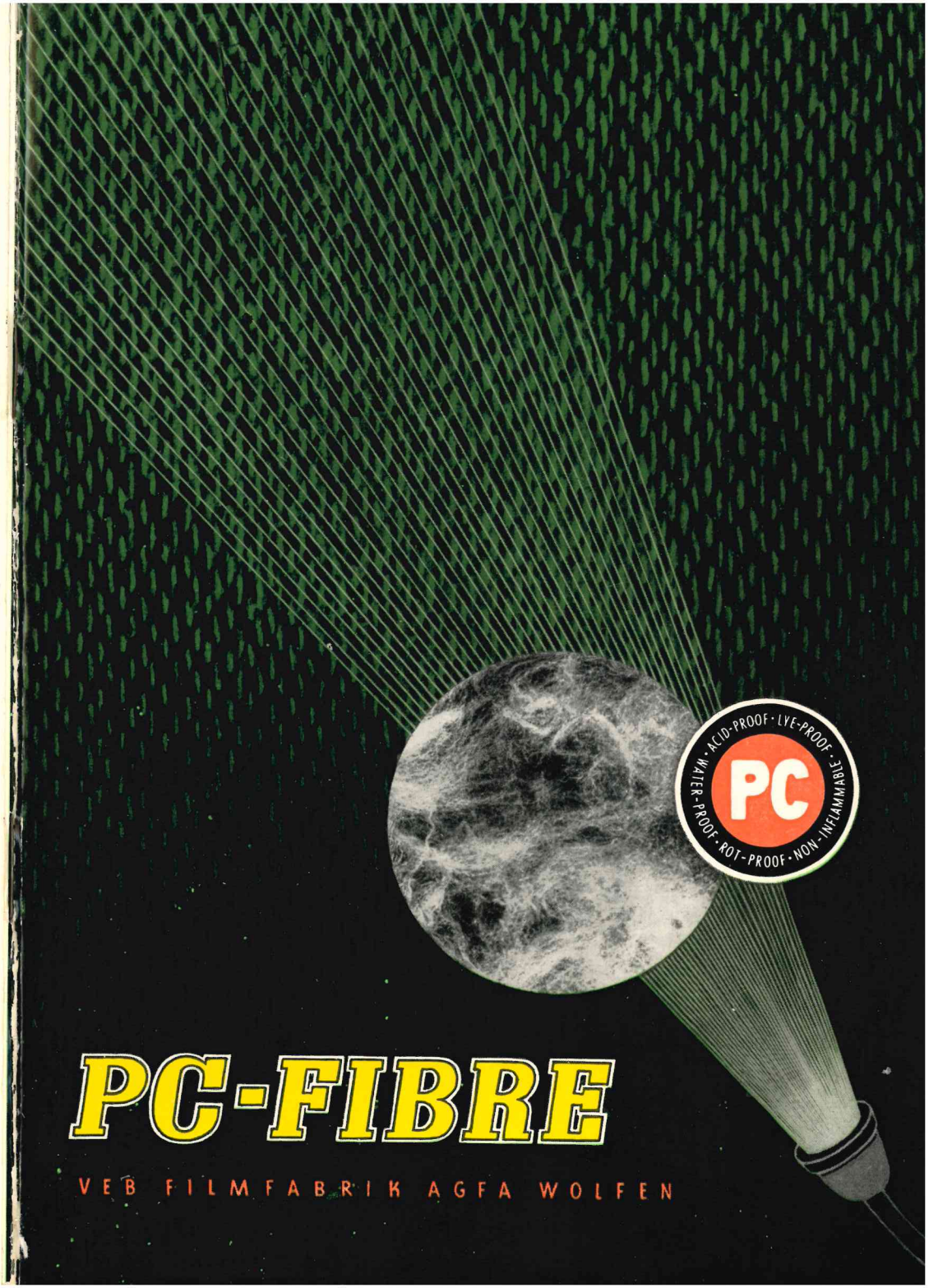

PC
ACID-PROOF · LYE-PROOF · WATER-PROOF · ROT-PROOF · NON-INFLAMMABLE
PC-FIBRE
VEB FILMFABRIK AGFA WOLFEN

PC-FIBRE

acid- and lye-proof

water- and rot-proof

non-inflammable

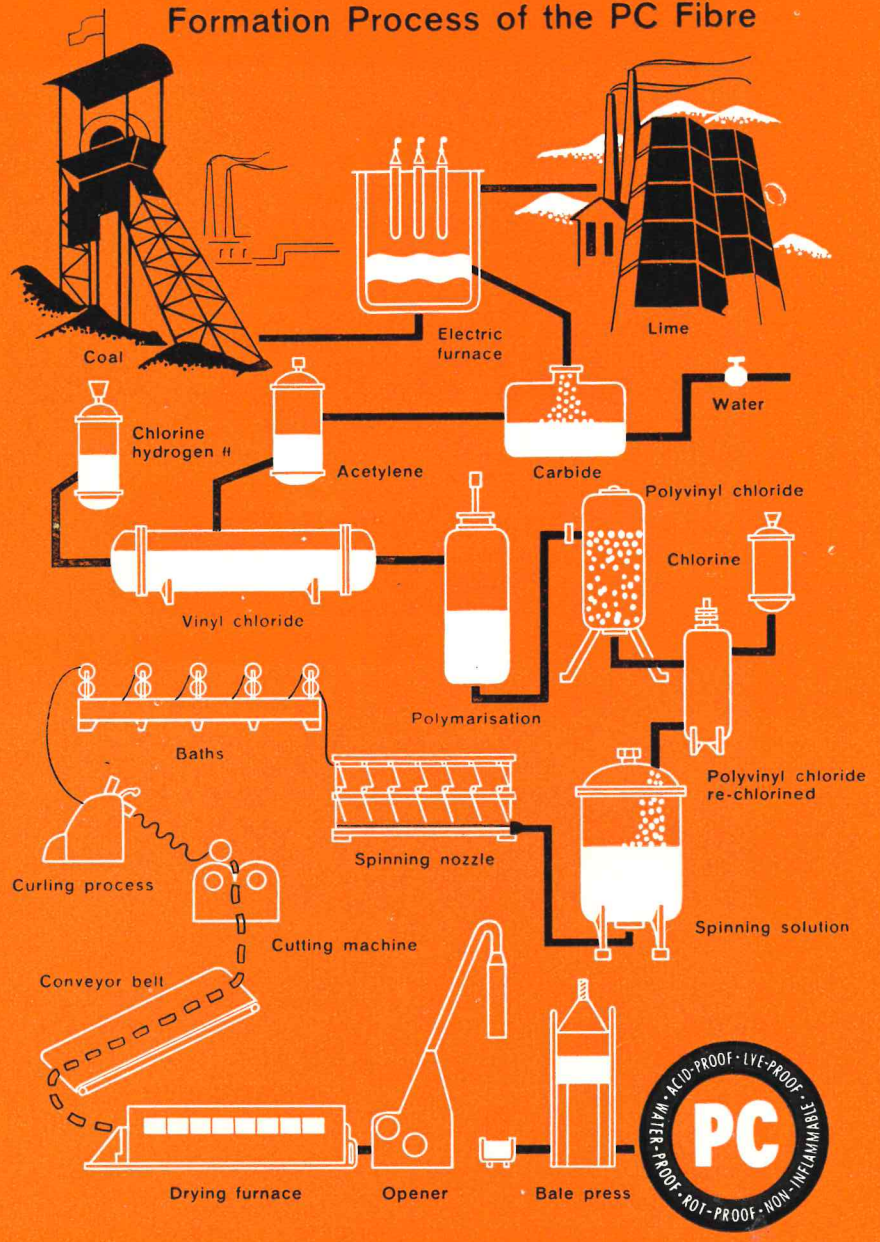
The PC FIBRE manufactured since 1938 on a large scale by the Filmfabrik AGFA Wolfen excels, thanks to a great number of extremely valuable features, the well-known natural and artificial fibres.

It is
1. completely insensitive to water,
2. of equal firmness in dry and wet state (⌀ 17 Rcm),
3. extremely resistant to acids, alkalis and further aggressive chemicals,
4. utmost rot- and decay-proof,
5. non-inflammable,

It has
6. a high elasticity and
7. a high heating and isolating capacity.

