Welcome to the
IFR Press Conference
18th September 2019
Shanghai
Agenda

Welcome

Presentation of the Speakers

World Robotics 2019 Industrial Robots

World Robotics 2019 China Market Data

World Robotics 2019 Service Robots

Questions
Speakers on the Panel

Steven Wyatt
IFR Vice President
Group Vice President and Head of Marketing & Sales Robotics
ABB, Switzerland

Susanne Bieller
General Secretary
International Federation of Robotics, Germany

Christopher Müller
Director
Statistical Department
International Federation of Robotics, Germany

Daokui Qu
CRIA President
President
SIASUN, China

Xiaogang Song
CRIA Executive Vice President and Secretary General
Member of the International Federation of Robotics Executive Board
International Federation of Robotics

• Voice of the global robotics industry

• Annual global robotics turnover almost $50 billion (robot systems including software & peripherals)

• Almost 60 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 source for world-wide data on use of robotics – IFR Statistical Department
2018 : Another Record Year - First Time over 400,000 Units

2018 : 422,000 Units, +6%

2019 : 421,000 Units, +/-0%

2022 : 584,000 Units, +12% on average per Year
Positive medium-Term Growth Expectations

Annual installations of industrial robots 2013-2018 and 2019*-2022*

*forecast

Source: World Robotics 2019
Asia Region the Growth Engine

Annual installations of industrial robots 2017-2018 and 2019*-2022*

<table>
<thead>
<tr>
<th>Year</th>
<th>Asia/Australia</th>
<th>Europe</th>
<th>America</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>280</td>
<td>67</td>
<td>46</td>
</tr>
<tr>
<td>2018</td>
<td>283</td>
<td>76</td>
<td>55</td>
</tr>
<tr>
<td>2019*</td>
<td>285</td>
<td>74</td>
<td>54</td>
</tr>
<tr>
<td>2020*</td>
<td>320</td>
<td>79</td>
<td>59</td>
</tr>
<tr>
<td>2021*</td>
<td>368</td>
<td>83</td>
<td>64</td>
</tr>
<tr>
<td>2022*</td>
<td>420</td>
<td>87</td>
<td>69</td>
</tr>
</tbody>
</table>

*forecast

Source: World Robotics 2019
China remains the main End User of Industrial Robots

Annual installations of industrial robots
15 largest markets 2018

- China: 154.0
- Japan: 55.2
- United States: 40.4
- Rep. of Korea: 37.8
- Germany: 26.7
- Chinese Taipei: 12.1
- Italy: 9.8
- France: 5.8
- Mexico: 5.7
- Spain: 5.3
- India: 4.8
- Singapore: 4.3
- Canada: 3.6
- Thailand: 3.3
- Czech Republic: 2.7

Source: World Robotics 2019
Key Industries: Automotive, Electronics & Metals

Annual installations of industrial robots at year-end worldwide by industries 2016-2018

- Automotive: +2%
- Electrical/electronics: -14%
- Metal and machinery: -1%
- Plastic and chemical products: -6%
- Food: +32%
- All others: +48%
- Unspecified: +44%

Source: World Robotics 2019
Collaborative Industrial Robots still a Niche

Collaborative and traditional industrial robots

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Industrial Robots</th>
<th>Collaborative Robots</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>409</td>
<td>14</td>
</tr>
<tr>
<td>2017</td>
<td>389</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: International Federation of Robotics
Technological Developments expanding Robot Adoption

Today
- More intelligent components, e.g. Smart Grippers
- Greater Connectivity, e.g. “Plug & Play” Interfaces and Cloud Computing
- Easier to Use, e.g. “Programming by Demonstration”

Tomorrow
- “Machine learning” enables Robots ….
  ▪ to learn by trial-and-error or by video demonstration.
  ▪ to self-optimise.
  ▪ to communicate with other machines to improve entire processes.
- New business models, e.g. Robots as a Service (RaaS)
2022: 4 Million Industrial Robots in the World’s Factories

Operational stock of industrial robots 2013-2018 and 2019*-2022*

<table>
<thead>
<tr>
<th>Year</th>
<th>Units (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>1,332</td>
</tr>
<tr>
<td>2014</td>
<td>1,472</td>
</tr>
<tr>
<td>2015</td>
<td>1,632</td>
</tr>
<tr>
<td>2016</td>
<td>1,838</td>
</tr>
<tr>
<td>2017</td>
<td>2,125</td>
</tr>
<tr>
<td>2018</td>
<td>2,440</td>
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<tr>
<td>2019*</td>
<td>2,747</td>
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<tr>
<td>2020*</td>
<td>3,152</td>
</tr>
<tr>
<td>2021*</td>
<td>3,554</td>
</tr>
<tr>
<td>2022*</td>
<td>3,971</td>
</tr>
</tbody>
</table>

+13% p.a.

