

Industrial Robots

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What would you say to a product that could bring the improvement of productivity, resulting in economic development and increase of employment, prevention of industrial accidents due to unfavorable working conditions, improvement of labor welfare, and humanization of working life? Well, robotics promises to fulfill these and other objectives that are common worldwide. These are the reasons that international cooperation in the field of industrial robots (IRs) is so important, especially now as the field nears its take-off.

The steam engine, spinning machine power loom and other trademarks of the 18th century industrial revolution brought about substantial industrial development, and created many employment opportunities. The age of automation which has been going on since 1950 did the same and likewise, the new age of automation, the so-called flexible automation (FA) age which began around 1980, is anticipated to help revitalize industry; great expectations are being placed on the role of industrial robots in this new age.

When Britain experienced the first industrial revolution back in the late 18th century, spinning machines and power looms were destroyed by the Luddites, a radical labor organization that opposed such inventions for fear of unemployment. But in reality, what was the result of such inventions? The number of British workers in the cotton spinning industry increased 3.5-fold from about 100,000 in 1770 to 350,000 in 1800, a result of brisk demand for textile goods, thanks in large part to lower prices and improved quality. When conveyers and other mass-production systems were introduced to turn-of-the-century America, employment of autoworkers increased from 37,000 persons in 1910 to some 200,000 in 1920. In this 10-year period, the U.S. auto industry raised its productivity by an annual rate of 8.5%, cut working hours by 56% and reduced the average sales price of a car by 62%. Demand shot up 10-fold.

As stated in the decision on "International Research and Cooperation in the Field of Advanced Robots" made at the

1983 Summit meeting of seven industrialized nations, industrial robots are a major area for international industrial and research cooperation.

Worldwide robots

The number of industrial robots in operation throughout the non-communist world and an estimate of future robot production are as follows:

Fig. 1 shows robot utilization throughout the world, according to the RIA (Robot Institute of America) survey conducted in 1983 with the cooperation of robotics associations or representatives of other countries. A similar survey carried out in 1981 showed that about 22,000 units were in operation at the end of 1980. The latest review found that the number of industrial robots in operation in the Western block increased some 2.6-fold in the two-year period. In particular, France, West Germany, Italy and Britain showed a phenomenal increase. The U.S. growth was smaller than anticipated (1.6-fold), and the growth for Japan was 2.2-fold.

The U.S., however, is actively promoting the use of robots, with automakers taking the initiative. General Motors Corp. has announced a plan to introduce 14,000 robots by the end of 1990. If a survey similar to the above-mentioned RIA Survey is conducted again, the rate of increase in the U.S. use of robots should be considerable.

International exchange of research and technological information

ISIR (International Symposium on Industrial Robots)

International cooperation in the field of industrial robots has made remarkable progress, mainly through exchange of research and technological information under the auspices of the International Symposium on Industrial Robots. Such cooperation is encouraged for the future.

The Symposium on Industrial Robots

was held first in the U.S. in 1970. It was decided at this time to make the symposium an international organization and the symposium has since been held in the U.S., Europe and Japan, with up to 1,000 persons from about 20 countries attending each time.

Papers concerning research and development, applications, and the socioeconomic impact of the use of industrial robots have been presented at past ISIR meetings, opening the way for ISIR to build a foundation for international exchange of research and technological information.

On the occasion of each ISIR, a meeting of national coordinators is held. Representatives from groups in various countries and authorities on industrial robots attend as national coordinators to make decisions about the forthcoming ISIR conference, and exchange information on the population of industrial robots, production and political measures such as national R&D or promotion of IRs' utilization. The 15th ISIR meeting is scheduled to be held in Tokyo from September 11-13, 1985. ISIR is expected to play an increasingly important role in the future exchange of research and technological information.

International Conference on Advanced Robotics (ICAR)

Based on a proposal regarding international cooperation in research on advanced technologies made by the Summit at Versailles, France in 1982, "Advanced Robotics" was adopted at the 1983 Summit meeting as a theme for international research cooperation. Japan and France were named lead countries on this project.

Feeling the weight of this responsibility, Japan held the first ICAR meeting September 12-13, 1983, in Tokyo. With a view toward international exchange of research information, Japan presented the results of national research projects on advanced robotics. The second ICAR meeting will be held in Tokyo in September 1985 immediately before the 15th ISIR.

International industrial cooperation

Japan's international industrial cooperation in industrial robots is taking the form of technological seminars for industrial cooperation overseas, international contracts for marketing and technology, and establishment of joint ventures. So far, the technology seminars have been held at the request of foreign countries under the sponsorship of the Japan External Trade Organization (JETRO) together with the cooperation of the Japan Industrial Robot Association (JIRA).

Topics for discussion include the technology of industrial robots, present and future implementation and the economic and social impact of robot utilization.

Export difficulties make cooperation necessary

The export of industrial robots is more difficult than, say, the export of cars and household electric appliances. Before introducing industrial robots, a system engineering service has to be provided, and after introduction maintenance should be guaranteed.