Due to the application of thermoplastics as raw material for production, the PC fibre is sensitive to temperatures. Consequently temperatures above 70° C must not be employed; otherwise the quality of the material will be affected. For the time being the PC fibre will be delivered in staple lengths of 40, 60 and 100 mm of approx. 2400 Nm and in curled state. It can easily be worked up according to the carded resp. worsted yarn spinning method, if the inclination to electrostatic charge is reduced by sufficiently high relative humidity of the work halls or by keeping the fibre moist.

Formation Process of the PC Fibre



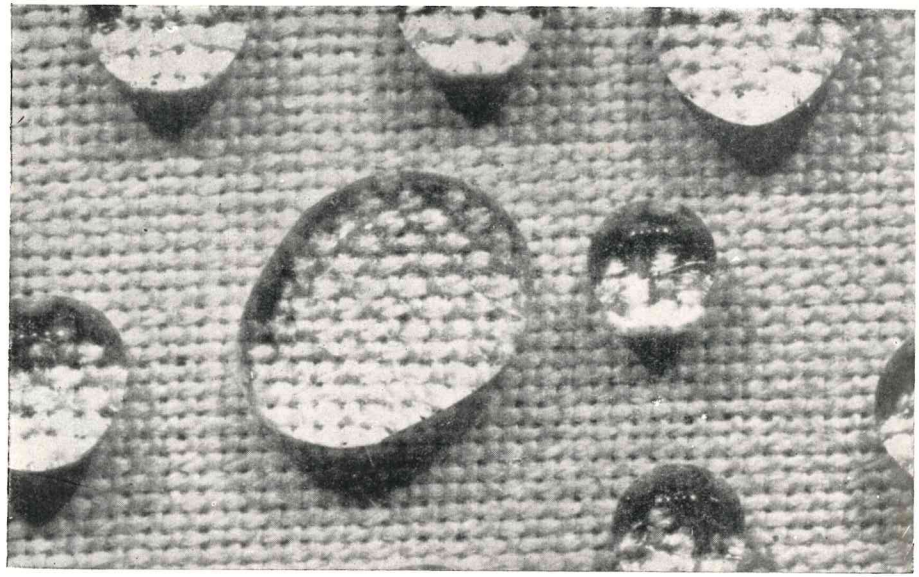
Owing to its outstanding properties the PC fibre has many fields of application in the German industries, e. g.

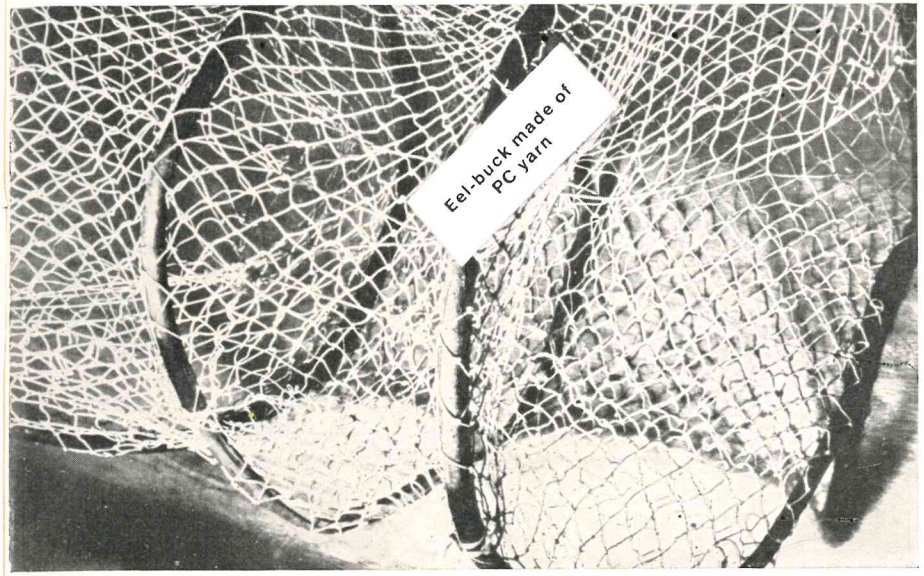
1 Utilization of the water insensibility
Production of water-resistant tilts, hatch covers, life-belts, cords etc.

2 Utilization of the resistivity to chemicals
Production of filter cloths, diaphragms, packing cords, protective clothing for workmen etc.

