KUKA AG
Automatica 2012
Dr. Till Reuter, CEO
May 22, 2012
Global mega trends

Robotics benefiting from global mega trends

- Automation in industrialized countries
- Sustainability
- Automation in emerging markets
- Increasing wage levels
- Demographic changes

Growth of robot-based automation
Mega trend: industrialized countries

Focus on general industry and smaller companies

Mega trend 1

Increasing automation in industrialized countries

Solutions from KUKA
- Lightweight robot and small robots (Agilus) facilitate implementation of robot-based automation
- KUKA software has a broad range of application (automation becomes easy)
Mega trend: sustainability

KUKA supplies solutions for lightweight construction

Solutions from KUKA

- KUKA makes more efficient production of carbon fibers possible
- KR Quantec with 30% lower energy consumption
Mega trend: emerging countries

KUKA is automotive market leader in China

Mega trend 3
Increasing automation in emerging markets

Solutions from KUKA

- KUKA is market leader in automotive; automotive is one of the first industries to implement robot-based automation
- Automation is the solution to balance increasing quality demands and rising costs in emerging markets
Mega trend: labor costs

KUKA supplies solutions for increasing productivity

**Solutions from KUKA**

- KUKA has 35 years of experience in robot-based automation
- Trend towards the relocation of capacities from emerging markets to industrialized countries
Mega trend: demography

KUKA promotes human-machine collaboration

Mega trend 5
Demographic changes

Solutions from KUKA

- Lightweight robot with safe human-machine interaction
- KUKA successfully implements robots in the healthcare sector
Development of robot-based automation

Robot applications increasing sharply

Articulated robot sales (2011: about 100,000)

<table>
<thead>
<tr>
<th>Today</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>~50,000</td>
<td>&gt; 150,000</td>
</tr>
</tbody>
</table>

- Automotive (industrialized countries)
- General Industry (industrialized countries)
- Emerging markets
- Service robotics

Development of robot-based automation

~100,000

Service
Fanuc, KUKA, ABB and Yaskawa together have a global market share of approximately 66%.
# Robotics – Potential: China

## KUKA benefiting strongly from rising wage levels

**Market**
- China expected to be world’s largest robot market in 2013
- Wages in China increased by about 20% in 2011
- Accelerated wage rises in China
  - CAGR: +10% (00-05) and +19% (05-10)

**KUKA Robotics in China**
- Automotive market leader for articulated robots
  - Strong market position with OEMs from industrialized countries and with local OEMs
- Increase in General Industry sales through expansion of local assembly capacity and product design to meet local demand

## Robot density (number of robots per 10,000 employees)

<table>
<thead>
<tr>
<th></th>
<th>Automotive</th>
<th>General Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>1,130</td>
<td>134</td>
</tr>
<tr>
<td>Japan</td>
<td>1,436</td>
<td>191</td>
</tr>
<tr>
<td>China</td>
<td>105</td>
<td>5</td>
</tr>
</tbody>
</table>

Facts relating to China:
1. Source: IFR World Robotics
2. Source: BCG
## Robotics – Potential: product portfolio

### KUKA robots creating new markets

<table>
<thead>
<tr>
<th>AGILUS</th>
<th>AGILUS with external sensors</th>
<th>Lightweight robot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industry: demanding force-controlled assembly tasks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Healthcare</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human-robot interaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mobility</td>
</tr>
</tbody>
</table>

#### Industrial robotics
- Waterproof, Cleanroom and Food sectors
- Pick & place (high velocities)
- Loading and unloading of machines

#### Service robotics
- Handling
- Assembly
- Polishing
- Grinding
- Deburring

#### High volume

#### Premium
Areas of focus in automotive and general industry

**Automotive**
- Body-in-white
- Assembly & Test
- Technology Solutions

**General Industry**
- Aero
- Logistics
- Tools and dies
- KTPO
- Others

<table>
<thead>
<tr>
<th>Units</th>
<th>Revenue share today</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe / USA</td>
<td></td>
</tr>
<tr>
<td>Asia</td>
<td></td>
</tr>
</tbody>
</table>
Strategy

Value enhancement of KUKA

- Safeguard automotive business
- Increase general industry business
- Strengthen global positioning

- Increase revenues in healthcare segment
- Market entry in service robotics

Long-term strategy

- Systems
- Robotics

Medium-term target margins

- Industrial Robotics

5%+

- Advanced Robotics

12%
Robotics

Automatica 2012

Manfred Gundel, CEO Robotics

May 22, 2012
Market for articulated robots

Development of robot market and Robotics

Market: articulated robot sales
- New sales record achieved in 2011
- Market growth in 2011: +46%
- Market breakdown 2011: 70% GI and Tier1, 30% Automotive

Robotics: articulated robot sales
- New sales record achieved in 2011
- Robotics market share up to 13.8%; w/o strong position in small robots
- Robotics growth in 2011: +62%

1) IFR (International federation of robotics) preliminary data 2011 and KUKA
General Industry – Market analysis

