EXECUTIVE

1.0 INTRODUCTION

HISTORICAL

The commercial production of Alpha Olefin first commenced in 1912. Initially made from natural fats and oils, thermal cracking of wax and petroleum sources developed in the 60's. Ehtylene is the favoured raw material for the current processes. Alpha Olefin Sulphonate was first experimented as a commercial surfactant in 1962.

PRODUCT

The homologous series of compounds having one double bond at the terminal position of a linear paraffin chain of more than four carbon atoms is known as Alpha Olefins. Alpha Olefin Sulphonates are made optimally from the C_{14}-C_{16} alpha olefins.

END USES

Besides the use of AO in the manufacture of detergents (C_{12}-C_{18}), it is used as comonomers in LLDPE and HDPE (C_4-C_8, in manufacture of lubricans (C_8-C_{10}), and industrial chemicals and plasticisers (C_4-C_{12} & C_{20+}).

AOS is an anionic surfactant with nearly 100% biodegradability. AOS with higher gamma sultones chlorosultones is known to cause skin irritation or dermatitis.

PROCESSES

Alpha Olefin can be obtained through the following routes :

1. From thermal cracking of wax-various types of olefins (including other than detergent grade) are formed simultaneously. This process provides both odd and even carbon olefins.

2. From natural fatty oils - the Godrej-Lurgi process, in which fatty oils are converted into fatty acids, hydrogenated into fatty alcohols and dehydrated into alpha olefins.

3. From ethylene,

   (a) The catalytic Ziegler process using aluminium alkyls for chain growth-Chevron process.

   (b) A peaked Ziegler process which provides a narrower distribution of chain length in the product - Ethyl process

   (c) Shell Higher Olefins Process (SHOP) - This technology converts ethylene to AO by oligomerisation as in the above (a) & (b). However, since a substantial range of AO produced is outside commercial interest, it takes the low valued lighter and heavier olefins and reacts them to from internal olefins in the desired molecular range by disproportionation.

AOS

Alpha Olefin Sulphonation yields a mixture of sultones and alkene sulphonic acids and is carried out in a film reactor only. The alpha olefin sulphonic acid from the reactor ages in the digestor and reacted with sodium hydroxide in the neutraliser. The neutral slurry is heated and sent to the hydrolyser where the sultones are converted to sulphonates. Film reactors are made by Chemithon, Ballestra, Mazzoni and Meccaniche Morderne.

2.0 STRUCTURE AND STATUS OF INDIAN INDUSTRY

The Gujarat Godrej Innovative Chemicals Limited has set up a 35,000 TPA AO along with 12,000 TPA AOS plant at Valia near Bharuch, Gujarat. The said unit has commenced commercial operation recently including AOS. For AOS, there are three more plants working at present; the 5,000 TPA Godrej Soaps Ltd., Vikhroli, Bombay, the Dharamsi Morarji Chemical Co. Ltd., 5,000 TPA, Roha, Maharashtra and the recently commissioned 12,000 TPA Nirma Plant at Ahmedabad.

The units which are in the pipeline are IPCL's 100,000 TPA AO plant at Gandhar, and Tata Vashisti Detergents Ltd. 10,000 TPA, AOS plant in Ratnagiri, Maharashtra. All the units mentioned above are in organised sector.

The demand of AO for various end uses is expected to be 88,000 TAP by 94-95 and 1,44,000 by 1999-2000, while for AOS it is likely to be 32,000-40,000 TPA 2,000-2,001.

The Indian collaborators who have supplied know-how, plant and equipment for AOS are Eurrestrta Industries Ltd. (Ballestra), Chemithon Engineers Pvt. Ltd. (Chemithon), Mazzindia Pvt. Ltd. (Mazzoni) and K.M. Feil Pvt. Ltd. (Meccaniche Moderne). Only Chemithon is USA based, while the others are based in Italy.

3.0 INTERNATIONAL SCENARIO

Shell, Ethyl, Chevron, Mitsubishi and Idemitsu are the major producers of AO in the world. Shell and Chevron are the world's largest producers of alpha olefins. The primary technology suppliers are Shell, Chevron and Ethyl. The current global demand for AO is put at 900,000 MT and that of AOS about 60,000 - 70,000 MT for various end uses.

The 35,000 TPA GGICL AO plant with limited range AO products primarily for AOS is expected to cost nearly Rs 171.67 crores on the fatty oil technology including 12,000 TPA sulphonation unit. The capital cost of a 45,000 TPA ethylene based AO plant with wider product range is substantial, primarily because of ethylene generating cracker unit. The cost can range from Rs. 810 - 1,890 crores depending on the infrastructure.

4.0 R&D EFFORTS, TECHNOLOGY ABSORPTION AND GAPS

The major R&D in India is being carried out by Godrej Soaps Ltd. who have patented their process on alpha olefin as well as commercialising the same. AO sulphonation units are in operation in India for over six

years and technology more or less absorbed. The draft Indian Standard on AOS is under circulation for comments. There is no Indian Standard on AO.

Major efforts are being made to increase palm oil and palm kernel oil production in the country. As part of the know-why exercise a comprehensive model on sulphonation has been included. The liquid feed loading, the air rate, the cooling water temperature, tube diameter and viscosity effects have been dealt and correlation reported between reactor peak temperature and colour of the product. AO sulphonation film reactors are either proprietary or patented design.

5.0. RECOMMENDATIONS

- For production of alpha olefins three different feed stocks e.g. petrochemicals based ethylene, ethanol or industrial alcohol based ethylene or natural fatty oil may be critically examined for long term economy and sustained activity by the industry.

- Natural fatty oil, renewable resource feed stock bassed AO plant may be given preference if the product is used exclusively for AOS industry.

- Development of market may be undertaken for various AO fractions using petrochemical feed stock which are less likely to be used in the near future, specially the heavier fractions.

- The cultivation of oil palm and nonedible oil which has commenced in certain parts of the country may be persued with concerted efforts by industry.

- Indian soap and detergent industry may consider using more of high biodegradable active matter simultaneously cutting down consumption of TFM and STPP in some of the products, resulting in saving of TFM and minimising eutrophication of water source.

- Sulphonation of AO to produce AOS must only be carried out in falling film reactor and by recognised/registered units.

Only ISI marked AOS may be marketed by AOS producers for use in detergents, personal care products etc. preferably with thorough predictive toxicological testing.

Producers of AOS to adhere to strict production process and use appropriate analytical methods to determine sultones in ppb level. Lion Corporation of Japan have process for the manufacture of AOS having sultone levels less than 100 ppb. This technology may not be available in India. Industry may take necessary steps to acquire relevant instruments/Technology for the same in case considered necessary.