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PRESENT STATUS OF ALCOHOL AND ALCOHOL BASED CHEMICALS INDUSTRY IN INDIA *

by

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PRESENT STATUS OF ALCOHOL AND ALCOHOL BASED CHEMICALS INDUSTRY IN INDIA ---By K.D. SHARMA

1.0 ALCOHOL

1.1 PRESENT STATUS: The production of alcohol was taken up in India initially with a view to utilize molasses available from sugar factories as a by-product. In 1931, about 19 distilleries were set up having a total production of 3.7 million litres. Between 1931 and 1947 the production of alcohol increased to 60 million litres. Between 1947 to 1960, the number of distilleries increased to 51 with a production figure of 81 million litres. Thereafter upto 1966 due to increased availability of molasses and growing demand of alcohol, production reached a level of about 195 million litres. Now, there are about 101 distilleries in production with an installed capacity of about 600.0 million litres. Production of molasses and alcohol achieved during the last 5 years are as follows:

YEAR	MOLASSES MILLION TONNES	ALCOHOL MILLION LITRES
1973-74	1.825	367.97
1974-75	2.015	400.60
1975-76	1.800	408.19
1976-77	2.215	445.23
1977-78	3.000	500.00
1978-79 (estimated)	3.020	537.00

1.2 RAW MATERIALS: As indicated earlier molasses is the main raw materials used in India for the production of alcohol at present. The yield of molasses in the country is in the range of 40-45% of the sugar production. One tonne of sugar factory molasses yields about 220-240 litres of alcohol. The production of alcohol is, therefore, directly related to the sugar production in India. The estimates of production of sugar by 1982-83 are of the order of 6.5 million tonnes, which will give over 3.0 million tonnes of molasses.

1.3 PRODUCTION OF ALCOHOL BY 1982-83:- As there is considerable scope for technological improvements and increase in efficiency, it is expected that by 1982-83 the recovery of alcohol from molasses will improve upto 250 litre per tonne of molasses. The conservation of molasses will also continue to improve with better storage facilities. The actual production is therefore expected at a minimum of 600 million litres by 1982-83.

1.4 TECHNOLOGY FOR THE PRODUCTION OF ALCOHOL: Molasses contain 50% sugar, of which the total fermentation sugar is 45% and 5% is non-fermentable. The molasses are diluted to the required strength and acidified with sulfuric acid in large fermentation tanks of mild steel. The requisite amount of yeast and a nutrient, like ammonium sulfate, is added. Fermentation takes place with the evolution of carbon dioxide and heat. In most

cases carbon dioxide is allowed to escape into the air. Fermenters are cooled by spraying cool water outside their walls. The process of fermentation is complete in about 36 hours, yielding 6-7% of alcohol in the wash. The wash liquor is steam distilled to recover the alcohol. The distillation is done in two stages by two different distillation columns known as an Analyser and Rectifier. At the end of rectification, 95% alcohol is obtained, which is called rectified spirit. For most applications, rectified spirit is quite suitable and is used with or without denaturants. If 99.5% alcohol or absolute alcohol is required, rectified spirit is further distilled by making azeotropic mixture with benzene.

The overall efficiency of operation of alcohol distillery is a combination of the fermentation efficiency and distillation efficiency. The fermentation efficiency is usually in the range of 71% to 86%, the distillation efficiency in the range of 95% to 98% and the overall efficiency 72 to 88%.

1.5 EFFLUENT TREATMENT: The distilleries discharge on an average 15 litres of spent wash per litre of rectified spirit produced. The B.O.D. of the spent wash is around 40,000 mg/litre. The concentration of dissolved inorganic solids is also high. Spent wash is kept in anaerobic lagoons and allowed to degrade over a period of 35 to 60 days. At this stage B.O.D. contents is reduced to about 3000. This residual waste is diluted with fresh

89 water to bring down the B. O. D. content to the required standard and used as water for irrigating sugar-cane fields. A few distilleries are using cow-dung for anaerobic biodegration of spent wash in lagoons over a period of 45 to 60 days.

