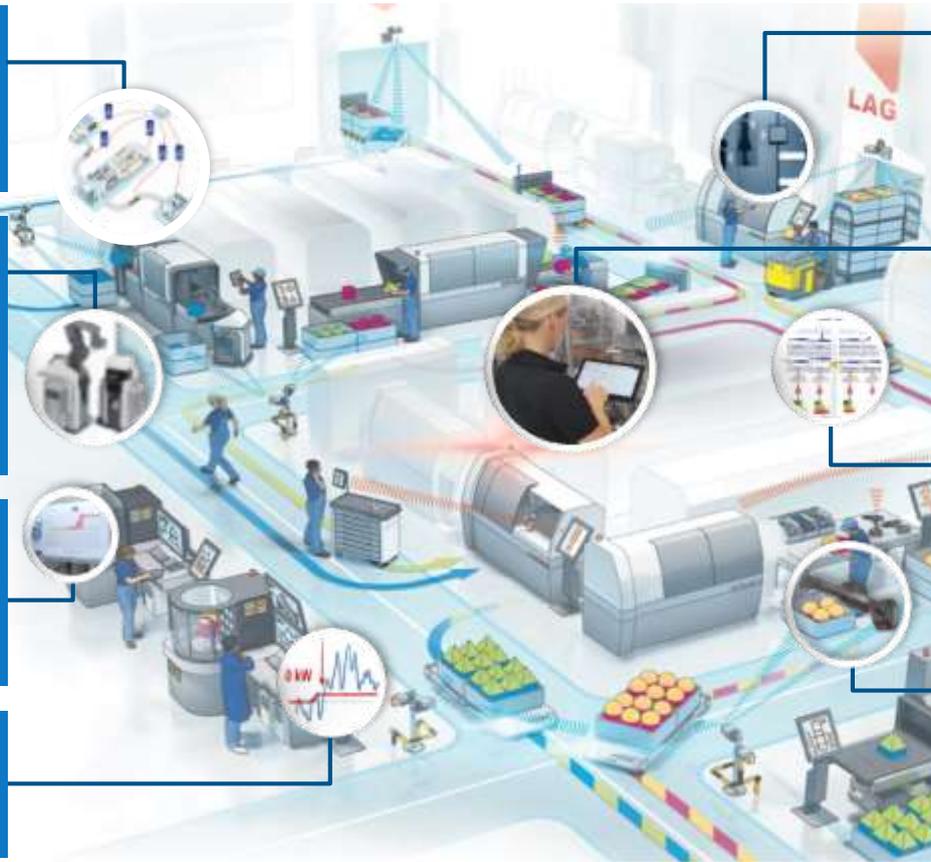
Convertible Equipment
- ✓ fix cost reduction
- ✓ efficient M2H collaboration
- ✓ human relief of heavy load / repetitive tasks

Shop Floor Mgmt. Information
- ✓ real time data
- ✓ fast escalation
- ✓ paperless

Power / Energy Management
- ✓ peak reduction
- ✓ energy cost saving

Operator Support
- ✓ agility & quick reaction
- ✓ quality increase
- ✓ efficiency increase

Predictive Maintenance
- ✓ improve OEE
- ✓ no sudden breakdown

Adaptive Testing
- ✓ increase efficiency
- ✓ less invest

Quality Improvement
- ✓ instant feedback
- ✓ fast identification of error sources

