EXECUTIVE SUMMERY

0.1 INTRODUCTION

The Electronic Weighing System (EWS) industry has grown rapidly since its introduction in the past decade. In India, Narne Tulaman, Hyderabad and Integrated Process Automation (IPA), Bangalore were the earliest units to start the production of electronic weighing systems in the year 1977 and 1978 respectively. Today, there are about eight major EWS units in India with a total production of about Rs. 800 million per year. Out of this, Rs. 600 million corresponds to dynamic weighing system. The industry is growing at the rate of 18% per annum. It is expected that by the year 1995, electronic weighing will capture 50% of total weighing market.

0.2 SOURCE OF TECHNOLOGY

In the international arena there are about a dozen leading EWS manufacturing companies: Philips of Germany, Chronos Richardson of UK, Asea Brown Boveri of Sweden, Carl Schenck of Germany, Defiant of UK, GEC Avery UK (erstwhile W&T Avery, UK), Ohaus of USA, Shimadie of Japan, Sortorius of Germany and Mettler Toledo AG of Switzerland. These companies have worldwide operations through their subsidiaries and only a few amongst them have given technologies to outside companies. For Indian units, technology supplier companies are Philips, GEC Avery, Asea Brown Boveri and Chronos Richardson. In most of the cases, the technology transfer from these companies has been restricted to transfer of designs and drawings and training of personnel only. The crucial "Know- Why" pertaining to electronic weighing system or component design, however, is not transferred in most of the cases. Only Avery India is reported to have "Know why" also made available to them. The companies like Avery, Tulaman have diversified from mechanical weighing to electronic weighing. M/s IPA Bangalore is the only company which has used indigenous know-how developed within the country. The technology base in majority of the Indian units is limited to assembly of systems and modification of software to suit the Indian conditions.

0.3 SOURCES OF EWS RAW MATERIALS/ COMPONENTS

Except for IPA, Avery and Indchem, all the major units import vital components like load cells from aboard. Avery India imports a few items for manufacture of load cells such as strain gauges and

adhesives either due to non-availability or poor quality of indigenous supplies. Similarly, IPA imports strain gauges, adhesives, silicone sealants and steel bars, etc. from Japan and USA.

The structural portion of the EWS is fabricated within the country by all the units. They use indigenous material like M.S. channels, M.S. plates and rods supplied by SAIL.

The third important constituent of EWS is electronic components and its hardware. These are either imported or indigenously procured. The imported items include digital displays, multipin connectors, integrated circuits, and special cables. Many leading Indian companies are planning to manufacture load cells due to its criticality for EWS production. It is essential that, technical know-how about components and raw materials be insisted in future to develop design capability within the country.

0.4 PRODUCTION CAPACITY

The EWS industry has a production capacity of Rs.1000 million. The production in dynamic weighing systems is not regular and depends on order position. Available capacities in many units are not fully utilised. Most of the units are fabricating static weighing systems, yet they can also go in for dynamic weighing.

0.5 EXPORTS

The EWS industry has not made significant headway in exports, which is stated to be mainly due to high prices of raw materials and components. A few units, however, have marketed their products to Asian and African countries under deemed exports.

The other problem faced is that due to exchange rate of rupee, imports of components have become costly. According to the industry, they also need to keep a high level of inventory to compensate for import delays which add to the overhead cost. Steps should be taken therefore for indigenisation of load cells and their components.

0.6 EWS MACHINERY

For manufacture of quality electronic weighing machines sophisticated equipments like Computerized component testers, IC testers, Automatic or Semi-automatic component insertion machines, Wave soldering machines, Equipment for soldering surface mounted devices, Rework station for SMDs, Hot & cold chambers with temperature gradient control, Mass-spectrometer

and leak detector, TIG welding machine, Universal testing machine, etc. are required. Avery India, possess testing facility like 100 tonne universal testing machine for testing of load cells and are also in the process of commissioning of 50 T dead weight testing machine.

0.7 RESEARCH AND DEVELOPMENT

There is no R&D base in the country doing basic research in the electronic weighing system. National Aeronautical Laboratory, Bangalore used to carry out some research on load cell for their wind tunnel and fatigue testing system. These results were later adopted for industrial weighing but at NAL, further development activities were not pursued due to stoppage of work on project. Most of the units are planning to take up R&D projects for in-house manufacture of load cells.

0.8 FUTURE TRENDS

The industry has a great potential for exports specially to Asian and African countries. The world market is presently dominated by a few leading West European EWS companies. To cite an example, ABB Sweden has developed pressductor technology for load cells for high load ranges with the required accuracy. However it is reported that pressductor technology is used for measuring force of higher order but less accurately. Load cells with strain gauge technology are highly accurate and used widely. Other companies in Sweden, UK and USA have gone for shear beam devices which is an advanced design in EWS. The Indian EWS units should aim at building design capabilities in offering solutions then only they can achieve international stature.

