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presented by

[illegible] them

[illegible] rapidly [illegible] expansion [illegible] approximately [illegible]

[illegible] production [illegible] as [illegible]

[illegible] of about [illegible] filament has grown [illegible] represents about [illegible] of the total

[illegible] the [illegible] nylon are a substantial [illegible]

[illegible] responsible for its progress. Its [illegible] into more [illegible] use and [illegible] by nylon [illegible] year. [illegible] with other fibers, [illegible] from [illegible] of yarn [illegible] of [illegible] employment [illegible] provides [illegible] lity and pilling

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Baku, USSR, 20 - 31 October 1969

PET. SYMP. D/4

SUMMARY

COMPETITION BETWEEN POLYESTERS AND NYLONS AND THEIR FUTURE PROSPECTS 1/

presented
by

T. Tetsuo

Technical Committee of Japan Chemical Fibres Association

The production of nylon and polyester in Japan in 1968 was about 210,000 tons and 180,000 tons, respectively. Both fibers showed about 20 percent increase annually. Nylon filament, with a remarkable increase, accounted for about 94% of overall nylon production. With polyester, staple leads in production, in recent years filament has been increasing production and accounts for about 34% of total polyester production.

The production of raw materials for nylon and polyester are based on the petrochemical industry. Their production cost could be expected to be reduced by collaboration with the petrochemical industry. Meanwhile the Japanese producers have been exerting efforts to improve production processes and to utilize new processes. These factors will

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...d be possible cost reduction in the production of both fibers. At present, ...th fibers are produced by melt spinning, but new processes are being ...eloped such as continuous polymerization, direct spinning or high-speed ...tinuous spinning without drawing process.

Nylon has many good properties: excellent dyeability, strength, ...eriority in elastic recovery and small young's modulus. Polyester has ...e valuable properties: better blending with other fibers, perfect ...ture resistance, excellent wrinkle resistance, high resistance to heat ...particular conditions necessary for dyeing.

Nylon is used for industrial materials with a share of about 30% ...use of its excellent strength. Especially, in the sector of the tire-... nylon is predominant with a share of about 9%. Nylon is also used ...ly for apparel and interior materials, as woven or knitted fabrics, ...ially soft fabrics made with textured yarn.

Polyester is also used widely for apparel and interior materials. ...lyester staple is mainly used for various kinds of apparel by blending ...th other fibers. In recent years, however, polyester filament is used ...r outerwear because of the unique qualities of its fabrics made with ...tured yarn. Polyester has presently a small share of industrial materials, ...with its excellent properties it is expected to be used much more in this ...ld in the future.

Nylon and polyester are the leaders in the synthetics fields. However, ...se fibers are being used in different fields because of their unique ...acteristics. While they are competitive in some fields, as a whole they ...expected to develop in the course being complementary to each other ...cause of their properties.

Table 1 Output of Synthetic Fibers in Japan

Unit 1000 tons

Year	Total Synthetic Fiber			Nylon			Polyester		
	F	S	Total	F	S	Total	F	S	Total
1955	7.2	8.5	15.7	5.7	2.4	8.1			
56	12.9	15.9	28.8	10.3	5.0	15.3			
57	20.3	21.3	42.4	16.3	5.8	22.1			
58	23.1	23.0	46.4	19.1	4.0	23.1	0.5	2.5	3.0
59	34.5	46.3	80.8	26.4	4.6	31.0	2.6	11.3	13.9
60	46.7	71.6	118.3	33.7	6.6	40.3	4.5	17.9	22.4
61	62.9	90.2	153.1	42.0	7.5	49.5	9.5	27.8	37.3
62	77.7	105.0	182.7	51.4	6.3	57.7	13.5	33.3	46.8
63	108.6	130.6	239.2	72.0	8.0	80.0	18.3	43.5	62.3
64	160.4	181.9	342.3	109.6	9.5	119.1	27.0	58.6	85.6
65	165.6	214.0	379.6	107.1	10.9	118.0	33.5	64.9	97.4
66	200.1	260.4	460.5	134.2	11.8	146.0	37.0	83.7	120.7
67	256.0	322.0	578.0	174.9	12.8	187.7	48.2	103.7	151.9
68	297.4	388.0	685.4	201.0	13.8	214.8	61.4	120.0	181.4

F: Filament

S: Staple

[illegible] Production Processes

[illegible] for Nylon 6 [illegible] or phenol, [illegible] however [illegible]

[illegible] exane. [illegible] by the [illegible]

[illegible]

[illegible] glycol [illegible]

[illegible] which the [illegible] various pro- [illegible] techniques [illegible] shown in [illegible] improvements. [illegible] the SD process [illegible] raw [illegible] material are