BOSCH

Industry 4.0 live at Bosch
Logistics with RFID

30% reduction of stock in processes
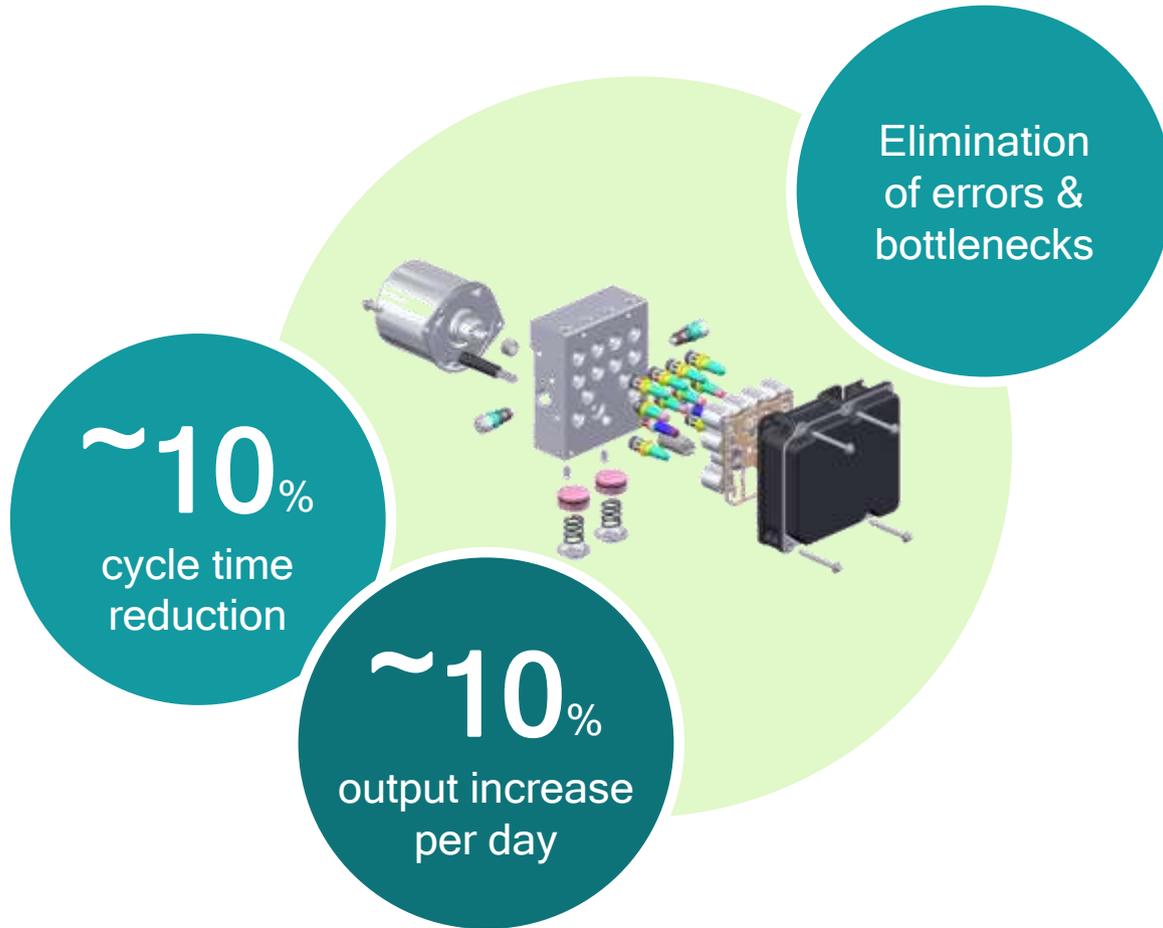
10% efficiency increase in processes

LOGISTIK AWARD 2014
VDA | Verband der Automobilindustrie

BOSCH

Industry 4.0 live at Bosch
Production quality: Smart tightening

Estimate: down time reduced by **10**%

Estimate: failure costs reduced by **10**%

Failure reaction time drastically reduced

BOSCH

Industry 4.0 live at Bosch
Smart Adaptive Testing

Elimination of errors & bottlenecks

~**10**% cycle time reduction

~**10**% output increase per day

BOSCH

Industry 4.0 live at Bosch
Flexible Automation - APAS assistant

- Flexible
- Mobile
- Collaborative
- Connected

Direct and safe collaboration
Sensorskin

Autonomous recognition of objects
Integrated 3D image processing system

Configuration instead of programming
User interface

Sensitive three-finger-gripper
Universal gripper

Workspace monitoring Additional feature
APAS speed switch

Location-independent
Quick release castors

i4.0 | 06/15/2016

BOSCH

Industry 4.0 live at Bosch
Shopflor Transparecy – Active Cockpit

Interactive info & communication platform

Up to 60' saved per day

Live data for Moring Round (Notes, mailing,escalation)