Source: World Robotics 2019
Highest Robot Density in Singapore - lowest Average in Asia

Robot density in the manufacturing industry 2018

Source: World Robotics 2019
Short-Term Volatility, but the Future for Robots is very bright!

Today
- Automotive Industry Transition from ICE to EV
- Declining Smartphone Sales
- Political Headwinds

Tomorrow
- Increased Manufacturing Flexibility : Batch Size = 1
- Demographic “Time Bomb”
- Emerging and rapidly-growing Market Segments
- Business and Technological Innovation, e.g. for SME Category
China: slightly declining after 8 Years of strong Growth
Robot Density in China surpassing Global Average

Number of installed industrial robots per 10,000 employees in the manufacturing industry 2010 - 2018 in China

Source: International Federation of Robotics
Main Industries in China: Electronics, Automotive & Metals

Annual installations of industrial robots at year-end in China by industries 2016-2018

Electrical/electronics
Automotive
Metal and machinery
Rubber and plastics
Food
Pharma/cosmetics
All others/unspecified

Source: World Robotics 2019
Chinese Suppliers gaining Market Share

Estimated annual supply of industrial robots at year-end in China by industries 2017 and 2018

- Electrical/electronics
- Automotive
- Metal and machinery
- Rubber and plastics
- Food
- Pharma/cosmetics
- All others/unspecified

Chinese Suppliers 2018
Foreign Suppliers 2018
Chinese Suppliers 2017
Foreign Suppliers 2017

Source: World Robotics 2019
Main Applications in China: Handling and Welding

Annual installations of industrial robots in China by applications 2016-2018

- Handling
- Welding
- Assembling
- Dispensing
- Cleanroom
- Processing
- All others/unspecified

Source: World Robotics 2019
Chinese Suppliers increased their share in Handling Applications

Annual installations of industrial robots in China - 2017 and 2018

Source: World Robotics 2019
Operational Stock in China: increased by 30%

Estimated operational stock of industrial robots at year-end in China

Source: World Robotics 2019
Domestic Service Robots

Value of Sales:
2018: US$ 3.7bn, +15%
2019: US$ 4.6bn, +27%
2022: US$ 11.5bn, +35% (CAGR)

Unit Sales:
2018: 16.3 million units, +59%
2019: 22.1 million units, +35%
2022: 61.1 million units, +40% (CAGR)
Vacuuming and Floor Cleaning Robots are established Personal/Domestic Service Robots

Service robots for personal/domestic use. Estimated value 2017** and 2018, forecast 2019* and 2020*-2022*
2018: 12 Million Units (+90%) - further Growth expected
Professional Service Robots support our Workers

**Value of sales**

2018: US$ 9.2 bn, +32%

2019: US$ 12.6 bn, +37%

2022: US$ 38 bn, +45% (CAGR)

**Unit sales:**

2018: 271,000 units, +61%

2019: 361,000 units, +33%

2022: 1,000,000 units, +41% (CAGR)
Professional Service Robots: Main Value Growth Drivers are Logistic Systems

Service robots for professional use. Main Applications
Estimated values 2017** and 2018, forecast 2019* and 2020*-2022*

![Bar chart showing the estimated and forecasted values of different applications of service robots from 2017 to 2022.](chart.png)

*Source: World Robotics 2019*
AGVs in Factories, Warehouses, Logistic Centers, Hospitals …

111,000 units deployed in 2018, 60% more than in 2017

- 7,700 units in manufacturing
- 103,000 units in warehouses, logistic centers, hospitals …

2019:
176,000 units (+58%)

2022:
712,000 units (+59% on average each year)
Medical Robots – most valuable service robots: US$ 2.8 billion in 2018

- 2018: 5,100 units (+50%)
- 2019: 7,200 units (+39%)
- 2022: 19,700 units (+40% CAGR)

Field robotics – the future of plowing

- 5,800 milking robots in 2018 (+8%)
- Agricultural robots expected to grow strongly
  - 2018: 480 units (+30%)
  - 2019: 720 units (+50%)
  - 2022: 2400 units (+50% CAGR)
Logistic Systems are also the Growth Driver in Units
Public Relations Robots on the Rise

Service robots for professional use. All other applications
Unit sales 2017** and 2018, forecast 2019* and 2020* - 2022*

- Public relations: 15, 19 (11, 21)
- Professional cleaning: 10, 12 (8, 15)
- Exoskeletons: 9, 13 (7, 11)
- Field robotics: 8, 10 (7, 9)

*forecast, **revised

Source: World Robotics 2019
The blurring Lines between Industrial and Service Robots

Depending on its application, the same unit can be a service robot or an industrial robot. Usage concepts change – new applications emerge.

Reimagine business processes to make optimal use of collaborative robots. AI and machine learning technologies enable robots to sense and respond to their environment.

Robots are increasingly supporting humans both at work and in their private lives.
Thank you!

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