Robots are coming!

At the end of 2010 about **1.2 million industrial robots** will do their job in the factories worldwide!

After the peak in 2005, the *world market was down by 11% in 2006*, at 112,203 newly supplied industrial robots. Nevertheless, this was the *second highest result ever recorded*. The developments were quite dissimilar in the three large industrial regions of Europe, America and Asia. After huge investments in the previous year, robot sales in Asia and Americas plummeted in 2006. Europe recovered after a weak year in 2005.

In fact, the automotive industry and the total electrical/electronics industry – which in 2005 were still the main engines of the rapid growth that had been experienced - reduced their robot investments by 17% and 34% respectively. All other industries, however, increased their robot purchases by 25%. Robot sales to the metal products industry, the chemical industry and the food industry increased substantially.

In order to survive in the global marketplace, every producer of goods is forced to increase its productivity and to save costs. Many simple manual operations are no longer cost-effective in high-wage countries, therefore some production has been shifted to low-wage countries. However, even then, ever more demands in terms of product quality can only be satisfied by automation. Robot investment raises the possibility of keeping production sites in high wage countries and of *improving product quality*. Robots often replace jobs which are tedious and even dangerous. Thus robot investment can save qualified jobs and help safeguard workers’ health. The introduction of robots brings with it a requirement for *further tasks such as motion control of robots, programming of machines etc.* Robot suppliers are developing new applications - specialised for small and medium sized companies – which permit *interactive co-operation between man and machine*. Sensor and vision technology will become ever more advanced and will be applied more often within robot systems. Robot applications for the *photovoltaics* industry, for *construction*, for *logistics operations* and in *micro-assembly* are expanding.

In 2007, *robot investments will increase in all regions* as a result of automotive industry investment and increasing investments by other industries such as the electrical/electronics industry, chemical industry, metal industry and food/beverage industry. Particularly in countries like China, India and Russia, where automotive industry investment has hitherto been of paramount importance, robot supplies to other industries will start to grow. IFR Statistical Department estimates a worldwide increase of about **10% of the robot supplies in 2007**.
Between 2008 and 2009, moderate growth can be expected worldwide. Investments by the automotive industry worldwide will only grow modestly or even stagnate. In 2010, a cyclical decrease can be expected. The consolidation of production capacities, concentration on special production hubs and relocations to low cost countries will diminish the yearly demand for new robots for the automotive industry. Refurbished robots will gain importance, although up to now their share of the total supply of new robots is estimated to be lower than 10%. All other industries still have high potential for robot investment. Efforts of robot suppliers to offer robotics solutions for industries other than automotive have already resulted in increasing demand. Between 2008 and 2010 these industries will gain more and more importance, especially in terms of units.

The Americas: a pause for rest

After the robot boom in 2005, sales in the Americas fell by 18% in 2006, to 17,900 units. This fall was particularly in evidence at the large production sites of the automotive industry in the USA and Canada. Conversely, robot sales in Mexico and South America increased. In the non-automotive sector, the electrical/electronics industry in particular boosted its robot investments. Furthermore, robot sales to the chemical industry, including the rubber and plastic products industry, increased remarkably. However, such increases were not sufficient to offset the sharp cyclical decline in sales to the automotive sector.

Total supplies in the United States fell by 16% to 14,800 units and in Canada by 44% to 1,700 units, down from 3,100 in 2005. An increasing demand of industrial robots has been registered in Mexico and Brazil.

The supply of robots for cleanroom applications doubled in 2006 compared to 2005. Assembly slightly increased. All other applications declined sharply. All handling applications were down by 29%. Only handling operations for plastic moulding increased by 11%.

The automotive industry reduced their robot purchases by 42% in 2006. After the massive investment in 2005, particularly on the part of Japanese producers, this development is hardly surprising, and should be interpreted as the market 'pausing to catch its breath'. The electrical/electronics industry (most prominently the semiconductor industry) doubled its robot installations in mainly in the United States. Demand from the rubber and plastics industry also rose further. There was, however, a fall in sales in the metallurgical and engineering industries, as well as in the food and beverage sector.

The operational stock of industrial robots increased by 8% to almost 155,000 units. That is about 16% of the total world stock. The share of the stock of Japan is about 37%. It is interesting to note that the share of the American stock was 16% of Japan's in 1997 and 44% in 2006. So Americas is catching up!

Forecasts 2007 – 2010

The North American automobile market is highly competitive: although American producers have already lost ground, there will be no let up in investments by Asian and European producers. Furthermore, the 'Big Three' (GM, Ford and Chrysler), who have already reduced their capacity, will need to invest in modernising their production sites to remain competitive. In 2007, increased demand for industrial robots has already been registered in the first half of 2007, North American orders rose by 39% according to the RIA (Robotics Industry Association), USA. The competition in the biggest and most saturated market is set to
continue and will stimulate robot investment. Installations in non-automotive industries will increase as well.