Potential: Low robot density in General Industry

Number of robots per 10,000 employees in top 4 countries

<table>
<thead>
<tr>
<th>Industry</th>
<th>General Industry</th>
<th>Automotive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan 2010</td>
<td>164</td>
<td>1,136</td>
</tr>
</tbody>
</table>

Number of robots per 10,000 employees in BRIC countries

<table>
<thead>
<tr>
<th>Industry</th>
<th>General Industry</th>
<th>Automotive</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRIC 2010</td>
<td>3</td>
<td>58</td>
</tr>
</tbody>
</table>

Potential:

- General Industry: 7x (164 → 1,136)
- Automotive: 19x (3 → 58)

1) Japan, Korea, Germany and Italy in 2010
General Industry – Segments and countries

Focus on 10 countries/regions + 7 segments

<table>
<thead>
<tr>
<th></th>
<th>Food</th>
<th>Electronics</th>
<th>Plastics</th>
<th>Foundry</th>
<th>Machine Tools</th>
<th>Arc</th>
<th>T/I/others</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South-East Asia</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taiwan</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central and Eastern Europe</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scandinavia</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>High</td>
<td></td>
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</tr>
</tbody>
</table>

Market volume¹
- High
- Medium
- Low

Measures

- The 10 countries/regions in focus represent 80% of the global General Industry market
- Managers responsible for sectors/regions appointed
- “Sales, Service and Product Management” unit in all countries/regions
- Increase number of industry specialists
- Set-up of key account management in General Industry

¹ Source: IFR. Annual market volume – high: >300 robots / medium 150-300 robots / low <150 robots
General Industry – Example: food/palletizing

Attractive market due to local focus

- High market potential due to standardization
  - Installation of around 3,000 industrial robots per year in the food industry
  - Growth potential in Asia: food/palletizing segment one of the first markets to be automized after Automotive and Tier 1
- 90% of robots sold via system integrators
- Number of large goods distribution centers in the food industry increasing rapidly
- Countries in focus: Germany, Spain, USA, Italy and China
General Industry – Example: food/palletizing

Leading position due to broad product range

Advantages Robotics

- Short cycle times – fastest palletizing robots in cycle time comparisons
- With maximum payload, virtually no reduction in cycle time compared to minimum payload (same robot)
- Best product portfolio in the palletizing robot class – coverage of all payload ranges from 40 to 1300 kg
- High IP65\(^1\) protection rating for all palletizing robots
- All motors operate without an additional fan (even at full load)
- Low energy consumption

1) IP 65 – Ingress Protection. IP Code classifies the degrees of protection provided against the intrusion (e.g. dust, water etc.) in mechanical casings.
General Industry – Example: machine tools

Growth market machine tools

- Large number and broad spectrum of system integrators worldwide
- Combination of “machine tools + automation solutions” offers sales potential for machine tool manufacturers
- Good opportunities for automation by lightweight robots
- Countries in focus: Germany, China, Taiwan and USA
General Industry – Example: machine tools

Great market potential

Machine tools market (2011)

<table>
<thead>
<tr>
<th>Total market</th>
<th>Potential</th>
<th>Equipped with robots</th>
</tr>
</thead>
<tbody>
<tr>
<td>500,000</td>
<td>250,000</td>
<td>6,000</td>
</tr>
</tbody>
</table>

Only 1.7% of machine tools sold in 2011 were equipped with robots

Advantages Robotics

- Return on investment (ROI) for customers significantly increased by Robotics portfolio (Agilus, KR Quantec, KR C4 - control)

- **mxAutomation**: Simple operator control
  - Robot programming based on PLC\(^1\); extensive programming know-how available on the market
  - (Almost) every CNC\(^2\) controller is equipped with a PLC\(^1\)

- **KUKA.CNC**: Milling by robot
  - Robot used as a machine tool
  - Interesting segments: lightweight construction and large work space

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1) PLC = Programmable Logic Controller  
2) CNC = Computer numerical control
General Industry – Product portfolio

Launch of Agilus to win General Industry customers

Agilus product features

- Payloads of 6 and 10 kg available for vertical arm robots
  -> Expansion of Robotics’ product portfolio

- Reaches of 700, 900 and 1100 mm

- Waterproof, Cleanroom and Food variants available

- Coverage of more applications and sectors

- Complete in-house development
## General Industry – Product portfolio

### Agilus launch timeline

<table>
<thead>
<tr>
<th>Main topics</th>
<th>Start of market launch</th>
<th>Reach, Axes</th>
<th>Reach, Axes, Payload + Variants</th>
<th>Focus segments for AGILUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 6 R900 6 axes</td>
<td>KR 6 R900 6 axes</td>
<td>Food</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 6 R900 5 axes</td>
<td>KR 10 R900 5 axes</td>
<td>Elektronics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 6 R700 5 axes</td>
<td>KR 10 R1100 5 axes</td>
<td>Plastics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Education/R&amp;D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### General Industry – Product portfolio

