How robots conquer industry worldwide

IFR Press Conference, 27 September 2017
Frankfurt
Schedule

- Welcome and introduction of the panelists
- Global robot market up to 2020 by Joe Gemma
- Today’s trends – tomorrow’s robots by Steven Wyatt
- Questions
International Federation of Robotics
Representing the global robotics industry

- Robotics turnover 2016: $40 billion
- More than 50 members:
  - National robot associations
  - R&D institutes
  - Robot suppliers
  - Integrators
- Sponsor of the International Symposium on Robotics (ISR)
- Co-sponsor of the IERA Award
- Primary resource for worldwide data on use of robotics – IFR Statistical Department
Speakers on the Panel

Joe Gemma
IFR President
President and CEO, KUKA Robotics Corp., USA

Steven Wyatt
IFR Executive Board Member
Group Vice President, and Head of Marketing & Sales Robotics, ABB, CH

Gudrun Litzenberger
IFR General Secretary
Frankfurt
Joe Gemma, IFR President

Global Robot Market up to 2020
1.7 million new industrial robots by 2020
Double-digit average annual increase

Source: IFR World Robotics 2017
Continued increase in major industries

Estimated annual supply of industrial robots at year-end by industries worldwide 2014-2016

- Automotive industry
  - 2016: 103,000
  - 2015: 98,000
  - 2014: 94,000
  - Change: +6%

- Electrical/electronics
  - 2016: 65,000
  - 2015: 46,000
  - 2014: 91,000
  - Change: +41%

- Metal
  - 2016: 29,000
  - 2015: 29,000
  - 2014: 21,000
  - Change: -3%

- Chemical, rubber and plastics
  - 2016: 20,000
  - 2015: 20,000
  - 2014: 17,000
  - Change: -4%

- Food
  - 2016: 7,000
  - 2015: 7,000
  - 2014: 8,000
  - Change: +20%

- Others
  - 2016: 19,000
  - 2015: 15,000
  - 2014: 11,000
  - Change: -4%

- Unspecified
  - 2016: 24,000
  - 2015: 20,000
  - 2014: 24,000
  - Change: +0%

Source: IFR World Robotics 2017
Main driver of the growth: Asia

Estimated worldwide annual supply of industrial robots 2015-2016 and forecast for 2017*-2020*

*forecast

Source: IFR World Robotics 2017
2016: 5 markets account for 74% of total supply

Estimated worldwide annual supply of industrial robots
15 largest markets 2016

<table>
<thead>
<tr>
<th>Country</th>
<th>'000 of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>87,0</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>41,4</td>
</tr>
<tr>
<td>Japan</td>
<td>38,6</td>
</tr>
<tr>
<td>United States</td>
<td>31,4</td>
</tr>
<tr>
<td>Germany</td>
<td>20,0</td>
</tr>
<tr>
<td>Taiwan</td>
<td>7,6</td>
</tr>
<tr>
<td>Italy</td>
<td>6,5</td>
</tr>
<tr>
<td>Mexico</td>
<td>5,9</td>
</tr>
<tr>
<td>France</td>
<td>4,2</td>
</tr>
<tr>
<td>Spain</td>
<td>3,9</td>
</tr>
<tr>
<td>Thailand</td>
<td>2,6</td>
</tr>
<tr>
<td>India</td>
<td>2,6</td>
</tr>
<tr>
<td>Singapore</td>
<td>2,6</td>
</tr>
<tr>
<td>Canada</td>
<td>2,3</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>2,0</td>
</tr>
</tbody>
</table>

Source: IFR World Robotics 2017
China: 40% of the global supply by 2020

Estimated annual supply of industrial robots in China 2008-2016 and 2017*-2020*

+20% to +25% on average per year

Source: IFR World Robotics 2017
Rep. of Korea: considerable increase since 2010

Estimated annual supply of industrial robots in the Rep. of Korea 2008-2016 and 2017*-2020*

Source: IFR World Robotics 2017
Japan: significant recovery and continued growth

Estimated annual supply of industrial robots in Japan 2008-2016 and 2017*-2020*

Source: IFR World Robotics 2017
USA: considerable increase since 2010

Estimated annual supply of industrial robots in the USA 2008-2016 and 2017*-2020*