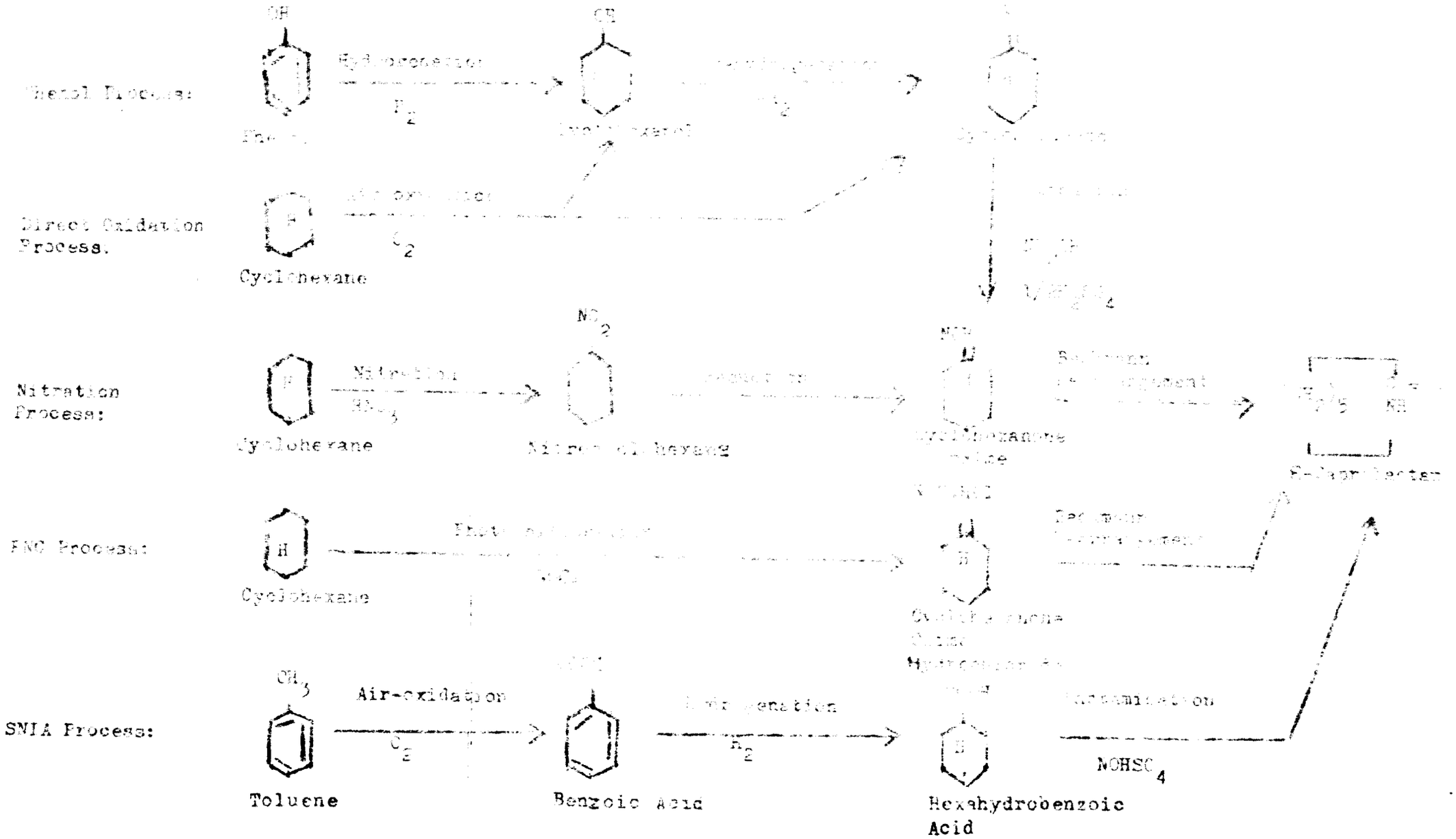
