

EXECUTIVE SUMMARY

1. MACRO STRUCTURE OF THE INDIAN INDUSTRY

The two-way wireless communication industry is comparatively new in India. It is only during the last ten years or so that the industrial units have been set up. Almost all the units are in the Public Sector.

The major users of the products are: Defence Services, para-military forces and police organisations. Other major users are: coal industry, steel industry, oil industry and irrigation projects.

Most of the units are producing many other items of electronic equipments apart from two-way wireless communication equipment. Due to inadequate data, classification of investments on manufacturing and R&D activities on this subject vis-a-vis other items is not possible. The main item of production is VHF radio systems. The production is practically entirely based on imported technology.

The licenced capacities of the units are for low value of production (of the order of Rs.300 lacs) and a number of units have been licenced.

There are severe limitations on indigenous availability of different types of components required for the manufacture of different types of radio equipment. Most of the components are to be imported. For many items of equipment, custom-built sub-systems are involved which are to be imported from the original suppliers.

The low volume of production imposes limitations, on deployment of modern types of automated production process, resulting in, many of the undertakings resorting to labour intensive manual operations.

The main items of equipment coming under the category of two-way wireless communication equipment, being currently manufactured in India, is the VHF Transreceiver set, both for fixed station applications and Mobile Station applications for vehicle mounting and hand-held. HF SSB Transreceiver sets constitute the next major item of product line mainly for use by various Government departments, Defence services and large users like ONGC. UHF multi-channel Radio Relay Systems and Multi-Access Radio Telephone Systems have recently gone into production line in a few undertakings, mainly for public telecom services. These are currently of the analog type. Indigenous manufacture of digital systems is now contemplated. Almost all

major users have complained of long delivery schedules, extending to almost a year after placement of order and poor after-sales-service. As per the manufacturers version, production-planning becomes difficult due to uncertainty of demand. Moreover, many of the vital components are to be imported and import action can be initiated only after receipt of orders. These result in delays in production.

2. STATE-OF-THE-ART TECHNOLOGY

The technological advances in the electronics and telecommunications industry in the recent years have resulted in many innovations in the concept of two-way wireless communication systems in the industrialised nations. The observations on the state-of-the-art technology of typical types of equipment in the different frequency bands are given below:-

2.1 HF Radio Systems :

Modern types of HF transmitters incorporate fast tuning amplifiers, together with programmable exciters and programmable receivers. Built-in microprocessor techniques, combined with high reliability, enable complex transmitter and receiver stations to be fully controlled by a single remote centre. This removes the need for these stations to be manned. HF radio adaptive communication systems enable incorporation of many new features: fully automated link establishment, busy channel detection, transmit only on clear channel, slow and high speed data (upto 2400 bps) selective calling, built-in test set and full remote control. This results in a fully automated HF communication system which removes traditional operator guess work and eliminates the need for trial-and-error methods. The development of automatic request (ARQ) radio teletype system, with built-in error correction, has resulted in extremely profitable, easily handled RTT communications.

2.2 Meteor Burst Transmission Systems (MBTS) :

This is a telecom network using ionised meteor trails as reflectors when communicating between two sites upto 2,000 kms. apart. This has been successfully deployed for transmission of telemetry signals from remote unattended observation points to central control stations. This usually operates in the frequency band 40-50 MHz which is less crowded than the HF band. The network consists of one or more master stations and the required number of remote stations. The telemetry device stores data in a PC or a plain terminal in the remote location. The master station sends signals periodically to remote stations and when a link gets established by acknowledgement of signals, the message stored in the PC is sent at a high data rate which is collected in the host computer at the master station. Thus, this

is well suited for transmission of automated measurement data from uninhabited sites to central locations.

2.3 **VHF Systems :**

The primary use of VHF systems being for mobile applications, the advances have been to make the portable sets very light (weighing even less than 1 kg.) and extremely rugged. Technological advances have been in the introduction of multichannel systems featuring micro processor-controlled selective calling.

2.4 **UHF Systems :**

These have wide range of applications: narrowband radio channels (30 and 120 voice channels) for long haul and short haul transmission links; Multi-Access Radio Telephone (MART) systems; and mobile telephone systems. The advances in technology for systems in this band of frequencies have been in the development of digital systems and increasing degree of automation. The main usage of the UHF band is turning out to be for portable telephone service, either for group usage or for public telephone service on cellular radio principle. For group usage, fully synthesized portable radio systems programmed to operate on specific trunked radio systems have been developed.