1.6 PRICES: The prices of Ethyl Alcohol (industrial alcohol) are regulated by Government under the Ethyl Alcohol (price control) Order, 1971. The present ex-factory prices effective from 31.10. 1975 are as below:-

(Rs. /Kilolitre)

	Before 31.10. 1975	After 31.10. 75
Absolute alcohol 100% strength	250.50	668.41
Rectified spirit 100% strength	242.37	622.20
Rectified spirit 94.68% strength	229.47	589.10

(The distilleries are also permitted to charge a maximum price of Rs. 150/kl. on account of the cost of transport of molasses incurred by them).

1.7 CONSUMPTION PATTERN: The present consumption pattern of alcohol is as follows:

Industrial	.....	310 million litres
Potable	.....	170 million litres
Exports	.....	20 million litres
T O T A L	.....	500 million litres

Further approvals have been accorded for the establishment of units of chamicals based on alcohol as feedstock. The demand from these units on the basis of maximum utilization of capacity is assessed at 120-130 million litres of alcohol per annum.

1.8 PRESENT PROBLEMS:

(a) The raw material availability for this industry depends upon sugar-cane plantation and the utilisation of sugar-cane by the sugar factories. To the extent that sugar-cane goes for the production of jaggary etc., the availability of molasses is reduced.

(b) The efficiency of the alcohol industry needs improvement. While an average yield of 225 litres/per tonne of molasses is considered as reasonable, very few distilleries have reached this level or exceeded it. In some distilleries recovery of alcohol has come down to only 180-200 litres/tonne of molasses.

(c) Pollution control measures require modernisation.

(d) The industry has represented that the present prices of rectified spirit are quite unremunerative. The industry has sought relief either by decreasing the price of molasses or by a substantial increase in the prices of rectified spirit. The present price of molasses at Rs. 60 per tonne includes charges for the construction of molasses storage tanks at a rate of Rs. 20 per tonne .

2.0 ALCOHOL BASED CHEMICAL INDUSTRY.

2.1 ALCOHOL AS FEED-STOCK: Ethyl alcohol is a chemical which can be converted into ethylene or acetaldehyde, both of which are starting materials for synthetic chemicals. In this respect, it can be compared with naphtha, which is an alternative source for the production of such chemicals. However, alcohol has an advantage over the petroleum feed-stock because it is derived from renewable resources. It has been widely accepted that in a matter of decades, available stocks of petroleum all over the world could be much reduced and that we should look for alternative sources. While in the case of alcohol every year through the crop of sugar cane the supply of alcohol can be regenerated. Fortunately, India is one of the largest producers of sugar cane and therefore India can be one of the largest produsers of alcohol. The second advantage is that it can be locally available. The cultivation of sugar cane can be spread far and wide and in almost all parts of our country alcohol can be generated. This is not the case with petroleum. The third advantage is that plants utilizing alcohol as feed-stocks are less capital intensive and fall in medium scale category. In contrast with Naphtha the fewer by-products are formed with alcohol as a feed-stock and the plants are therefore less complicated. The fifth advantage is that the downstream units of alcohol based industries can be in small scale sector and spread all over the country because alcohol itself is available over a wide area.

2.2 PRESENT STATUS: Alcohol is basically utilized for the making of certain basic building blocks, like acetaldehyde, acetic acid, ethylene, acetone and various other chemical products. Present installed capacity of various chemicals based on alcohol in the organized sector is given below. In addition to this, a few chemicals are also produced in the small scale sector. It is estimated that around 300 million litres per annum of alcohol is being consumed at present by these chemical industries.

ALCOHOL BASED CHEMICALS

Products	No. of Units	Installed capacity tonnes	Production in 1976 tonnes	Capacity utilization %
Acetic Acid	9	29220	24984	85.5
*Acetic Anhydride	5	11770	5700	48.4
Butyl Acetate	4	8730	3781	43.3
Ethyl Acetate	8	6390	4915	76.9
Monochloro acetic acid	4	6900	3652	52.9
Pentaerythritol	2	1800	298	16.5
DDT	2	4200	4527	107.8
Styrene	3	33000	21061	63.8
Polyethylene	1	13000	13000	100
Acetone	1	1500	30	2

1.	2.	3.	4.	5.
Butanol	3	8250	3522	42.6
Butadiene	1	25200	10462	41.5

2.3 ECONOMICS OF USING ALCOHOL AS A FEEDSTOCK: The Government of India had set up a Committee to make a comprehensive study relating to the growth of industries based on alcohol. The Committee has given a comparison of feed stock cost element of alcohol-based and petro-based products and this is reproduced below.