Source: IFR World Robotics 2017
Germany: moderate increase at record levels

Estimated annual supply of industrial robots in Germany 2008-2016 and 2017*-2020*

+5% on average per year

Source: IFR World Robotics 2017
2020: 3 million industrial robots in operation

Estimated worldwide operational stock of industrial robots 2015-2016 and forecast for 2017*-2020*

Source: IFR World Robotics 2017
2020: 1.9 million operating in Asian factories

Estimated worldwide operational stock of industrial robots 2015-2016 and forecast for 2017*- 2020*

Source: IFR World Robotics 2017
2020: 950,000 robots operating in China

Estimated operational stock of industrial robots in China and in Japan 2015-2016 and forecast for 2017*-2020*

<table>
<thead>
<tr>
<th>Year</th>
<th>China (000s)</th>
<th>Japan (000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>256</td>
<td>287</td>
</tr>
<tr>
<td>2016</td>
<td>340</td>
<td>287</td>
</tr>
<tr>
<td>2017*</td>
<td>451</td>
<td>285</td>
</tr>
<tr>
<td>2018*</td>
<td>585</td>
<td>292</td>
</tr>
<tr>
<td>2019*</td>
<td>748</td>
<td>301</td>
</tr>
<tr>
<td>2020*</td>
<td>950</td>
<td>316</td>
</tr>
</tbody>
</table>

*forecast

Source: IFR World Robotics 2017
Today’s trends, tomorrow’s robots!
The Changing Nature of Manufacturing & Work

- Shift from high volume/low mix to low volume/high mix is having a profound impact on manufacturing.
- Many industries facing acute shortages of skilled labor.
- Quicker automation ROIs and rising wages bringing an end to labour arbitrage.
- Increasing focus on workplace safety.

Today’s Digital Generation doesn’t do “4D” Jobs!
Addressing these Realities: a Huge Opportunity

<table>
<thead>
<tr>
<th>The Trends</th>
<th>The Challenges</th>
<th>The Enablers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low volume high mix</td>
<td>Automation complexity and unpredictability</td>
<td>Collaborative automation for greater flexibility</td>
</tr>
<tr>
<td>Shorter cycles, faster launches</td>
<td>Shop floor disruptions and high engineering costs</td>
<td>Better software for engineering efficiency</td>
</tr>
<tr>
<td>Increased need for automation and scalability in SMEs</td>
<td>Lack of robot integration and programming expertise</td>
<td>Easier to use robots with more intuitive programming</td>
</tr>
<tr>
<td>Rising cost of downtime</td>
<td>Higher lifetime TCO due to increase in planned downtime</td>
<td>Advanced analytics and services for greater reliability</td>
</tr>
<tr>
<td>Increased and sporadic human intervention</td>
<td>Lost productivity to maintain safety</td>
<td>Collaborative automation to maintain safety and productivity</td>
</tr>
</tbody>
</table>

The Answers to these challenges lie in Simplification, Digitalisation and Collaboration.
Robots which are easier to install, program and operate will unlock entry barriers to the large, untapped market of small and medium enterprises (SMEs).

Trend towards having production closer to the end consumer driving the importance of standardisation & consistency across global brands.

Simplification critical to SMEs, but also important for large Global Manufacturers
• Industry 4.0, linking the real-life factory with a virtual one, will play an increasingly important role in global manufacturing.

• Vision and sensing devices, coupled with analytics platforms, will pave the way for new industry business models.

• Machine Learning will drive many robotics developments over the coming years.

Digitalisation

Big Data allowing People to make better Decisions about Factory Operations
Collaboration

• Collaborative robots are shifting the traditional limits of “what can be automated?”

• Collaborative robots increase manufacturing flexibility as ‘low volume high mix’ becomes the new normal

• Collaboration is also about productivity with increased human/robot interaction
Self-optimising Production

Robots doing the same task connect across all global locations so performance can be compared and improved at the click of a button.

Self-programming Robots

Robots automatically download what they need to get started from a cloud library and then start to optimise through “self-learning”.

Connected & Collaborative Robots enable SMART Manufacturing for both SMEs & Global Enterprises
Thank you!

Contact:
Gudrun Litzenberger
International Federation of Robotics IFR
c/o VDMA Robotics+Automation
60528 Frankfurt Main, Germany
Email: gl@ifr.org
Phone: +49 69 6603 1502
Internet: https://ifr.org/