Data collection from different sources (SAP,MES, SQL,Office

Fully customized by java widgets

i4.0 | 06/15/2016

BOSCH

Industry 4.0 live at Bosch
Active Assist Industry 4.0 Workplace

freely configurable and adaptable

Ergonomic

Assembly data documen-tation

Interactive guiding of assembly steps

Reduced failure costs

Worker Guidance

Nutrunner Positioning

Interactive Instructions

Hand Tracking

Product identification

Rexroth

ActiveAssist
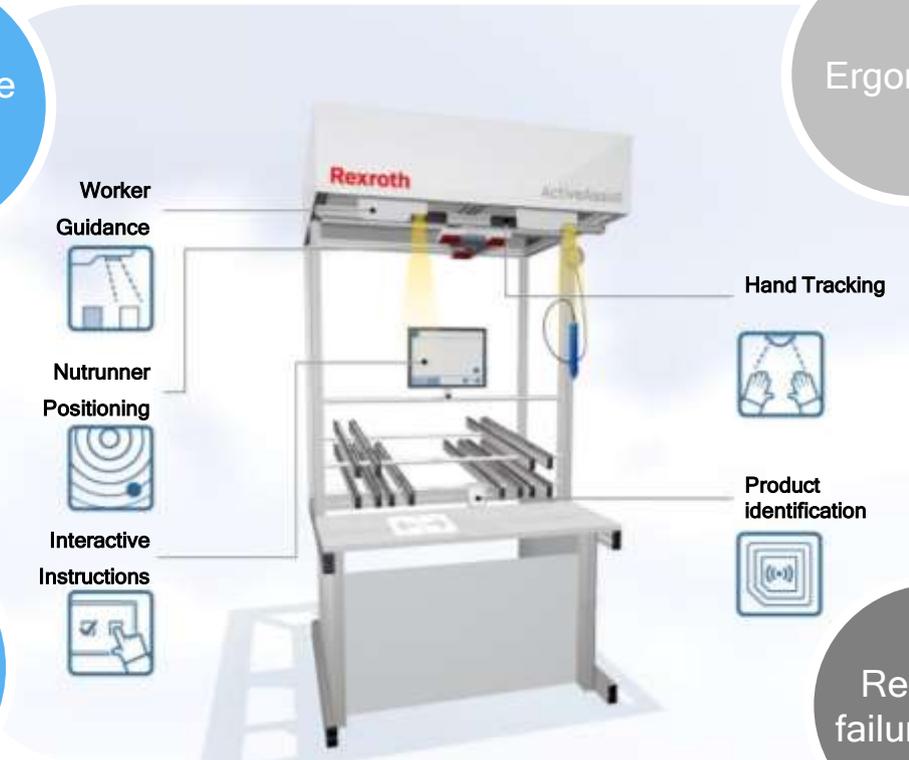
BOSCH

Industry 4.0 live at Bosch
Open Core Engineering

New freedom in engineering

The revolutionary new approach to software engineering that enables unprecedented customization, speed, efficiency and automation intelligence. Open software interface for direct function access to control core.

Rexroth
Servo Drive
(used as test and
measuring unit)
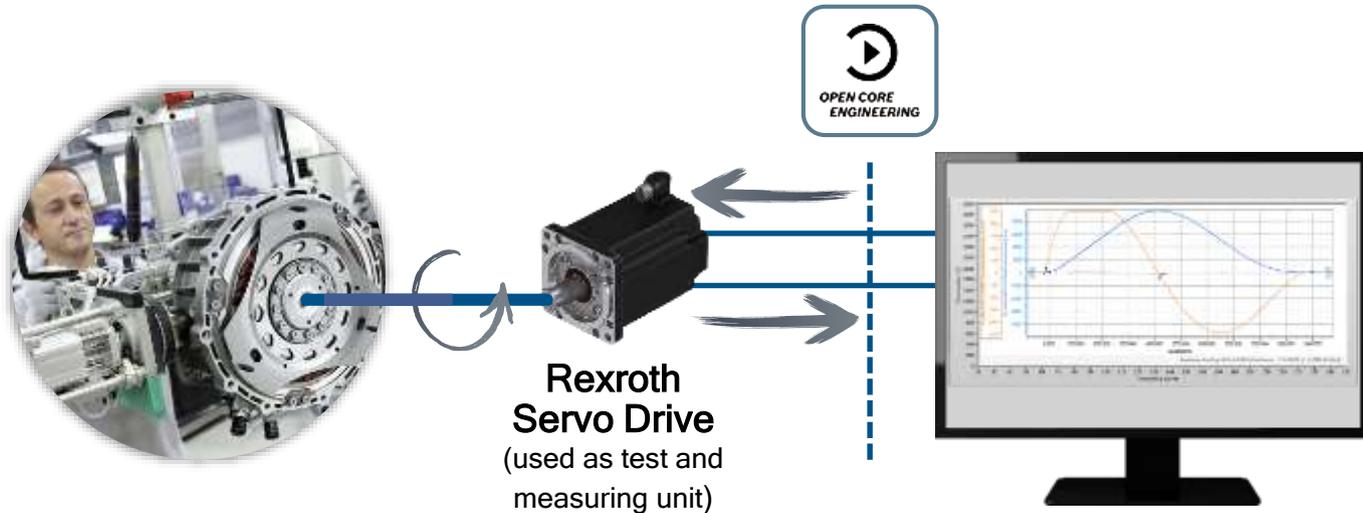
Open Core Engineering facilitates the networking in Connected Industry production

BOSCH

Industry 4.0 live at Bosch
i4.0 in an entire line – example Homburg

30% stock reduction, no setup

Up to **0.5** mio € savings year / line

10% output increase

People as key players

INDUSTRIE 4.0 @ INTELLIGENTE FABRIK

BOSCH

Real Use Case – Homburg Plant

BOSCH

I4.0 use case

Less is more: Shopfloor Management Cycle

Before

After

BOSCH

I4.0 use case

Less is more: Shopfloor Management Cycle

Before

- ▶ "Hourly tracking sheet" on paper
- ▶ Manual data collection and consolidation (non value added activity)
- ▶ Redundant data and stored files
- ▶ Delayed and error prone results
- ▶ Time for data collecting: > 2 h / assembly line / day
- ▶ Open Point List on paper
- ▶ Stock level information refresh with delay

After

- ▶ Automatic data collection from assembly lines
- ▶ Instant data storage in databases
- ▶ Real-time reports for productivity and stock levels (relevant KPI's)
- ▶ Web based solution accessible with browsers
- ▶ Reduced and sustainable investment per line
- ▶ Scalable and flexible solution (customizable)

BOSCH

THANK YOU FOR YOUR ATTENTION!

Ing. Marino Crippa
DCIT/SPL - SLG1
marino.crippa@boschrexroth.it
@marinocrippa