# EXECUTIVE SUMMARY

**0.1** The radiator manufacturing industry comprises of two sectors viz. organised sector and the small scale sector. The organised sector mainly supplies radiators to the OE market and some to replacement market. The small scale sector supplies radiators to the replacement market.

## 0.2 STATUS OF THE RADIATOR MANUFACTURING INDUSTRY

There are 19 units in the organised sector. For the year 1993-94 annual production from the organised sector stood at 4.8 lakhs numbers. All the units in the country excepting one is Climate Controls India Ltd. manufacture Cu./Brass radiators. The over-all capacity utilisation in the industry stands at around 60%. Production of the small scale sector stands at around 40% of the industry turnover.

The technology used in the industry is labour intensive and old when compared with contemporary technology. One of the major reasons for poor performance of the industry is the lack of availability of adequate quality of raw materials. Also, as the units established were earlier in the small scale sector, enough funds for modernisation of the units is not available. Thus the industry's growth and modernisation is severely hampered. Given below is a list of manufacturers in the organised sector alongwith their installed capacities :

| | NAME OF THE UNIT | INSTALLED CAP. (IN NOS.) |
|---|---|---|
| (i) | India Radiators Ltd., Madras | 1,48,000 |
| (ii) | Universal Radiators Ltd., Coimbatore | 1,50,000 |
| (iii) | Fine Automotive & Industrial Radiator Ltd., Pondicherry | 12,000 |
| (iv) | Asian Radiators Ltd., Coimbatore | 50,000 |

(Contd.)

| | NAME OF THE UNIT | INSTALLED CAP. (IN NOS.) |
|---|---|---|
| (v) | Premier Radiators (P) Ltd., Coimbatore | 72,000 |
| (vi) | Deccan Radiators & Pressing Ltd., Coimbatore | 42,000 |
| (vii) | Madras Heat Transfer Products (P) Ltd., Madras | 24,000 |
| (viii) | Bharat Radiators Ltd., Bombay | 60,000 |
| (ix) | Teksons Ltd., Bombay | 1,00,000 |
| (x) | Standard Radiators Pvt. Ltd., Baroda | 60,000 |
| (xi) | Banco Products (I) Ltd., Baroda | 85,000 |
| (xii) | Southern Radiators & Oil Coolers, Madras | 12,000 |
| (xiii) | Ratnatraya Heat Exchangers Pvt. Ltd., Bombay | 66,000 |
| (xiv) | Consolidated Radiators Ltd., Gurgaon | 1,10,000 |
| (xv) | Halgona Radiators, Bangalore | |
| (xvi) | Climate Controls India, Bhiwadi | 7,50,000 |
| (xvii) | National Radiators & Oil Coolers, New Delhi | 36,000 |
| (xviii) | Bhagat Motors Co. Pvt. Ltd., New Delhi | 43,200 |
| (xix) | G.S.Radiators, Ludhiana | 1,00,000 |

## 0.3 INTERNATIONAL SCENARIO

With the growing demand for lighter, sleeker and powerful vehicles, there has been increasing demands on radiator manufacturers to modify designs to lesser weight, increase heat transfer efficiency while at the same time reduce costs.

This has spurred the development of new materials, new alloys and efficient production techniques. With a preference for front wheel drive vehicles in North America and Europe, aluminium radiators have been widely adopted for use by most vehicle manufacturers.

Thus key technologies in the manufacture of aluminium radiators have emanated from American and European car manufacturers.

At present technology used in the manufacture of aluminium radiators are

- Extruded or drawn tubing of AA-3003 (Al-Mn) or AA4343 (Al-Si) alloy
- Fins - AA 1050
- Plastic tanks - fibre reinforced polyamid & nylon 6/6.
- Bonding technology

Existing technology uses a vacuum brazing furnace to join tubes to the header plates or alternatively uses epoxy binders to bond the two surfaces.

While substantial progress has been made in the design and manufacture of aluminium radiators, Cu./Brass radiator manufacturers too have redesigned their existing product to improve its competitiveness. Pioneering work in this area has been carried out at Nippon-Denso Ltd., Japan. Today the fin has been developed consisting of a Cu-Mg core with a film of Cu-Zn on either side. The Cu-Zn layer is highly corrosion resistant, while the Cu-Mg core exhibits superior mechanical strength.

Brass tanks have been replaced with PVC or plastic tanks. New solders have been developed which have good corrosion resistance and good high temperature mechanical strength properties. The alloys are (5% Sn, 0.25% Ag, 12% Sb and balance Pb) and (95% ±) zinc based alloys. The advantage of Zinc based alloys is that it is far less polluting when compared to lead based alloys.

Other advances in joining technology include special brazing furnaces for reducing pollution effects and special Beta Weld technology for joining tubes to header plates. Unlike most Indian companies, Western manufacturing companies use automation extensively for manufacturing. A few units have been described in the chapter on International Scenario.

Some major international manufacturers of radiators are given below :

**FRANCE**

- Airelec Industries
- Denichers Bilbert SA
- NEC. S.A,
- Rhonelec S.A.
- Francia-Hoval

**GERMANY**

- Albers & Sochne KG
- Behr GmbH & Co. KG
- Langerer & Reich GmbH & Co. KG
- Autokuhler GmbH & Co. KG
- Bergmeir U Seitz GmbH

**JAPAN**

- Tokyo Radiator Mfg Co. Ltd.
- Tokyo Radiator Co. Ltd.
- Nippon Denso Co. Ltd.
- Yamomoto Radiator Co. Ltd.