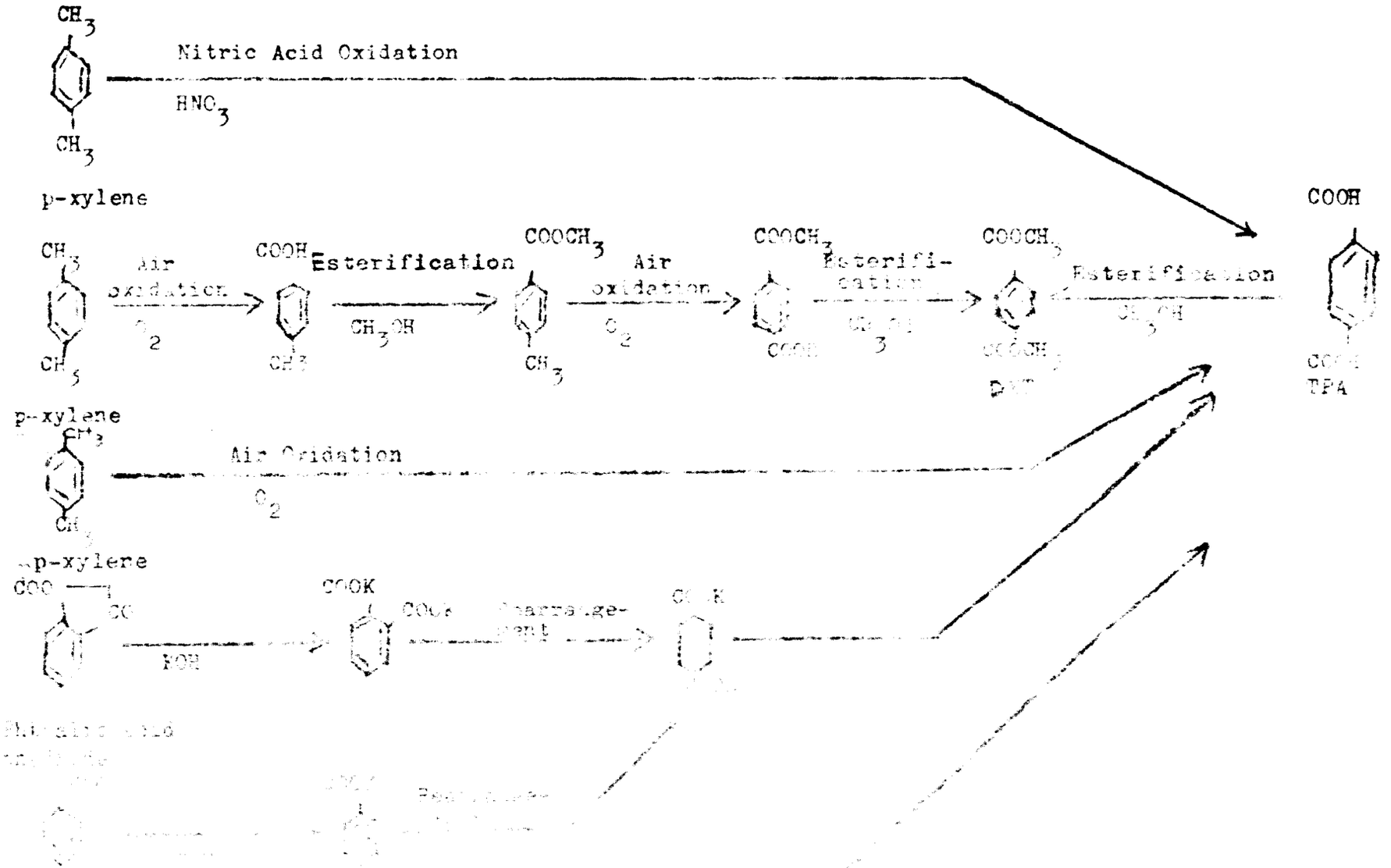

