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05103

Distr.
LIMITED

ID/WG. 158/17
June 1973

ORIGINAL: ENGLISH

United Nations Industrial Development Organization

Expert Group Meeting on the Development
of the Synthetic Rubber Industry

Snagov, Romania, 25 - 29 June 1973

CARBOXYLATED BUTADIENE COPOLYMER LATEX 1/

by

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A. THE MARKETS FOR 'SPECIALITY' LATICES

Investigation by experts of detailed plans and long term projections of those plans, for consumer type products with reference to local economic [illegible] essential. Tariffs, transportation problems, irregularity of supply coupled with a production unit adjacent to an existing synthetic rubber plant can make a versatile speciality polymer unit an attractive investment possibility.

Should a developing country consider exporting end-products such as tufted or needlepunched carpets, non-woven fabrics, or paper based products, competitive high quality binders are essential.

In the U.K., synthetic latex production reached 92,000 dry tonnes for 1972. Of this some 57-58,000 tonnes was of the carboxylated latex types mainly for tufted carpet backing, textile applications and paper coating consumption, both for home demand and export. U.K. consumption for total synthetic latex was 56,100 tonnes in 1972 with exports of 48,866 tonnes.

Doverstrand Ltd. started production in 1963 with an available market then of less than 3,000 dry tonnes and our share of that market is now in excess of 25,000 dry tonnes.

Of course, this has been largely related to the growth of tufted carpet production which in 1972 was approximately 88 m m^2. The U.K. carpet industry consumed during that period 42,500 tonnes of latices of all types. Synthetic latex principally of the carboxylated types accounted for some 37,000 dry tonnes.

By comparison, West Germany produced only 1.3 m m^2 of tufted carpet in 1957 and currently produced approximately 95 m m^2 during 1972.

Many of the developed countries faced during the late 1950's and early 60's the situation which many developing countries are already facing or will face before the end of the next five years. Some figures quoted from "Rubber Statistical News" give the current situation viz.:

(i) in the U.K. 30% of synthetic rubber is sold as latex (90,000 t out of 307,000 t);

(ii) in Western Germany 18.5% (56,000 t out of 300,000 t);

(iii) in the U.S.A. 7.5% (185,000 t out of 2,455,000 t).

Totals: 332,000 t latex out of 3,162,000 t i.e. around 10.6%.

From the above it can be seen that some developing countries may be approaching the stage where a versatile specialit/ latex polymer plant may be planned for if not initiated now.

B. MANUFACTURE OF CARBOXYLATED BUTADIENE COPOLYMER LATEX

1.0 Introduction

This note is intended to summarize the costs and returns of building and operating a plant to produce carboxylated butadiene copolymer latices.

The main fields of application are plain and foamed backing for tufted carpets; paper and board coating and impregnation; fabric backing and stiffening; needlefelt binding and backing; and a wide variety of general adhesive uses.

Raw materials are:

Butadiene

Styrene

Acrylonitrile

Methyl Methacrylate

Various unsaturated Carboxylic acids

Various surfactants and modifiers

Antioxidants

Polymerization is achieved by radicle catalysis in aqueous dispersion of the monomers. It is normally carried out in glass-lined pressure reactors at controlled temperatures, the reactions proceeding usually to 95% conversion of the monomers. The residual monomers are stripped by evaporation or steam sparging under vacuum, leaving a latex which can then be stabilized and finally treated with the antioxidants and surfactants appropriate to the final end use of the latex.

Finally, the material is shipped either in bulk rail, road or sea-tanker, or in drums.

2.0 Capital Costs for Battery Limits Plant

These are shewn for a single reactor and for a 2 reactor plant. Capacities are also shewn. Costs are estimated at today's prices.

Number of reactors	1	2
Annual tonnage (dry metric)	2,500	5,000
	K£ Sterling	
Mechanical equipment	175	235
Piping & Valves	105	141
Instruments	35	47
Electrics	70	94
Insulation & Painting	8	11
Civil Works	53	71
Temporary facilities	35	47
Total site costs	481	646
Design	72	97
Procurement	14	19
Total erected cost	567	762
Contingency allowance	57	76
Gross fixed capital cost	624	838

3.0 Utility suppliers ex-battery limits

It is assumed that the following services will be available in the quantities indicated:

Service	Quantity per dry tonne latex
Steam	3.5 tonnes
Electricity	600 KW
Raw Water	40 tonnes
Demineralized water	2.5 tonnes
Cooling water	500 tonnes circulated
Plant air (8 Bar)	200 standard cubic feet per minute
Instrument/Medical air (6 Bar)	200 " " " "
Inert Gas (8 Bar)	70 " " " "

No allowance has been made for effluent treatment, as this depends on site conditions.

4.0 Building Size and Requirement

Because of the hazardous nature of some of the raw materials, local regulations may influence site area and building size. In the estimates made, a building of 5,000 m^3 (= say 14x30x12m high) has been allowed.

For this, a site area of approximately 50x100m should suffice.

No allowance has been made for laboratory facilities, as the need for these will vary with site conditions.

5.0 Operating Costs

On the basis of most recent experience, the costs of operation of a large SBR latex plant, including technical testing, maintenance, utilities, supervision and administration would be approximately £40 per dry tonne at full capacity. This excludes any provision for depreciation of plant, or other fixed costs such as insurance.

