EXECUTIVE SUMMARY

1.0 PRODUCT AND APPLICATIONS

1.1 Butyl Acrylate is a prominent member of alkyl acrylates. The Other significant alkyl acrylates are methyl, ethyl and 2-ethyl hexyl. The production and hence technology of these acrylates is integrated. It is therefore necessary to consider these alkyl acrylates as a group.

1.2 All over the world, these acrylates are predominantly used in the form of polymers in surface coatings, textiles and adhesives. In India, the major sectors are textiles, paints, leather processing and adhesives. Methyl acrylate, however, is mainly used in the production of acrylic fibre.

1.3 On commercial scale, the acrylates were first produced in Germany in 1927. Acrylic acid used was from ethylene cyanohydrin process. Subsequently, acrylic acid from acetylene based routes was used. At present, i.e., since 1977 onwards, most of the acrylic acid is manufactured by propylene oxidation process. However, a small quantity of acrylic acid is still being manufactured from acetylene and acrylonitrile based routes.

2.0 INDIAN INDUSTRY STATUS

2.1 There are two producers of these acrylates in India. Both use acrylonitrile as the raw material. Indian Petrochemicals Corporation Limited (IPCL) has a capacity of 10,000 TPA and Raj Prakash Chemicals Limited (RPCL) has a capacity of 3,000 TPA. Thus the total capacity is 13,000 TPA.

2.2 The apparent consumption of acrylates in India for the year 1991-92 was about 7800 tons. The estimated consumption of acrylates in 1993-94 was about 9240 tons. This figure has been estimated on the basis of Tables 2.2, 2.4 and 2.1 (RPCL's production has been estimated at 1000 tons in 1993-94).

2.3 In terms of quality, the acrylates produced by indigenous producers have been well received by the end-users.

2.4 The producers, however, have not been able to attain high capacity utilisation because of competition form imports. In fact, recently both the producers have made a representation to the Government for imposing anti-dumping duty.

2.5 The projected domestic demand for all the acrylates put together would be in the region of 11,780 tons by 1996-97.

2.6 Raj Prakash Chemicals Limited (RPCL) has expanded its capacity from 2,000 TPA to 3,000 TPA in 1992. No other party is implementing any new capacity.

2.7 Domestic availability of acrylonitrile is not good. IPCL is the only producer and is unable to meet domestic demand. Hence, any fresh planning has to be based on imported acrylonitrile. Propylene, the alternate raw material, is also not easily available at present. However, in near future propylene availability is likely to improve.

3.0 MANUFACTURING TECHNOLOGY

3.1 At present around 85% of the world capacity of acrylates is based on proplyene as the raw material. All the new plants being planned are reportedly based on propylene as the starting point.

3.2 In India however, the existing plants are based on acrylonitrile as the starting material. Since acrylonitrile itself is produced from propylene, this method has in-built technical inefficiency. In the process starting from acrylonitrile, it is first converted to acrylamide sulfate. The reaction mixture is then hydrolysed and extracted acrylic acid is then esterified with alcohol to get the ester.

3.3 For producing higher acrylates viz., butyl and 2-ethyl hexyl; two methods are employed. In one of these, acrylamide sulfate is first hydrolysed to acrylic acid, which in turn is esterified with butanol or 2-ethyl hexanol. In the alternative process, these higher acrylates are produced by transesterification of either methyl or ethyl acrylate.

3.4 In the propylene process, propylene is oxidised to acrylic acid via an intermediate, acrolein. The crude acrylic acid is directly used for esterification to produce acrylates. Also, after purification, the crude acrylic acid is converted into glacial acrylic acid which is used in polymeric form in super absorbents (mainly in disposable diapers) and detergents. Thus the propylene based plant can also be used to produce glacial acrylic acid.

3.5 The technology used by both the producers in India has been essentially developed indigenously and successfully commercialised. In case of IPCL, process outline with some basic information for methyl and ethyl acrylates was obtained from Asahi Chemicals alongwith technology for acrylic fibre. However, process details were jointly developed by National Chemical Laboratory, Pune and Engineers India Limited. They also developed proces for butyl and 2-ethyl hexyl acrylates.

3.6 As regards propylene based technology, it appears that there is a fair degree of standardization and the differences in different technologies may not be substantial. The main technology licensors at present are the following.

(i) Japan Catalytic Chemical Co. Japan
(ii) Mitsubishi Petrochemical Co., Japan
(iii) Toyo Soda Company, Japan
(iv) Sohio, U.S.A.
(v) Rohm and Hass, U.S.A.
(vi) Sumitomo Chemical Co., Japan
(vii) BASF, Germany
(viii) Celanese Corporation, U.S.A.
(ix) Nippon Shokubai Kagaku Kogyo Co. Ltd., Japan

4.0 CONCLUSIONS

4.1 Both IPCL and RPCL have successfully implemented production facilities based on indigenously developed technologies.

4.2 No party at present is reported to be implementing any project for the production of acrylates. Projections regarding domestic

demand for acrylates (and also acrylic acid) do not suggest justification for establishment of additional capacity, atleast in near future.

4.3 Technically, use of acrylonitrile as the raw material for acrylates would be relatively inefficient as compared to propylene. This is because, acrylonitrile itself is produced from propylene. The world trend is clearly for propylene based technology. However propylene based acrylates plant would be required to have a much higher capacity, which is of the order of 25,000 to 100,000 TPA.

5.0 RECOMMENDATIONS

5.1 New capacity, if any, may be based on propylene as the raw material. Since no technology base is available in India for this process, import would become inevitable.

5.2 R&D efforts should be directed towards development of technology for propylene based routes since the technology is difficult to get and the technology fees are also very high (approx. Rs. 80 to Rs. 90 crores). A 25000 TPA acrylates plant is expected to cost between Rs. 300 to Rs. 350 crores, and the project becomes unviable. If our laboratories are able to develop this technology, we may be in a position to export the same, in addition to building our own capability for a propylene based acrylates plant. With indigenously developed technology, the project cost is expected to be substantially lower than the above figure of Rs. 300 to Rs. 350 Crores.