Phenol Process:
Direct Oxidation Process.
Cyclohexane
Nitration Process:
Cyclohexane
FMC Process:
Cyclohexane
SNIA Process:
Toluene
Benzoic Acid
Hexahydrobenzoic Acid
$NOHSO_4$

Figure 2 Various Routes to TPA and DMT Synthesis



[illegible] of Fiber [illegible] Processes

[illegible] ester [illegible] produced by the melt-spinning process. Pro- [illegible] classification of the polymerization [illegible] and drawing process. A direct spin- [illegible] is also employed. [illegible] making [illegible] melt-spinning after dry- [illegible] purposes [illegible] a direct [illegible] also employed. [illegible] polyester, [illegible] employed in the field of staple. This [illegible] of equipment because polyester does not [illegible]

[illegible] temperature [illegible] point [illegible] tempe- [illegible] secondary transition point of approxi- [illegible] drawn [illegible] Various properties [illegible] imparted to [illegible] spinning, drawing [illegible] treatment conditions [illegible]

[illegible] processes is toward [illegible] combination [illegible]. It is also [illegible] yarn. [illegible] anti-static yarn [illegible] spinning [illegible] the [illegible] simultaneous [illegible] step, the [illegible]

[illegible] the method of [illegible] into one continuous step is under develop- [illegible] this process will reach commercial production in the [illegible] future. A further advanced study is an approach to obtain [illegible] spinning by passing over the drawing [illegible] help to reduce plant installation area,

[illegible] lingerie, underwear,

[illegible]

[illegible] be one of

[illegible] In

[illegible] skin,

[illegible] wear and

[illegible] Entry

[illegible] stockings

[illegible] socks,

[illegible]

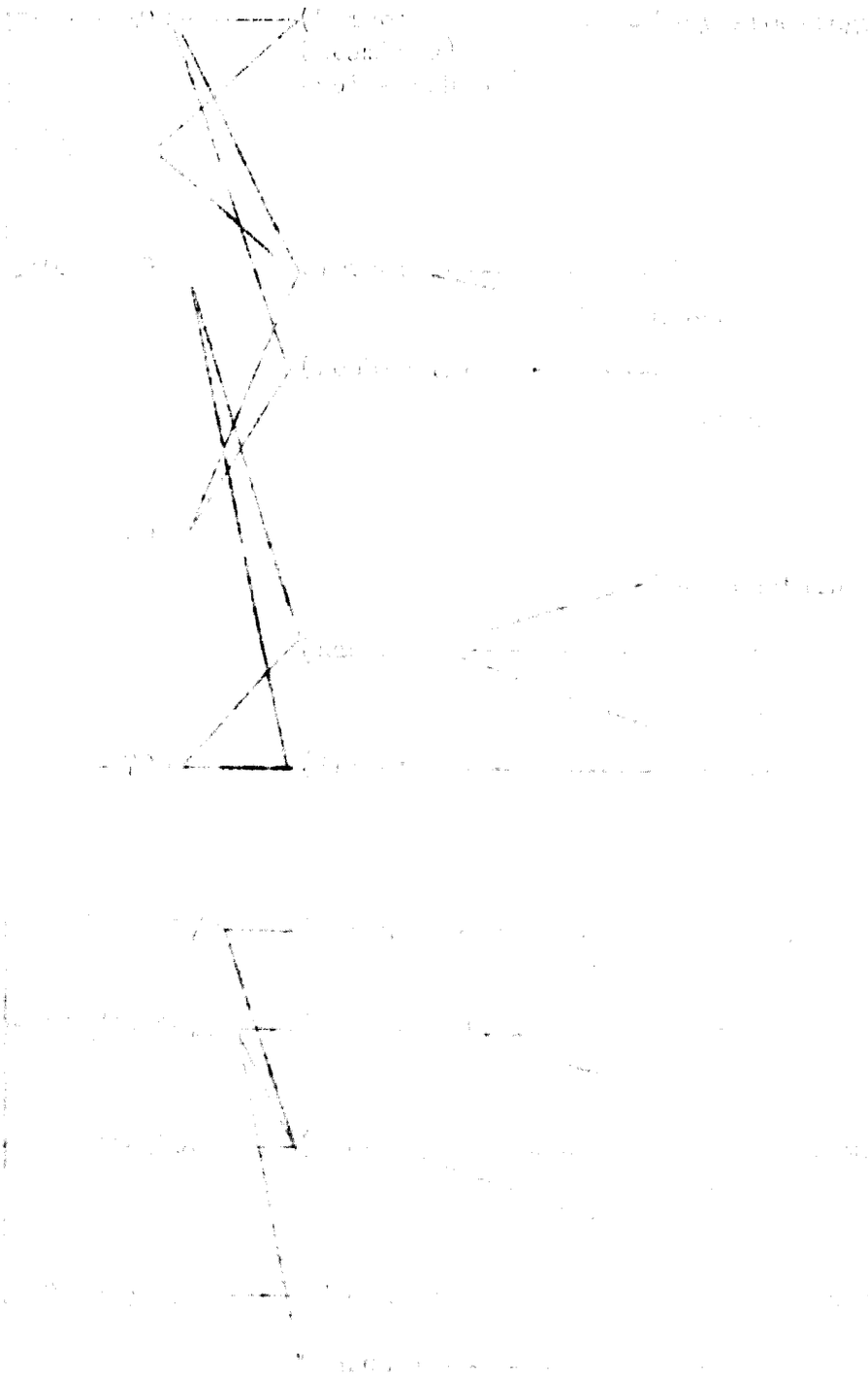
[illegible] types

[illegible]

[illegible] on.

[illegible]

[illegible] charac-



[illegible] and blankets are examples of use.

[illegible] upholstery, curtains, carpets, [illegible] cloths, [illegible], [illegible] sheets, and cushions.