The advances in technology in two-way wireless communication systems in the industrialised nations are attributable to two main factors : (i) increasing automation by development of software-oriented systems; and (ii) incorporation of development in other disciplines in the electronics industry, such as data communications, in radio systems to make them compatible in the future digital environment of the telecommunication systems. The status of technology of radio equipment manufactured in India is still largely hardware-oriented.

3. **GAPS IN TECHNOLOGY**

The gaps in technology can be categorised as under:-

- i) Manufacturing process; and
- ii) Systems Technology

3.1 **Manufacturing Processes :**

This has much similarity with the manufacture of modern types of electronics equipment. This report, accordingly, covers only salient features special to wireless communication equipment. Most of the industrial units currently function as assembly shops. For components, PCBs and mechanical parts, facilities available for mass production in other undertakings are availed of. For special components and subsystems, imports are invariably resorted to. In common with other modern types of electronic equipment, production of wireless communication equipment is to be considered on three main aspects: (i) assembly plant for finished product; (ii) components from the component industry; and (iii) development of software. Most of the units are functioning as simple assembly shops with relatively low capital investment. Component industry needs high investment costs with high-volume production. The equipment currently manufactured in India are mostly hardware-oriented. Modern communication systems are becoming more and more software-oriented. The generation of software is practically outside the production capabilities of many of these units.

3.2 **Systems Technology :**

Despite the fact that the manufacturing activities by most of the units are under foreign collaboration agreements, many with leading companies of the world, there is a very wide gap in the equipment technology when compared with the state-of-the-art technology. The technological advancements in the recent years have been building of "intelligence" into the systems by having micro processor-controlled systems and incorporation of development in other disciplines in the electronics industry as in computers and data communications. Such developmental activities have been mainly in some of the world's leading organisations, which have multi-disciplinary divisions with their own R&D centres in their corporate sector. While some of the units in India have ambitious plans and promising capabilities, there are doubts on the funds availability for carrying out R&D activities to develop software oriented systems and component development to match the advances in technology, especially considering the broad spectrum of disciplines involved in such activities.

4. **SUGGESTIONS AND RECOMMENDATIONS**

- 4.1. The bulk of the problems faced by the Indian Industry can be solved if large volumes of production of wireless communication equipment is made possible. This, in turn, will depend on raising the market potential for such

items of equipment for use within the country and make them competitive, in price, quality and technology, in the international market. There is a wide range of applications for wireless communication equipment for raising the efficiency of operations of many undertakings. However, under the conditions in India, the user licencing procedure for the operation of wireless communication equipment is somewhat cumbersome and time consuming. There are such other communication services as Highway Communication, metropolitan taxis, transport operations, etc. as utility services which have not yet been introduced in India. These aspects call for a review of the licencing policy of the government. If the volume of production could be increased by stimulating the demand, the industrial undertakings would be enabled to deploy improved production process and better quality control measures together with a reduction in price.

- 4.2 There are many factors outside the scope of assembly plants of wireless communication equipment for updating the technological advancements taking place in other relevant industries, for example the component industry, in which the manufacturers are dependent on, the advances in other disciplines of the electronics industry, as in computers and data communications, are also having a bearing on technological advances in wireless communication systems. Under these circumstances, some amount of resources may have to be devoted by the Government for the improvement of technology in the wireless communications industry.
- 4.3 The situation calls for intensive R&D efforts both at industry level and research institutions. Academic institutions like IITs could supplement research efforts. Specific products and systems could be developed in the R&D units of large electronics industries in India. The nominated units will have to keep track of the state-of-the art technologies and futuristic trends, with suitable interface with large users of wireless communication services to meet their specific requirements. The R&D activities will have to include component technology and materials technology with equal emphasis on application oriented software development. As all such activities cannot be confined to a single industry, the nominated R&D units may have to interface with many other related undertakings. It would be advantageous for a specified department of the government acting as a nodal agency for such multi-industry coordination. Partial financing of such R&D activities by the government may also become essential in the initial stages of the activities as, in the current situation, the venture will not be able to raise its own resources.

- 4.4 There has hardly been any export of items relating to two-way wireless communication equipment. The products of indigenous manufacture are invariably not quite competitive in the international market on price, quality, technology and delivery schedules. If these aspects are properly tackled, the products of Indian manufacture will have good potential in many of the developing countries and even in some of the industrialised countries by adopting proper marketing strategies.
- 4.5 The problems of the industry are of a special nature. The needs of the users vary and the users are of varied types. A bulk user cannot be identified who could devote attention on R&D activities to keep pace with the advances in technology in all spheres of applications. The needs of the country, with the existing policy on licencing, is too inadequate for the industry to devote proper attention or financing to promote developmental activities. These limitations have resulted in the products of indigenous manufacture, remaining outdated, in technology and unable to compete, in international markets.