3 Utilization of the rot proofness
Production of yacht rigging, nets, sail-cloths, tent bottoms, etc.

4 Utilization of the non-inflammability
Production of decoration and covering fabrics for museums, of theatre side-scenes and curtains, of textile furnishings for ships.





5 Utilization of the low heat conductivity
Isolating material for tropical tent cloth (termite-proof), refrigerating plants, refrigerators.

6 Utilization of the heat reserving and the electrostatic capacity
Production of anti-rheumatism underwear and of blankets as well as quilt fillings.

The anti-rheumatism underwear well-known by the trade-mark „Vylan" is very comfortable in wear and has a soft feel. Physicians and persons suffering from rheumatism emphasize that the heat reserving of the „Vylan" fabric has, same as cat skin, soothing and partially even curing effects.
It must be observed, however, that the PC fibre is of thermoplastic origin and that the textiles should only be washed and dried at temperatures below 60—65° C, as prescribed for pure-woolen knitted goods, too.

Yet the most important feature of the PC fibre is and will be its very high resistivity to acids and lyes which no other natural or artificial fibre attains, apart from the polyvinyl chloride fibre made of PVC. This fact is clearly shown in the following table.

	Resistivity	
	at room temperature judged after 14 days of influence	at 50° C judged after 8 days of influence
Oxidation agents		
Chromium acid solution 20%	very good: at least 80% of the original thread firmness is kept	
Chromium acid solution 40%		
Chromium sulphuric acid	as before	destroyed
Permanganate solution 20%	as before	good: 70—80% of the tensile stength is kept
Chloride of lime, elutriation 10%	as before	as before
Bleaching lye	as before	as before
Hydrogen-peroxide 3%	as before	as before
Hydrogen-peroxide 10%	as before	as before
Hydrogen-peroxide 30%	good: 70-80% of the tensile strength is kept	sufficient: abt. 60% of the tensile strength is kept

	Resistivity	
	at room temperature judged after 14 days of influence	at 50° C judged after 8 days of influence
Acids		
Hydrochloric acid 25%	very good: ad least 80% of the original thread firmness is kept	
Hydrochloric acid, conc.	as before,	good: 70-80% of the tensile strength is kept
Sulphuric acid 50%	very good: at least 80% of the original thread firmness is kept	
Sulphuric acid 66%	as before	as before
Sulphuric acid 75%	as before	as before
Sulphuric acid. conc.	good: 70—80% of the tensile strength is kept	
Nitric acid 25%	as before	as before
Nitric acid 50%	as before	as before
Nitric acid, conc. 65%	as before	as before
Aqua regia		
3 parts HCL : 1 part HNO_3	as before	as before
Nitrating acid		
1 part H_2SO_4 : 1 part HNO_3	as before	as before
2 parts H_2SO_4 - 1 part HNO_3	as before	sufficient: abt. 60% of the tensile strength is kept
Acetic acid 50%	as before light swelling	good: 70-80% of the tensile strength is kept, light swelling
Perchlorine acid 40%	very good: at least 80% of the original tensile strength is kept	good: 70-80% of the tensile strength is kept
Perchlorine acid 60%	as before	as before
Phosphoric acid 25%	as before	as before
Phosphoric acid 50%	as before	as before
Fluorine hydrogen acid 40%	as before	as before
Oxalic acid 7½%	as before	as before
Formic acid 50%	as before	as before
Formic acid, conc. 99—100%	as before	as before

	Resistivity	
	at room temperature judged after 14 days of influence	at 50° C judged after 8 days of influence
Various salt solutions		
Sodium bisulphite solution 30%	very good: at least 80% of the original tensile strength is kept	
Sodium bisulphite solution 40%	as before	as before
Chlorine zinc solution 40%	as before	good: 70-80% of the tensile strength is kept
Iron trichloride solution 40%	very good: at least 80% of the original thread firmness is kept	
Iron trichloride solution 20%	as before	as before
Lyes		
Soda lye 18%	as before	good: 70-80% of the tensile strength is kept
Soda lye 30%	as before	as before
Soda lye 50%	as before	as before
Potash lye 18%	as before	as before
Potash lye 30%	as before	as before
Potash lye 50%	as before	as before
Ammonia conc. abt. 25%	as before	as before

The resistivity to chlorine and sulphureous acid in very high concentrations is limited; phosphorus and sulphuric chlorides as well as chlorine sulphone acid have dissolving effect on the PC fibre. Among the organic combinations benzine, aliphatic alcohols and methanol, ethanol, glycerine, etc., as well as oils and greases are indifferent to the PC fibre, whereas chlorinated hydro-carbons, esters, ketons and aromates have mostly swelling effects.