[illegible] tufted carpets as well as woven carpets are being [illegible] for these [illegible] introduc- [illegible] antistatic [illegible] overcome the [illegible] the further advance of nylon in these appli-

[illegible]

[illegible] industrial applications [illegible] its biggest [illegible] abrasion resistance [illegible] combination with other [illegible] insulation properties and chemical [illegible], fishing [illegible] sheets, [illegible], parachutes,

[illegible] recognized

[illegible] Nylon [illegible] However, [illegible] total [illegible]

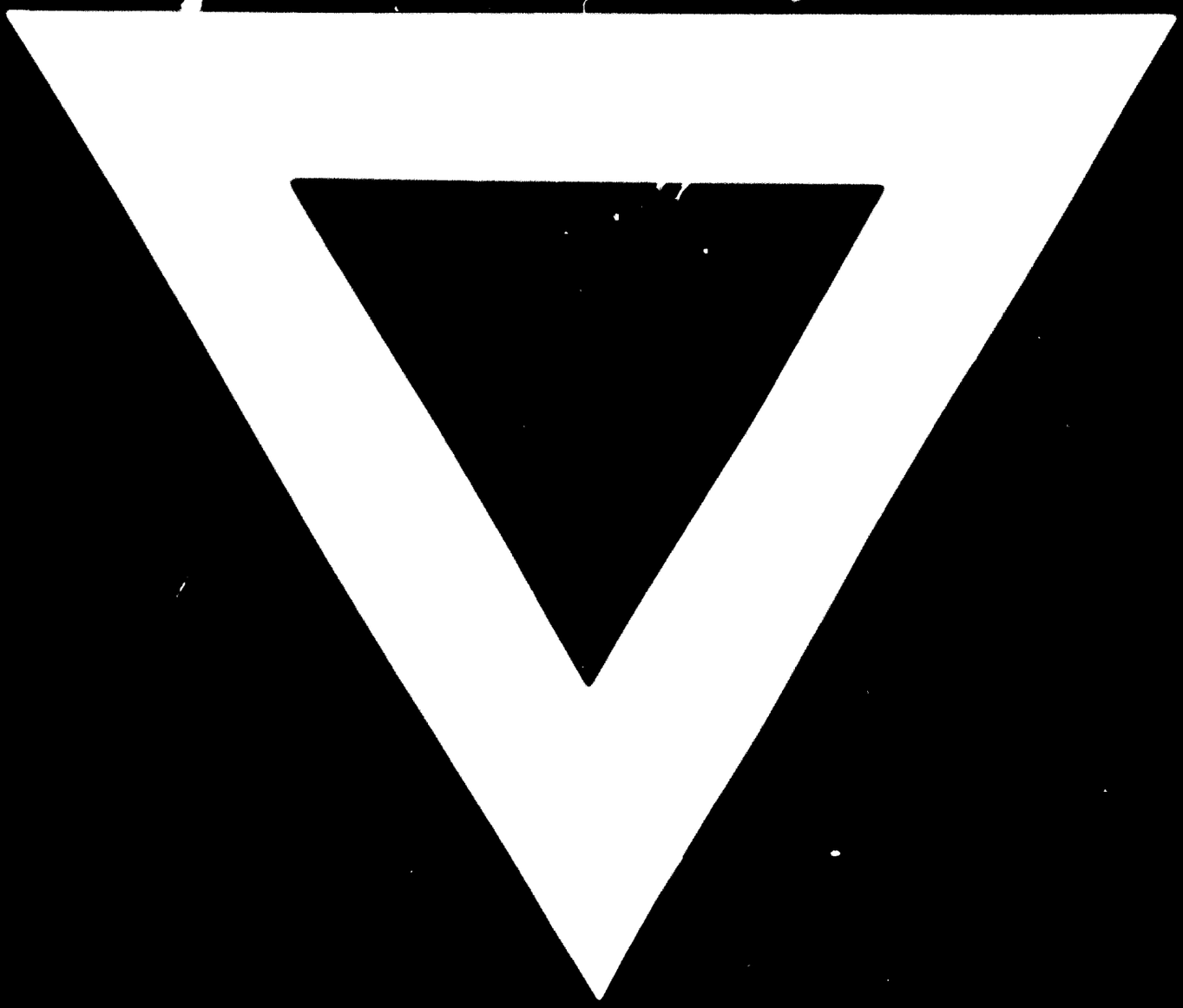
[illegible] highly appraised [illegible] industrial materials [illegible], and in car- [illegible] that nylon will [illegible] further growth in [illegible]

[illegible]

[illegible] suited as raw material for non-woven [illegible] cloth, lining, filters and [illegible] material

[illegible]

[illegible] produces and piece washing is [illegible]



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