China expected to overtake Japan’s number one position in Industrial Robot Market

Author

Rani Ratna
Global Demand for Industrial Robots will continue to Grow

Demand for robots is increasing across the countries from various industries. Year 2013 witnessed a record sale of robots of around USD 9 billion (179,000 robots), 12% increase from the previous year as per the report from IFR (International Federation of Robotics). Also, based on early orders they claim that year 2014 is going to create another record in Robots sale as more than 200,000 robots would have already been installed in 2014 by now. It is expected that the robot sales with grow at a CAGR of 15% from 2014-2017.

Increasing need for efficiency, mass production, standardization, better quality products, focus on reduced wastage are some of the driving factors for the industries to automate their plan in order to remain competitive with the world class Manufacturers. Robot sales had taken a dip in 2009 when many companies halted their production operation. Soon after 2009, robot sale has made record sale year on year.

Source: IFR

China, which is the biggest exporter for manufacturing product for the world and which is preferred as low cost country sourcing by all the Purchasing managers was the biggest importer of Industrial robots in 2013 and this trend is expected to continue in 2014 also. Automobile sector is the driving industry for robot market and China is the biggest car manufacturer of the world. 60% of robot demand in China comes from automobile sector. China is facing the competition from other emerging economies in terms of labor rate. Since 2000, the labor rate has doubled in China. The other problem China is facing is the aging population and it is expected that China will reach the Lewis turning point between 2020 - 2015. Hence demand for robot in China is expected to grow at the rate of 25 % in the coming decades.
China bought one out of every five robots sold in 2013 and surpassed Japan for the first time in number of robots bought in 2013. As per IFR, in 2013 Japan bought around 26,015 robots and became the second biggest buyer of robots followed by USA, which bought 23,679 robots in the same year. But if we see number of robots in operation, Japan is still by far ahead of all the countries. Japan is the most automated country in the world with more than 300,000 robots in operation.

% Growth of Global Output and Robots per 10,000 Employees in 2011

Source: IFR

Robot density is quiet high in developed countries but the emerging market which accounts for 50% of world production has very low robot density, which shows that demand for robots will grow in the emerging countries. In 2013, world robot density was 62 units (Number of robots per 10,000 employees). Europe and America’s robot density was above the world average, which was 82 and 73 respectively while Asia’s robot density was only 51. If we exclude Japan’s number of robots then Asia’s robot density will be very low. The numbers in Asia has definitely improved in the recent years due to aggressive buying of Robot by China. China’s robot density has increased from 51 to 281 from 2006-2013.

Source: IFR

Estimated worldwide annual supply of Industrial robots at year-end by main industries 2010 - 2013

Source: IFR
Automotive sector is the biggest end user of industrial robots. Demand for robots is also increasing in Semiconductor industry.

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Import pattern of Top 3 Robot Importer Countries

### China Robot Imprt 2013
- **Japan**: 57.9%
- **Germany**: 16%
- **Sweden**: 6%
- **Korea**: 5%
- **China-Reimport**: 3%
- **Taipei, Chinese**: 3%
- **USA**: 3%
- **Austria**: 2%
- **ROW**: 5%

**Japan export growth to the world < China Import growth from Japan**

### Germany Robot Import 2013
- **Japan**: 35.31%
- **Sweden**: 26.9%
- **Austria**: 8%
- **France**: 8%
- **Switzerland**: 8%
- **China**: 7%
- **Italy**: 8%
- **ROW**: 27%

**Germany export growth to the world > China Import growth from Germany**

### US Robot Import 2013
- **Germany**: 24%
- **Japan**: 13%
- **Canada**: 13%
- **France**: 9%
- **Italy**: 9%
- **China**: 6%
- **Korea**: 4%
- **Sweden**: 4%

**Germany export growth to the world > US Import growth from Japan**

### Japan
- Share of Japan in China’s Import: 57.9%
- Annual Growth of Japan’s exports: 24%
- Share in World export: 32.32%

**Japan export growth to the world < China Import growth from Japan**

### Germany
- Share of Germany in China’s Import: 15.77%
- Annual Growth of Germany’s exports: 21%
- Share in World export: 19.2%

**Germany export growth to the world < Japan Import growth from Germany**

### Sweden
- Share of Sweden in Germany’s Import: 26.9%
- Annual Growth of Sweden’s exports: 9%
- Share in World export: 3.9%