0.9 CONCLUSION

0.9.1 EWS industry is more dependent on the foreign technology. Many units have obtained the know-how through collaborations. The know-why part was not transferred hence not much headway was achieved in the design of electronic weighing systems indigenously. This can be achieved only if the units evince keen interest in R&D and sponsor projects to research organizations.

0.9.2 NAL has carried out work on load cells but shelved this project later. Emphasis now should be laid to utilize their expertise and facilities to carry out research in this area.

0.9.3 Cost reduction is one of the objectives of R&D abroad in electronic weighing. Presently multiple load cell designs are being used which are costly but they give accurate weighing.

0.9.4 Avery India and GEC, UK have jointly developed weighing systems in motion and also double ended shear beam load cells. It is for the benefit of industry if joint research programmes can be conducted for specific applications to develop new technologies.

0.9.5 Not much basic research is being done in the country. The level of basic research and applied research is at a low level. The manufacturers claim that in most of the cases the development carried out by the foreign counterparts are being made available to their counterparts in India.

0.9.6 EWS industry is mainly concentrating on domestic market. Only some of the companies are exporting electronic weighing systems that too in a small way.

0.10 RECOMMENDATION

0.10.1 Load cell is one of the components which is yet to be developed fully by the EWS industry. Unless the industry has the know-why available to them for design and manufacture of load cell, EWS industry cannot attain international stature. Therefore stress should be to develop technology for load cells.

0.10.2 The strain gauge is one of the important constituent of the load cell (strain gauge type). In India, presently Avery, Indchem and IPA are manufacturing load cells of this type using imported strain gauges. It has to be seen that M/s IPA, Bangalore and M/s Encardiorite, Lucknow are manufacturers of strain gauges but for specialized applications they still have to depend on imports. Even in cases where the Indian made strain gauges are available, the users feel that the quality is not comparable with the quality of the strain gauges made by the international companies like Micro Measurement, USA, KWOYA, Japan and TML, Japan. Their technology acquisition for development of strain gauges can be encouraged and also efforts should be made for local development.

0.10.3 The VFDs, LEDs and multi-pin connectors are still not manufactured in India. Abroad, the companies manufacture large quantities of these components in order to meet the global market and thus are able to offer the product at cheaper cost. It will therefore not be viable for Indian companies to manufacture these items at present level of home demand. Instead of looking only at local requirements, they should plan to cater to the global market to become viable. Indian companies like Semi Conductors Ltd., Mohali may take the lead for local development.

0.10.4 R&D projects can be taken up for development of load cells, digital display units, strain gauges, sealants and adhesives. In India, the basic facilities are available only at National laboratories and academic institutions to take up such work. For example NPL, NAL, CMERI, Liquid Jet Propulsion Lab, Bangalore can take up the projects related to load cells. Similarly, for electronic components development leading electronic units like ECIL, BEL, SCL, DRDO, CEERI, Pilani can take up the development projects along with industry.

0.10.5 The performance of load cells depends very much on the quality of auxiliary items like the sealants, adhesive tapes, etc. These are used for bonding the strain gauges to base metal which undergoes cyclic loading and temperature gradient during curing and testing. Indian sealants and adhesives do not meet the stringent requirements and many times they fail. Indian EWS units tend to prefer use of imported material. The quality of sealants and adhesives needs to be improved.

0.10.6 The framing of Indian standards for dynamic electronic weighing systems is due for long. It is learnt that steps have been taken by Bureau of Indian Standards to draft the standards. Expeditious decisions may be taken up by Bureau of Indian Standards in finalising of standards for electronic weighing systems.

0.10.7 For quality upgradation in EWS, excellent facilities for testing and calibration are the pre-requisites. Establishment of this facility is quite expensive. Many companies cannot afford it. In this case, they look to external agencies. At present, the only agency at the national level is National Physical Laboratory located at New Delhi. Considering the logistics involved units situated away from Delhi find considerable difficulty in availing the facility. Therefore similar facility need to be established at other places in the country.

0.10.8 Research on metallurgical aspects of steel and aluminium required for load cell can be taken up. Presently, special steel and alumimium for load cells are imported. National laboratories like NML, DMRL, MIDHANI, INDAL may look into this in association with the manufacturers. However some leading manufacturers are using aluminium alloy for low capacity load cells.

0.10.9 An association of EWS units may be formed as an apex body to accelerate development of EWS industry. Such Association can play a vital role in building database for EWS technology, problems of modernisation and taking corrective action on issues of common interest. This agency can interact with the member units,

Government Departments and co-ordinate the research activities in electronic weighing.

0.10.10 The development of home market as well as export is necessary. The electronic weighing market in the country is growing at the rate of 18%. The ratio between conventional bridges to electronic weigh bridges is 80:20. This shows that enough potential exists for tapping the market specially for converting conventional bridges to electronic weigh bridges. In the area of bullion, drugs and pharmaceuticals, petroleum products and other consumer items use of electronic weighing systems can be encouraged.