Technical Properties of the PC Fibre

(according P. A. Koch-Wagner and to own examinations)

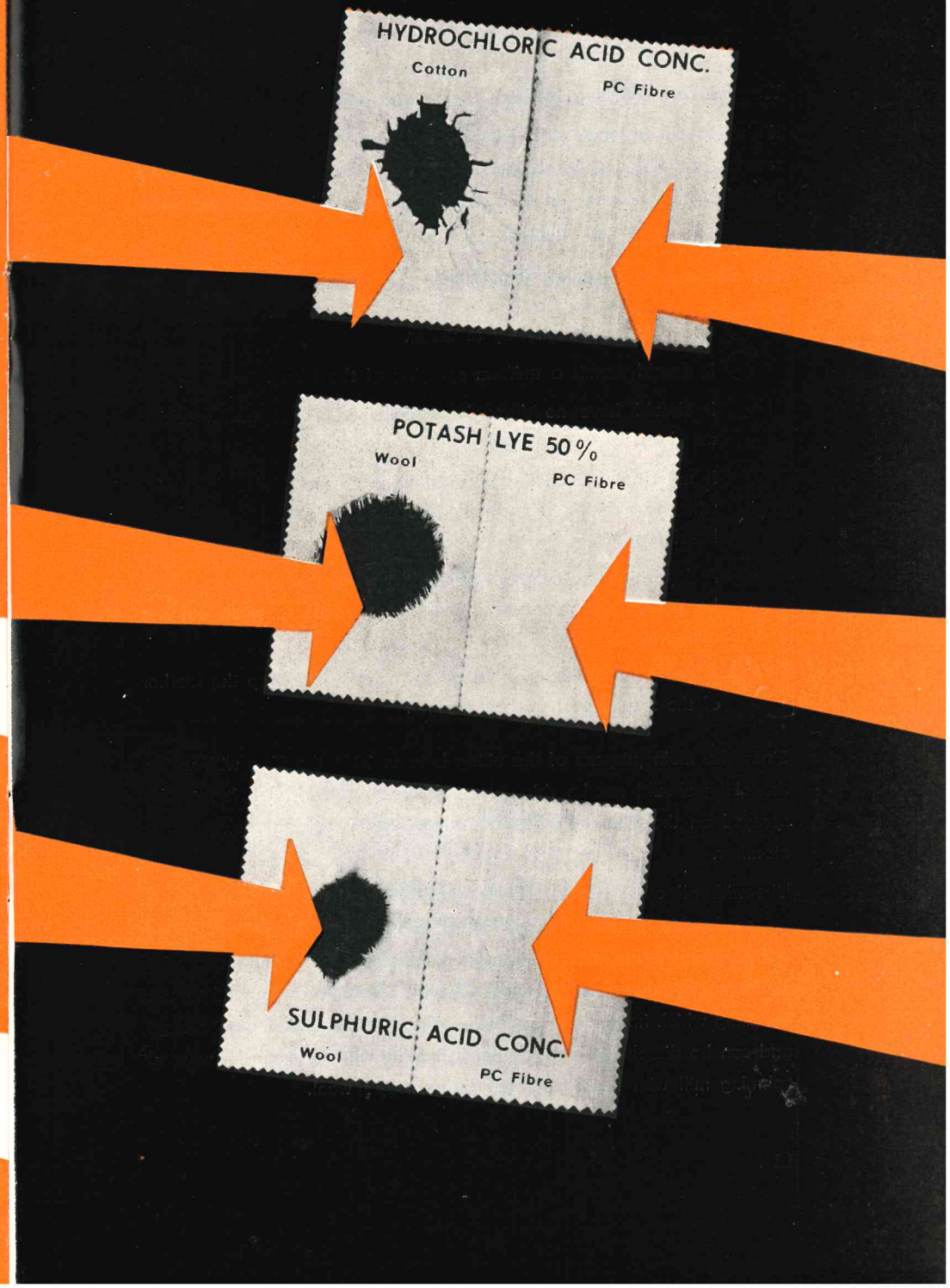
Material	Specific gravity g/m³	Fibre fineness Nm_F	Dry firmness Rcm	Dry firmness kg/mm²	Rel. wet firmness %	Breaking elongation % of E. L. dry	Breaking elongation % of E. L. wet	Rel. loop firmness %	Degree of elasticity %	Moisture content at 65% of rel. air humidity %	Torsion brittleness acc. to P. A. Koch, breaking distortion angle °	Heat conduction figure 2 kcal/m. h. °C *)
PC	1,44	2400-2500	17-18	24-26	95-100	38-46	38-46	44	40	0,4	45	0,036