**Sweden export growth to the world < Germany Import growth from Sweden**

### Japan
- Share of Japan in US Import: 23.74%
- Annual Growth of Germany’s exports: 24%
- Share in World export: 32.32%

**Germany export growth to the world > US Import growth from Japan**

### Japan
- Share of Japan in US Import: 21.55%
- Annual Growth of Japan’s exports: 24%
- Share in World export: 32.3%

**Japan export growth to the world < USA Import growth from Japan**

Source: Trademap.org
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Trade indicators indicate that Japan is the preferred source of buying robots across the end user countries. But after 2011, we can see that the Export of Japanese Industrial robots is reducing. Customer still prefers Japanese robots for their plant because of their superior performance.

Source: Trademap.org

Although the first ever industrial robot was designed and produced in America but in current scenario most of the industrial robot manufacturing is happening in European and Asian countries, majorly in Germany and Japan. In 2013, most of the countries have imported robots from European and Asian countries, mostly from Germany and Japan. Currently, Japan is the most preferred country for buying the robots. In 2013, Japan alone constituted 32 percent of world industrial robot export. And in these five years (2009-2013) Japan alone accounted for around 34 percent of world industrial robot export. Robot supplier market is highly consolidated with top 15 of them accounting for more than 60% of market share. Japanese robot manufacturer dominates the robots market.

Source: statista.com

The above companies mainly focus on high end customers with big size industrial robots but there are few small companies also which has entered into robots manufacturing and are catering to small and medium scale industries. Companies like Rethink Robotics, Universal Robots are making millions with their low cost entry robots. There is also a shift in the type of robots manufacturing. Now a day there is
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More demand for multitask robots rather than single task robots and dual arm robots compared to conventional single arm robots.

**Low bargaining power of Buyer**

End users prefer to buy the industrial robots directly from the manufacturers or from the Integrators due to its complexity in specification and specialized application. Application part of the robots is given the highest importance and the robots are manufactured on Make to order basis i.e. once the application is understood the robot design part starts. Both the user and the manufacturer/Integrator together work on the design and manufacturing of the Industrial robots in most of the cases. The costs of the robots are determined based on the user’s performance specification requirement. Depending upon the performance requirement the kind of hardware and software is used which contributes to the total cost of the robots. Every company has their own kind of requirement and the robots are customized accordingly. The more complex the operation is robots become costlier.

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<th>Buyer Power - Low</th>
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<tr>
<td>Number of Buyers</td>
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<td>Switching costs to other supplier</td>
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<td>Buyers’ knowledge of suppliers/industry (cost structures)</td>
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<td>Contribution to buyer’s efficiency</td>
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<th>Rivalry among Existing Suppliers – Medium</th>
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<tr>
<td>No. of suppliers and level of competition</td>
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<tr>
<td>Industry growth for this service</td>
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<td>Service and cost differentiation among existing suppliers</td>
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<td>Fixed costs for the service</td>
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<th>Threat of New Entrants – Medium</th>
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<td>Product differentiation creating price premium</td>
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<td>Economies of scale, experience and technical expertise</td>
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<td>Capital requirement</td>
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<tr>
<td>Service differentiation creating price premiums</td>
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<th>Threat of Substitutes – Low</th>
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<tr>
<td>Availability of substitute product/service</td>
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<td>Switching cost to substitute product/service</td>
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<th>Supplier Power – Medium/Low</th>
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<tr>
<td>Number of suppliers</td>
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<td>Contribution to output of industry process</td>
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<td>Supplier’s switching cost to other suppliers</td>
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<td>Supplier’s threat of forward integration</td>
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The bargaining power of buyer is quite low due to specialized application requirement. As per IBIS World, there has been an increase of 3.5% in the average rate of Industrial robots in the last three years and the robot’s price is expected to increase in the coming year. As per IBIS World, the average rate of Industrial robots was USD 58,354 per Robot in 2013.

Robots efficiency directly impacts the productivity of the plant, hence customer give preference to better quality, better design and good maintenance support provider. China is always preferred by the customer for standard electronic product but for specialized application or customized electronic products, customer rates Japan and Germany higher than China. Hence we see a lot of buying of industrial robots from Germany and Japan. Also, China is not going to be the low cost option in future as the economist predicts that by 2025 China will reach the Lewis turning point. It is expected that China’s labor rate will increase at the rate of 10% in the coming years. In terms of availability of skilled engineers and robust infrastructure, developed countries like Germany, Japan and USA is given higher ranks compared to other emerging economies.