COMPARISON OF FEEDSTOCK COST ELEMENT OF PRODUCTS:
ALCOHOL-BASED AND PETRO-BASED

	Alcohol Base Feed stock cost element Kilolitres	Rs./MT	Ethylene/Propylene Base Feed stock Cost element Tonnes	Rs/MT
Acetaldehyde	1.3	1300	0.67	2010
Acetic Acid	1.25	1250	0.74	2220
Acetone *	2.6	2600	1.04*	3120
Butanol*	1.9	1900	0.8*	2400
2 Ethyl Hexanol*	3.3	3300	1.0*	3000
Ethylene	2.7	2700	1.0	3000
Styrene	0.7	700	0.32	960
Butadiene**	2.6	2600	1.00*†	3000
Vinycloride	1.2	1200	0.5	1500

NOTE * : The figures for Butanol and 2 Ethyl Hexanol via Petrochemical source are deceptive because synthesis gas is required as additional feedstock, which will mean additional naphtha requirement and therefore, a feedstock cost element increase by at least 30%.

** Made from Propylene by petrochemical route by-product from Naphtha Cracker.

BASIS

Alcohol at delivered cost of Rs. 1/- per litre

Ethylene/Propylene at Rs. 1000/-per tonne.

The table above shows a guideline only to the preferential utilization of alcohol as feedstock as against naphtha-based feedstock. This does not represent at all the total cost of production of these chemicals.

It will be seen from the table above, that there are certain areas where alcohol definitely is a better and a cheaper feedstock than naphtha derived ethylene/propylene. We have assumed here, however, that although ethylene/propylene will cost Rs. 2,500/-per tonne to make, even for captive consumption, they will charge Rs. 3,000 per tonne to a user plant in order to ensure some sort of return on investment. Note that the products from Naphtha craker such as ethylene, propylene, butadiene and benzene have been jointly costed at the same value mainly Rs. 3,000/- per tonne delivered to the customer.

It can be seen that the feed cost element itself is a clear indicator of the areas in which alcohol has definite advantage over naphtha/natural gas and areas in which less priorities could be given to alcohol and in fact petrochemical growth could be encouraged. Although, for example, the cost of feedstock element in manufacture of ethylene from alcohol appears to be slightly lower, the economy of size of naphtha craker/optimum energy utilisation could well make Naphtha Cracker more viable than alcohol. Therefore, areas such as ethylene, styrene, and vinyl chloride should be given less priority and in fact for such chemicals, Naphtha/Natural Gas Plants should be given preference. However, in the areas such as acetaldehyde, acetic acid, acetone, butanol, 2-ethyl hexanol definitely, the stress should be on alcohol and in fact naptha-based petrochemical units for such chemicals should not be allowed as they form the basis of unfair monopolistic competition against alcohol. It has been argued by most petrochemical units that propylene should not be costed at Rs. 3,000 per

tonne but at almost fuel value to make either Acetone or Butanol or 2-Ethyl Hexanol more economically viable.

The time has come to look at the whole picture from international trend viewpoint and to respect porpylene to the extent that it is correctly utilized. In fact, today propylene is charged at a much higher price than fuel and almost as high as ethylene in the international market purely because most of the propylene is going towards the manufactures of Polypropylene. It may, therefore, not be economical to use propylene for the manufacture of chemicals which could more easily be made from alcohol,thereby diverting the propylene for the manufacture of Polypropylene.

2.4 PRESENT PROBLEMS:

(a) Alcohol based chemical industry have been finding difficulties in getting regular supplies of alcohol throughout the year. The processes are of continuous nature and if disrupted for want of alcohol, the production efficiencies suffer as during a shutdown and start-up, the raw material is wasted.

(b) The price paid for the alcohol by various industries varies from Rs. 0.80 per litre to Rs. 1.5 per litre from state to state. This is due to a wide variation in the taxes as well as variety of levies imposed by various states.