For a small scale plant, one might reasonably expect, at full capacity:

One reactor : £70 per dry tonne

Two reactors: £60 per dry tonne.

Assuming depreciation at 10% per annum on full capital cost, we would then have works on-costs of:

One reactor : £95 per dry tonne

Two reactors: £77 per dry tonne.

6.0 Raw Material Usage and Costs

This can be looked at only on an average basis. Taking a standard formulation of:

Butadiene	48.5 parts
Styrene	48.5 parts
Carboxylic acid	3.0 parts
Other additives	4.0 parts
Total	104.0 parts

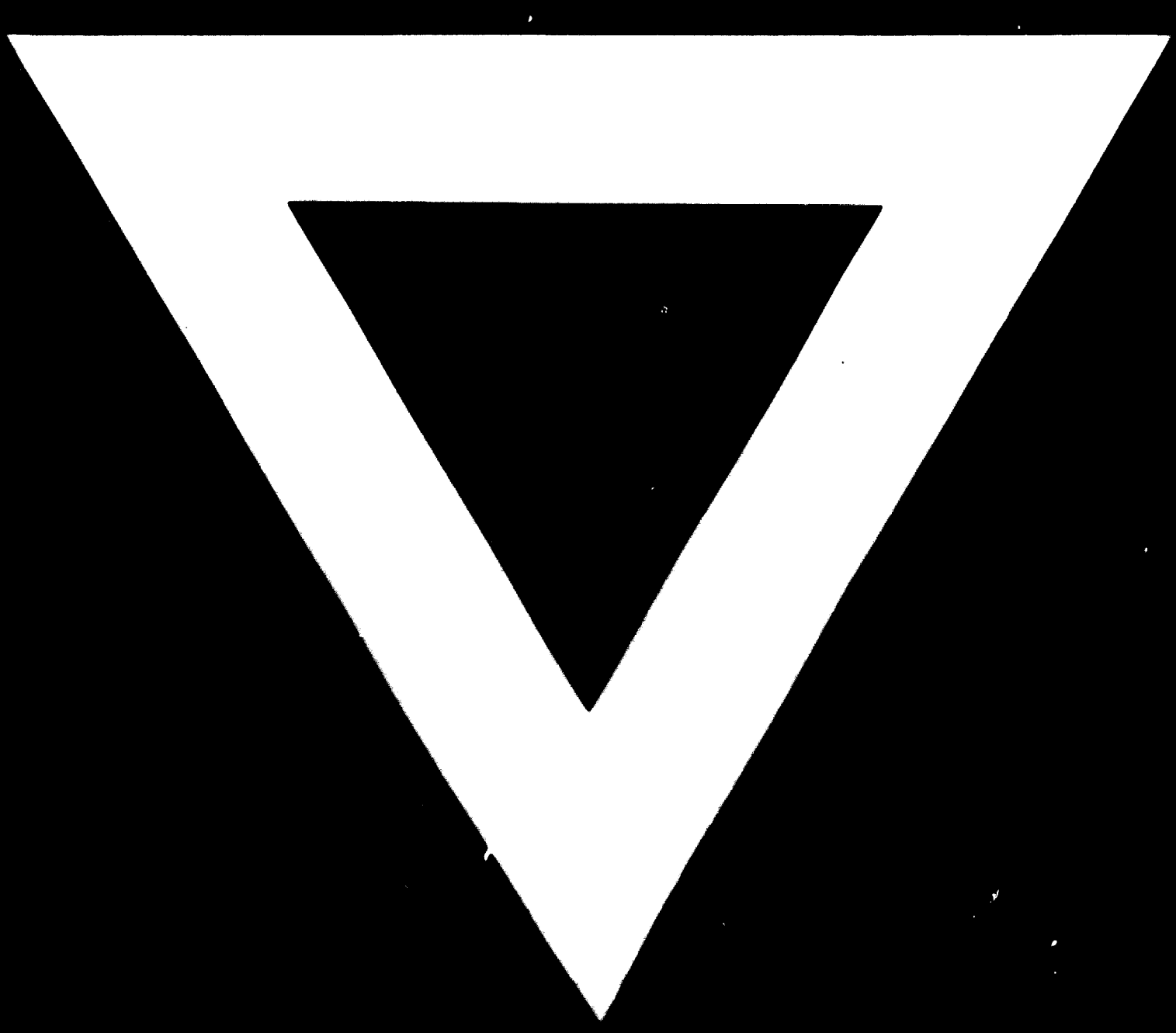
At a yield of 91%, the materials charged would produce 94.64 parts dry latex as finished product.

Taking roughly projected costs for 1974 of, say, £80 per tonne for Butadiene, and £130 per tonne for Styrene, and a total on the basis of cost in finished product for all other raw materials of £35, we then have a total cost of finished product of £142.6 per dry tonne.

7.0 Projected Profit Statements

Let us assume a naked ex-works selling price of £280 per dry tonne. Then at full capacity we have:

	1 Reactor	2 Reactors
	£/tonne	
Ex-works Sales	280.0	280.0
Less Raw Materials	142.6	142.6
Works costs	70.0	60.0
Depreciation	25.0	17.0
Total Works Costs	237.6	219.6
Gross Ex-works Margin	42.4	60.4



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