Significant increases in the investments made by the automotive industry in Mexico are anticipated in the next few years. In addition to the motor vehicle suppliers already established there, Indian and Chinese motor vehicle suppliers are considering investments in production capacities in Mexico.

All motor vehicle suppliers in Brazil intend to increase investments in the next few years. Besides the preponderant automotive industry, the chemical industry and the metal products industry are also important users of robots in Brazil.

Between 2008 and 2010, sales are projected to increase by a yearly average of about 4%.

The total operational stock of industrial robots is estimated to increase from 155,000 units at the end of 2006 to about 209,000 units at the end of 2010 in Americas. In 2010, about 18% of all installed industrial robots will operate in the Americas.

Asia: weak demand in Japan; boom in China

In 2006, more than 61,700 robots were supplied to Asian countries (including Australia), about 19% less than in 2005. Nevertheless, this is the second highest yearly supply of industrial robots in this region since 1990.

In Japan, the largest robot market in the world, sales were down 26% on the previous year, at 37,400 units. As expected, the two most important customers, the automotive and the electronics industries, sharply reduced their purchases after the high investment in 2005. On the other hand, demand from the rubber and synthetics industry, the engineering sector and the metal products industry rose at an above average rate.

Robot supplies fell by 17% in the Republic of Korea (the second largest Asian robot market) in 2006, to 10,800 units. A slump in orders from the electronics industry was partly offset by stronger investment from the automotive industry.

In China (now the third largest Asian robot market), robot investment is still booming, with 5,800 units installed in 2006, an increase of 29% on the previous year. Here, alongside the automotive sector, demand is increasing in the electronics and rubber and synthetics industries.

In India, robot installations almost doubled, reaching 850 units. Although the numbers involved here are still quite small, the high growth rates in the past two years are indicative of the dynamism of this market.

Total supplies in all other Asian markets, including, Indonesia, Malaysia, the Philippines, Singapore, Taiwan (Province of China), Thailand and Vietnam, decreased by 7%, Australia decreased by 19%.

Handling operations increased by 2%. Within this category handling operations for packaging, picking and placing, for stamping/forging/bending, and material handling decreased. All other handling operations increased remarkably. Processing remained stable. While all other applications plummeted by 28% on average.
The electrical/electronics industry in Asia, which invested very heavily in 2005, cut robot purchases by half. Supplies to the automotive industry also decreased slightly. Supplies to all other industries – in particular the metal products and machinery industry, the chemical industry, the communication industry and the food industry – surged. All industries except automotive and electrical/electronics increased by 24%.

The operational stock of industrial robots slightly decreased in 2006. The reason was the continued decrease of the operational stock in Japan. This has been the result of two factors:

- decreasing yearly supplies over several years due to economic reasons and
- revision of the data in 2001

Forecasts 2007 – 2010

In 2007 sales are projected to increase by 7% in Asia/Australia. The optimistic view for 2007 is partly a result of encouraging robot supplies to the ‘general industry’ – all industries except the automotive. After the decrease in 2006, demand from the electrical/electronics industry also should be higher in 2007. In the period of 2008-2010 a robust average growth rate of about 4% is estimated.

In Japan sales will increase from 37,400 to about 39,900 units in 2007. In 2007, demand from the automotive industry and the electrical/electronics industry will be higher than in 2006. An increase in installations in new application areas will ensure that robust growth is sustained. In the period between 2008 and 2010, moderate yearly average growth of between 2% and 3% is possible.

Restrained investments by the automotive industry and the electrical/electronics industry will result in a stagnation of robot sales in 2007 in the Republic of Korea. In the period between 2008 and 2010 an average yearly increase of between 3% and 4% will be realised.

In China, robot sales will grow at a lower rate in the period 2007 – 2010, because of the existing overcapacities and restrictions imposed by the government. India will be the fastest growing market in Asia. In Taiwan (Province of China), Thailand, Indonesia, Malaysia and other South/East Asian countries, robot sales will continue to surge ahead during the forecast period.

The total operational stock of industrial robots is estimated to increase from 479,000 units at the end of 2006 to about 580,000 units at the end of 2010 in Asia. In 2010, almost half of all installed industrial robots will operate in Asia.

Europe: growth against the worldwide trend

Sales of industrial robots in Europe were up by 11% to about 31,500 units. This was the result of surging investments in general industry – all industries except the automotive. The automotive industry again reduced their purchases in Europe.

In Germany – the largest market for industrial robots in Europe – supplies increased by 13% to about 11,400 units. This was to a large extent due to significantly increased demand of the metal products industry, the rubber and plastics industry and the food and beverages industry. Here as well, supply to the automotive industry slightly decreased. It seems that the peak of yearly robot investment within the automotive industry was reached in 2004: Germany as a production site for motor vehicles serves an almost saturated market in Western Europe.
Italy – the second largest market, recovered by 15% to almost 6,300 units. The rubber and plastics industry and the fabricated metal products industry invested very heavily in industrial robots. Sales to all other industries, including the automotive industry, decreased.