(c) In some cases alcohol has to be transported over long distances. This adds to the cost and causes irregular supplies due to non-availability of transport facilities in time.

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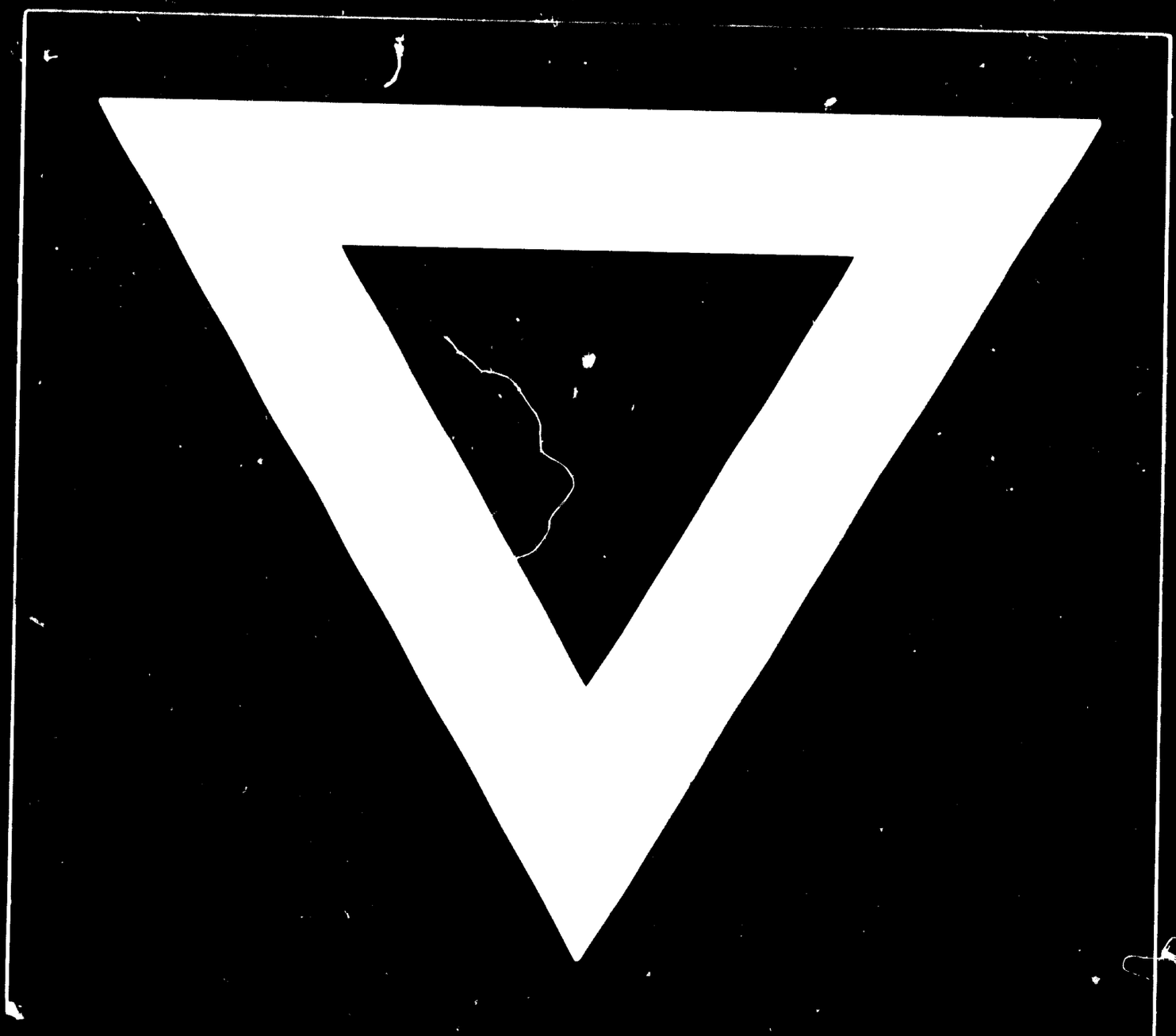

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