

EXECUTIVE SUMMARY

0.1 The Industrial Robots industry is still at a nascent stage in India. Some of its characteristics include the following :

- i) Mainly due to lack of substantial demand, major manufacturing/ assembling of industrial robots is still limited to various R&D institutions (BARC, CMTI, Hyderabad Science Society , IITs etc.) and large automotive and electrical manufacturing companies (TELCO, Crompton Greaves, L&T etc.) for their captive consumption.
- ii) Even the leading manufacturers of industrial robots such as SIEFLEX, HMT, BEML, etc. assemble robots as per customer requirement and their production levels are minimal. Technology mainly relates to assembling of components and sub-assemblies with emphasis on software development and system engineering.
- iii) System engineering of industrial robots around specific applications is a crucial area. It could be inferred that the lack of trained system engineering man-power and the reluctance of the Indian industry to open to advanced methods of manufacturing has led to a stunted demand for Industrial Robots.
- iv) Most of the critical electrical and mechanical components and systems ; including harmonic drives, servo valves and cylinders, servo motors, controllers, encoders, position resolvers etc. are currently being imported, making the final product extremely expensive. This is another factor inhibiting end-users from implementing such systems in their manufacturing plant.
- v) There is an urgent need for Indian manufacturers to be very competitive in India and abroad. Production of international quality goods at much lower costs would be requiring complete retrofitting or change over to advanced production techniques inclusive of Industrial Robots, FMS, CIM, etc.

0.2 INTERNATIONAL SCENARIO

0.2.1 Industrial Robots technology the world over is being spearheaded by large corporations and multinational research organisations mainly in Japan, USA and Europe. In these leading countries, technology development is done on a cohesive basis and is a well co-ordinated activity. The advanced level of research combines numerous state-of-the-art technologies including electronics, communications, measurement, control, mechanics and material sciences.

0.2.2 The major applications for industrial robots the world over include Arc welding; Spot welding; Metal cutting; Deburring & buffing; Sealant and Adhesive dispersing; Machine loading and unloading; Assembly; Inspection and other process applications such as material handling, spraying, moulding, forging etc. mainly in automotive, electrical and electronics industry. Some of the recent technology development work being undertaken internationally includes efforts towards further improvement in robot positioning accuracies, its dynamic performance and development of new sensors, vision systems and grippers along with development of more capable control systems.

0.3 TECHNOLOGY ABSORPTION & TECHNOLOGY GAPS

0.3.1 Robotics is a highly demanding field from the point of view of R&D inputs of a very high calibre. In India these inputs are mostly in the nature of systems engineering and application engineering. These efforts fall short of even the basic requirement in India on account of lack of trained manpower, lack of co-ordination and pooling of experience, low level of investments in R&D activities, lack of testing and certification laboratories spread across the country, non-existent standards of performance, safety etc. This in turn has led to minimal efforts towards technology absorption. Further, on account of very small requirements of components, sub-assemblies and T&M instruments, required for this industry, even indigenisation of these has been rather slow. These factors have, therefore, caused major technology gap areas in the field of industrial robots in India as compared to that in other leading countries.

0.3.2 Those gaps which are required to be bridged or suitably modified would include :

- i) Specifications of locally available sub-assemblies are unreliable and not accurate.
- ii) Technology of local electrical and electronic components in terms of their range, tolerance limits, performance standards is below what is required for designing and developing industrial robots.
- iii) Lack of qualified, knowledgeable system designers and application engineers has caused gaps in capability in India for system designing. This is mainly on account of lack of training facilities.
- iv) Slow progress of R&D activities on account of lack of personnel, testing facilities and marketable opportunities.
- v) Non-existence of facilities for production of sophisticated controllers, drive systems and sensors. This in turn has led to high cost

of imports making industrial robots out of reach for most of the end-users.

- vi) Lack of in-depth knowledge and experience of newer technologies such as FMS, CIM, etc.

0.3.3

Keeping the aforesaid technology gap areas and limitations in view, the following steps are recommended for pursuing development of Industrial Robots Industry in India :

- i) Relevant and inexpensive applications such as loading and unloading of high cost capital equipments in order to boost their utilisation. This may be achieved by designing and developing the inexpensive robots and widely selling them. This would also have a catalytic effect on appreciation in Indian Industry for such manufacturing automation technologies while preparing the ground for newer and sophisticated technologies.
- ii) Applications, wherein automation costs are not important, but say, are hazardous in nature, could be other thrust areas for industrial robot development. These would include applications such as nuclear fuel handling, deep sea operations, fire-fighting and defence operations.
- iii) Instead of expending efforts towards indigenisation of low requirement components, sub-assemblies and testing equipments, the focus must be on assimilation of these technologies, system engineering, application engineering and software development.
- iv) End-users should be exposed to demonstration projects of industrial robots with the help of appreciation programmes. Secondly, the need for harnessing the widely scattered R&D efforts in India is immense and must be done through co-ordinated interaction among these institutions involving even the endusers.
- v) Other areas requiring attention would include establishing regional testing, certification and promotional centres, opening up of a dedicated educational institute, creation of a centralised data bank, initiating standardisation processes etc.