The yearly supply of industrial robots in France has been fairly stable over the last five years, at around 3,000 units. The reason for this similar figure has been the largely stagnant investment climate in the automotive industry and the machinery industry, which has been somewhat compensated by a significant increase of robot supplies to the metal industry and a remarkable increase of robot supplies to the chemical and food industries.

Sales to Spain, the United Kingdom and Sweden were down. Of the Eastern European countries, only the Czech Republic and Poland saw a significant increase in robot supplies.

Handling operations increased by 7% - thereof packaging/picking/placing, plastic moulding and measurement/testing/inspection had substantial growth rates. Material handling slightly increased while all other handling applications were down compared to 2005. Welding robots were up by 19% and robots for processing increased by 4%. All other applications decreased.

In 2006, the chemical industry – mainly the manufacturers of rubber and plastic products – became the most important user of industrial robots in Europe. Also the metal products industry invested substantially in robots. The metal products industry is forced to automate their production in order to be able to meet the strong demand of their products as well as to compete against low cost competition. The basic metal industry, the glass industry and the food and beverage industry continued to increase their robot installations. In 2006, the “General Industry” - all industries except automotive - increased their robot sales by 25% compared to the previous year while the motor vehicle suppliers and the automotive parts suppliers again decreased their robot investment by 14%.

The operational stock of industrial robots increased by 6% to almost 316,000 units. That is about one third of the total world stock.

Forecast 2007 – 2010

In 2007, the robot market in Europe is set to rebound by around 11%. Return on investment in the automotive industry, as well as rising installations in the non-automotive sector will result in more robot sales as well as better returns. Between 2008 and 2010 a yearly growth rate of about 4% can be expected.

Germany, no significant investments of the motor vehicle industry in expanding capacities can be expected in the foreseeable future: robot demand from motor vehicle suppliers in Germany will primarily be a matter of renovation, restructuring and replacement. This itself should be sufficient to see an increase in robot sales to motor vehicle suppliers in 2007 i.e. because of necessary restructuring associated with new models, as well as through replacements. Furthermore, automotive parts suppliers facing price pressures and rising quality requirements are forced to automate and will doubtless invest in robots. Finally, the General Industry – all industries except the automotive – will gain in importance furthermore. In 2007, the robot supplies are estimated to increase by 11% in Germany. Similar growth rates are estimated for Italy and France in 2007.

Central and Eastern Europe are benefiting from relocations of production sites of the motor vehicle industry in low-wage countries. Turkey is becoming an attractive production site for the international automotive industry. Exports of motor vehicles and automotive parts are
increasing rapidly: more motor vehicles are now assembled in Turkey than in the United Kingdom or Sweden.

The fast growing economy of the Russian Federation is stimulating investments by the automotive industry, the metal and machinery industry, the food industry, the chemical industry and, given the country’s great natural wealth, the extractive industries.

The total operational stock of industrial robots is estimated to increase from 316,000 units at the end of 2006 to about 380,000 units at the end of 2010 in Europe. In 2010, about one third of all installed industrial robots will operate in Europe.

**Service Robots**

Up to the end of 2006 about 40,000 service robots for professional use were installed worldwide. With more than 9,000 units the service robots in defense, rescue and security applications, accounted for the highest share of the total number of service robots for professional use installed up to the end of 2006. The unmanned aerial and ground-based vehicles for military use are the most established professional robots. Thereafter follow milking robots, underwater systems, pool cleaning robots, demolition systems for the construction industry, robot assisted surgery and mobile platform for general use.

Turning to the projections for the period 2007-2010, the stock of service robots for professional use is forecast to increase by some 35,500 units. Application areas with strong growth are military applications, field robots, cleaning robots, medical robots and mobile robot platforms for multiple use.

About 3.5 million service robots for personnel/domestic use were sold up to 2006. So far, service robots for personal and domestic use are mainly in the areas of domestic (household) robots, which include vacuum cleaning and lawn-mowing robots, and entertainment and leisure robots, including toy robots, hobby systems and education and training robots.

Robots for handicap assistance have not yet taken off as could be expected given their potential in regard to both the supposable need and the existing technological level of the equipment. In a longer perspective, say in the next 10 years, and taking into account demographic shifts and advances in technology, assistive robots for disabled and handicapped persons are certain to be a key area for service robots. Important research institutions are focussing on developing prototypes of this kind of robot.

It is projected that sales of all types of domestic robots (vacuum cleaning, lawn-mowing, window cleaning and other types) in the period 2007-2010 could reach some 1.34 million units. The market for entertainment and leisure robots, which includes toy robots, is forecast at about 2.2 million units, most of which, of course, are very low cost.

The share of the value of domestic/personal robots was only 20% of that of the total value of service Robots at the end of 2006.

Robots are coming! Robots are everywhere: Industrial robots - a key to automation – are establishing in all industries. Service robots already entered our home. Service Robots are establishing in many non-industrial branches.