System engineering involves making a basic design of the production system by adjusting to the user's requirements, carrying out a feasibility study using robots, and selecting the most suitable robots. To satisfy user demands and requirements, Japanese manufacturers have to tie up with foreign system engineering companies or manufacturers who can supply the robots imported from Japan, system engineering services, and maintenance services to end users. This means that cooperative relations have been set up from the beginning between Japanese manufacturers and their overseas competitors. In other words, trade friction between them is unlikely to occur (see Fig. 2).

International sales, research & results

These international sales and technology tie-ups are now developing into international research cooperation.

As mentioned previously, the Summit members agreed in Williamsburg to promote international research cooperation on "advanced robots" aimed at economic growth and improvement of working conditions. As part of this research cooperation, the seven Summit members have made proposals on unique themes, such as advanced robotics research related to nuclear reactors, ocean devel-

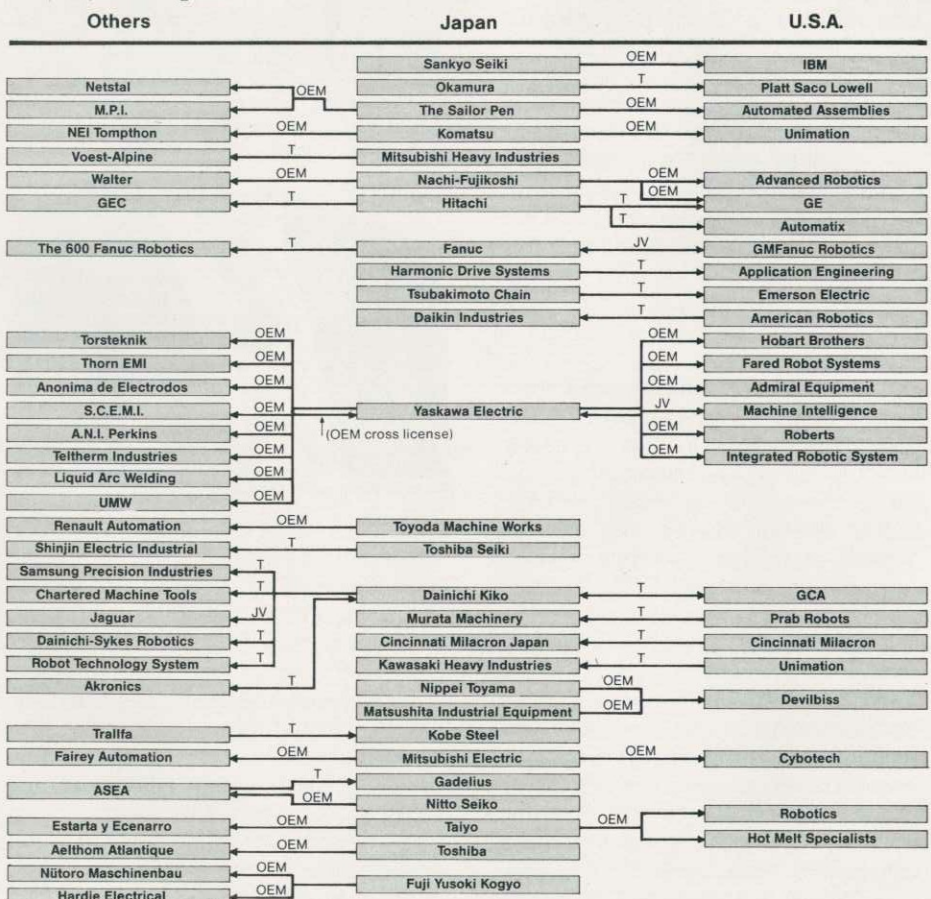
Fig. 1 Number of Industrial Robots in Operation in the World (as of the end of 1982)

Japan	31,900		31,900	(56%)
U.S.	6,301	}	North America	6,574 (11.5%)
Canada	273			
Austria	50			
Belgium	305	}	West Europe	18,480 (32.5%)
Denmark	63			
Finland	98			
France	9,993			
W. Germany	4,300			
Italy	1,100			
The Netherlands	71			
Sweden	1,450			
Switzerland	73			
Britain	977			
Total	56,954		56,954	(100%)

Note: The survey was conducted for reprogrammable robots, servo-controlled and non-servo controlled.

Source: Robot Industries Association, U.S.A., 1983

Fig. 2 International Industrial Cooperation on Robots (as of April 1985)



Notes: T = Technical tie-up JV = Joint venture
OEM = Original-equipment manufacturing
Arrows indicate the flow of products and technologies.

Source: Japan Industrial Robot Association

opment, fire fighting and rescue operations, agriculture and mining. In step with such moves, the Japan Industrial Robot Association established the International Technology Center of Robotics and Flexible Automation in May of this year. The center is a nonprofit organization which conducts international research cooperation in a major way for the future.

Being such a big growth field, one would expect that industrial robots would turn into another field for international rivalries to play themselves out in. But, surprisingly—and happily—the very nature of this field makes dialogue and cooperation necessary for the success of the individual company. Hopefully this success will bring greater prosperity worldwide.