![Comparison of Sourcing Capabilities of Selected Economies (2012)](chart)

Source: The Beijing Axis Analysis, World Bank, World Intellectual Property Organization

In the above chart the technology index is taken from WIPO’s (World Intellectual Property Organization) Global innovation Index. Infrastructure index is taken from World Bank’s Logistics Performance Index. In technology index the countries are rated on the scale of 1 to 100 while for infrastructure index the countries are rated over the scale of 1 to 5. From the chart, we can see that the countries like India, Vietnam and Brazil etc. are yet to cover a long distance in order to be considered as a preferred sourcing option for technical products. China lags behind Japan, Germany and USA in terms of technological and Infrastructure capabilities.

But reliability on Japan’s technology has been questioned by many experts across the world after the 2011 Fukushima Nuclear Accident. At that time, Japan used US made robot to enter the damaged reactor building. Recently telecom giant of Japan, Softbank bought robots from French company Aldebaran. Trade indicator also indicates that Japan’s share in the Industrial robot market is reducing. Instead of focusing on Industrial robots, Japanese manufacturers see future in Health care robots to cater to the need of aging population. Hence, there focus is shifting from industrial robots to health and nursing care robots.
Currently China buys most of its Robots from Japan and Germany. The market share of Chinese robot manufacturer is not more than 5% in the local robot demand. But, Chinese government is encouraging the manufacturers to buy robots from Domestic companies. Chinese government has succeeded in attracting the foreign established robot manufacturers like ABB, Kuka, Fanuc and Yasakawa to set up a joint venture with Chinese players and manufacture the industrial robots in China. Meanwhile, Chinese government is also supporting the local Chinese manufacturer to increase their market share in Robot market. For the first time in the history of 60 years, Chinese Government focused on Robotics as their key agenda for development plan in China’s 12th Five-Year plan (2011-2015). As per China’s news agency Xinhua, China is developing a “Robotics Technology Roadmap” for gaining the market share in worldwide robot industry. Around 30 industrial parks dedicated to robotics have been created in China where the robot manufacturers get various land and tax perks. ABB has set up a production, Research & Development Centre in China, while Yasakawa is planning to set up another plant in China. Five Chinese manufacturers have signed an agreement for investment on R&D on Robotics with the Chinese Academy of Science while other robot manufacturers in China are collaborating with the research institutions to develop their robotic base. Chinese government is also aiming to reduce its dependency on foreign countries for buying robots. In 2013 itself China bought about 37,000 robots, out of which 75% were bought from other countries. Chinese government is aiming to fulfill its domestic demand as well as they are planning to create 3-5 Robots manufacturer which will dominate the upcoming robot market. With so many initiatives being taken in China to improve the robotics market, it is expected that China might become a preferred sourcing option for buying robots in the coming years.

**Conclusion**

World robot market is expected to grow at a CAGR of 15% in the coming years and China is going to be the fastest market for Industrial robot. Currently Japan has the highest number of robots in Operation but China became the biggest buyer of robot in 2013. As China is facing labor inflation it is doing aggressive buying of robots to maintain its position as the manufacturing hub for the world. Currently Robot manufacturing is dominated by the Japanese and European countries. But Chinese government is pushing various reforms to attract the robot manufacturers to put their plant in China. At the same time, Chinese government is encouraging the companies to buy robots from domestic manufacturers. They also have put robotics technology development as an agenda in their 5 year plan. Big robot manufacturers like ABB, Kuka, Fanuc and Yasakawa has already set up their plant in China as they see China as the biggest market for robots in coming years, while the local manufacturers are also collaborating with various research institutes for R&D on robotics technology. It is expected that the robotic demand in China itself with grow at the rate of 25% in next ten years. Chinese government is aiming to reduce its dependency on overseas countries for robots buying at the same time they are encouraging the domestic manufacturer to dominate the world robot market At the same time, Japanese manufacturers are focusing on health care robots rather industrial robots. With all these positive vibes it is expected that China might surpass the Japanese Robot manufacturer in the coming years.

In terms of technological development in robots it is expected that the future robots will have enhanced features on safety, mobility, vision, artificial intelligence and flexibility.
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