**UNITED KINGDOM**

- Delanair Ltd.
- IMI Radiators Ltd.
- Serck Heat Transfer
- Llanelli Radiators
- Fin-Rad Ltd.
- Pentagon Radiators Ltd.
- Covrad
- Dimplex Heating Ltd.

**U.S.A.**

- Daniel Rediator Corporation
- Fedders Automotive Components Co.
- General Radiator Division
- Young Radiator Co.
- Harrison Radiators
- Modine Manufacturing Co.
- Thermal Components Inc

The complete addresses are given in Annexure-III.

## 0.4 R&D EFFORTS IN INDIA

Barring a few established units, most manufacturers do not have a separate Research and Development centre. The two apex bodies for research and development in the country i.e. ARAI, Pune and VRDE, Ahmednagar only carry out research work on materials and testing of products. The Automotive Research Association of India carries out testing of radiator fans, radiator hoses, radiator coolants and rubber components. The unit has developed a wind tunnel with sophisticated instrumentation and data acquisition facilities. This is being offered to various manufacturers in the Industry.

VRDE is the nodal agency which coordinates and carries out research work for defence vehicles. The establishment has a test track as well as testing facilities for all major engine components including radiators.

Most of the R&D centres in the corporate sector have focussed efforts mainly on cost reduction in the manufacturing process. Little effort has been directed at developing and designing new alloys, materials or manufacturing processes. This is largely because the units are severely handicapped by tight budgets. The units are not able to design new alloys, materials but due to the fact that they do not get adequate support and co-operation from the indigenous re-rollers. The indigenous re-rollers are yet to establish brass strips either arsenic or corrosion resistant. A detailed description of the R&D facilities in the country has been given in the chapter on Research & Development.

## 0.4 RECOMMENDATIONS

0.4.1 The re-roller industry may undertake development of new alloys and improve the quality of copper strips to thinner size required for manufacturing of copper/brass radiators.

0.4.2 Import of capital goods and raw matarials required for manufacture of radiator by the radiator industry may be considered at reduced rate of import duty because good quality defect free raw matarials are generally not available to the industry from indegeneous sources.

0.4.3 The melting loss of 5% claimed by the re-roller may be brought down to the norms being followed by the overseas units as most of the re-roller claims to have set-up their mills with modern Capital goods.

0.4.4 Sufficient measures are required to be taken to improve the quality of indigenously available copper and brass. This is essential to improve the overall quality of the product. Specific attention needs to be given to modernise existing copper smelting and refining units.

0.4.5 A concerted plan needs to be formulated for designing alloys. Leading technical institutes and laboratories such as National

Metallurgical Laboratory, Defence Metallurgical Research Laboratory, Jawahar Lal Nehru Aluminium Research and Design Centre in association with a consortium of leading vehicle manufacturers and radiator manufacturers may develop programmes for research and development in this field. These programmes can be funded by the industry. This will help to bridge the gaps in alloy design in solders fins and tubes.

0.4.6 New plastics and coatings need to be developed. For this, import of crucial technology may be required. Specific plastic technologies such as fibre reinforced polyamid and fibre reinforced nylon 6/6 will have to be made available if the country is to ensure the radiator reaches export quality standards.

0.4.7 The technology for manufacturing vacuum brazing furnace and other special furnaces (Cu./Brass brazing) can be absorbed through collaboration efforts of Indian furnace manufacturers with foreign equipment manufacturers. Companies like Wesman Engineering and Asea Brown Boveri can play a leading role in this regard.

0.4.8 Efforts should be directed at formulating new standards for Aluminium based radiators and new testing methods developed to cover aspects such as corrosion. The Bureau of Indian Standards in collaboration with Jawahar Lal Nehru Aluminium Research & Design Centre and leading manufacturers can develop the necessary standards.

0.4.9 New modern machinery, such as robots, modern tube mills can be manufactured in India. Leading vehicle manufacturers, radiator manufacturers and existing machinery manufacturers can jointly promote new machinery manufacturing companies in a consortium approach. Needed technology can be selectively imported, indigenised and adapted to meet the Indian industries requirements. In the long run this will obviate the need for expensive imports.

0.4.10 Additional training and retraining facilities are required for ensuring cost competitiveness and consistency in quality. Radiator manufacturing companies may concentrate on this aspect.

0.4.11 Evaluation needs to be done to establish the air flow resistance of radiators manufactured in India with comparable radiators in advanced countries.

0.4.12 There is a need to establish application engineering cells by rediator manufacturers, so that the radiator design can be done with collaboration with the vehicle or engine manufacturers.

0.4.13 With the advent of high powered, turbo charged, interacooled, high speed engines, in India, there is a need to encourage indigenous manufacturers, to develop compact, light weight and thermally efficient radiators and intercoolers. The required manufacturing, testing and development infrastructure can be encouraged at radiator manufacturer's end.

0.4.14 Manufacturers must perfect design of internal auxiliary tank radiators with fast engine de-aeration capabilities to be fitted in applications which need this type of radiators.

0.4.15 As aluminium radiators require plastic tanks, fin clad aluminium tubes, header, turbulator, epoxy and other raw materials of imported variety, so the development of these materials may be encouraged indegenously.

0.4.16 Indian radiator industry should collaborate with R&D institutions to see the possibility in reduction of weight, change of fin design from the existing technology because most of the radiator industry units cannot go for complete change presently with existing technology on immediately.

0.4.17 A committee may be constituted consisting of selected R&D heads of radiator manufacturers, related R&D institutions, concerned Government Departments and experts, in the fields to identify areas where R&D efforts should be concentrated for imported technology of radiators and identify the specific areas of import of technology required, if any.