**Strong competitive advantages of Agilus**

<table>
<thead>
<tr>
<th>Competitive advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low cycle times – fastest 5/6-axis robot</td>
</tr>
<tr>
<td>SafeOperation functionality available</td>
</tr>
<tr>
<td>Comprehensive product portfolio in this robot class (incl. Light weight robot)</td>
</tr>
<tr>
<td>Low energy consumption</td>
</tr>
<tr>
<td>Modular design and use of shared parts</td>
</tr>
<tr>
<td>Common control technology and software options (incl. technology packages) for all KUKA robots</td>
</tr>
</tbody>
</table>

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AGILUS is distinguished by its **INNOVATION and QUALITY**
Robot market in China

Robotics – Strong partner in China

Facts about Robotics China

- Market entry: 1997
- Market share in 2011: 16%¹
- Employees: 140
- Installed robot base by Robotics: > 7,000
- Assembly capacity expected to increase to 5,000 robots p.a. at YE12
- Strategy Automotive and General Industry:
  - Increase local presence by additional regional offices (Shanghai, Beijing, Guangzhou, Chongqing, Changchun)
  - Expansion of system partner network.

¹) IFR (International federation of robotics) preliminary data 2011 and KUKA
Robot market in China

KUKA growing faster than the market

**Market: Articulated robots, shipments**

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipments</td>
<td>2,690</td>
<td>3,692</td>
<td>5,502</td>
<td>4,360</td>
<td>11,775</td>
<td>18,196</td>
</tr>
</tbody>
</table>

**Market drivers in China**

- Market conditions are changing:
  - Increase of labor costs
  - Reduced availability of skilled labor
  - Productivity improvements
  - Increase of quality demand (Export)
  - Worker safety

- Expansion in other industries:
  - Automotive was first industry to implement robots, followed by Tier1, metal industry etc.

**Robotics: Articulated robots, shipments**

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipments</td>
<td>93</td>
<td>270</td>
<td>530</td>
<td>487</td>
<td>1,319</td>
<td>2,850</td>
</tr>
</tbody>
</table>

1) IFR (International federation of robotics) preliminary data 2011 and KUKA
Robot market in China

China: Robotics captures market position 3 (2010: 5)
## Robot market in China

### Selection of local customers in China

<table>
<thead>
<tr>
<th>Automotive</th>
<th>General Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Volkswagen" /></td>
<td><img src="image2" alt="Foxconn" /></td>
</tr>
<tr>
<td><img src="image3" alt="GAC" /></td>
<td><img src="image4" alt="XCMG" /></td>
</tr>
<tr>
<td><img src="image5" alt="SINOTRUK" /></td>
<td><img src="image6" alt="Cestbon" /></td>
</tr>
<tr>
<td><img src="image7" alt="SAIC MOTOR" /></td>
<td><img src="image8" alt="FUYAO GROUP" /></td>
</tr>
<tr>
<td><img src="image9" alt="Brilliance Auto" /></td>
<td><img src="image10" alt="BAOSTEEL" /></td>
</tr>
<tr>
<td><img src="image11" alt="JAC" /></td>
<td><img src="image12" alt="TSINGTAO" /></td>
</tr>
<tr>
<td><img src="image13" alt="CHANA" /></td>
<td><img src="image14" alt="CSR" /></td>
</tr>
<tr>
<td><img src="image15" alt="Volvo" /></td>
<td><img src="image16" alt="CHANGANFORD" /></td>
</tr>
<tr>
<td><img src="image17" alt="CHERRY" /></td>
<td><img src="image18" alt="HONGTA GROUP" /></td>
</tr>
<tr>
<td><img src="image19" alt="GM" /></td>
<td><img src="image20" alt="SNOW" /></td>
</tr>
<tr>
<td><img src="image21" alt="DFM" /></td>
<td><img src="image22" alt="SANY" /></td>
</tr>
<tr>
<td><img src="image23" alt="CNR" /></td>
<td><img src="image24" alt="Yong Ji Elec Trbc" /></td>
</tr>
</tbody>
</table>
Guidance Robotics

Increase market share in automotive and in general industry

<table>
<thead>
<tr>
<th>Market share Robotics Ø 2006-2011</th>
<th>Goals until 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automotive</strong></td>
<td></td>
</tr>
<tr>
<td>~28%</td>
<td>• Defend market #1 position</td>
</tr>
<tr>
<td></td>
<td>• Increase number of OEM customers</td>
</tr>
<tr>
<td></td>
<td><strong>Target market share 2017: ~30%</strong></td>
</tr>
<tr>
<td><strong>General Industry</strong></td>
<td></td>
</tr>
<tr>
<td>~6%</td>
<td>• Increase market share by 100bp p.a.</td>
</tr>
<tr>
<td></td>
<td>• Increase number of customers in General Industry</td>
</tr>
<tr>
<td></td>
<td><strong>Target market share 2017: ~15%</strong></td>
</tr>
</tbody>
</table>
Automatica – Automation Becomes Easy

The future is bright, the future is orange.
Robotics

Backup
Robot market in total grew by 31% in 2011

Total market: +31%
Articulated robots: +46%
Scara: +26%
Cartesian/Linear/Gantry robots: +13%
Parallel robots: +61%
Other robots: -71%

Total robot market in 2011: 158,272

Source: IFR preliminary data 2011
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