Pure Spinning of the PC Fibre

Owing to its extremely high electric insulating capacity in conjunction with the very low water absorption, the PC fibre is to a large degree liable to electrostatic charge. This charge is generated on the fibre surface by the least friction and cannot be shunted in time. To reduce this inconvenience the PC fibre which hardly absorbs water by itself, is provided with a hygroscopic preparation which permits by keeping water a compensation of the charge along the fibre surface and among the fibres themselves as well as a leakage against earth. This preparation developed by the manufacturers of the fibre becomes effective when the spinning rooms contain a sufficiently high air humidity (75—80% of relative moisture) at 25—27° C. The high temperature is required in order to avoid a moisture deposition on the machine members.

PC-FIBRE

acid-proof · lye-proof · rot-proof
water-proof · non-inflammable



Worsted Yarn Spinning Method

If due to the absence of a full-automatic air conditioning or to other reasons an electrostatic charge of the fibre causes difficulties in the manufacturing process, an oiling of the fibres will in most cases make possible a faultless spinning.

The oiling to be employed should have the following properties:

1. The oiling must emulsify in water.
2. It should permit a uniform spraying of the fibres.
3. It should have no damaging effects on fibres and machine members.
4. It must not reduce the fibre adhesion so much that difficulties will occur during the working process in consequence of band breakings etc.
5. A deposition or smearing of the oiling on leather or paper should be prevented; moreover it must be possible to wash out the oiling easily.
6. A certain fat content of the oiling is desired to keep the leather of the respective machines flexible.

Since the main purpose of the oiling is to moisten the fibre with water, the oiling should not be dripped on in concentrated state. It must be sprayed on the fibre by means of a pressure or even a high-pressure atomizer.

Like with all other synthetic fibres, the curling of the PC fibre, too, is not so durable as that of sheep's wool. Though the PC fibre is supplied with a spin curling, this curliness is diminishing more and more with an increasing number of passages. Therefore it is recommended to use an oiling which improves the adhesion. Besides, the fibre is pure enough and can be dissolved so easily that it may be worked up in the worsted spinning mill with fewer passages than sheep's wool.

In case of fine spinning the fibre is suitably combed, with Romaine figures of 1,5—2,5% to be obtained. The selection of the right spinning paper resp. pressure cylinder coat is of certain importance, depends, however, very much on local conditions, so that no general directions can be given. The standard maximum spinning productiveness of the fibre (Nm 2400/100 mm) is at Nm 40—48. As mentioned before it is recommended to use in the worsted spinning mill fewer passages than for sheep's wool. A spinning plan cannot be specified because the machine assortments in the worsted spinning mills are differing very much from each other. We advise to look for the most favourable working result by performance of test spinnings.

Carded Yarn Spinning Method

The specifications given in section „Worsted Yarn Spinning Method" are here applicable, too.

Cotton Spinning Method

As expected, the spinning of the PC fibre is in cotton mills more difficult. The carding effect which is at cotton cards essentially higher than at worsted and carded yarn cards, renders it very difficult to remove the very high electrostatic charge of the PC fibre by means of oiling. The air conditioning must be altered, too, and the relative air humidity as well as the temperature should be essentially higher.

As the PC fibre is softer, it presses itself easier into the fittings of the cards and is therefore more liable to smearing (filling of the fittings). The manufacturing of the PC fibre Nm 2400/60 mm (coarse strength — long staple) yielded favourable working results. Since the local conditions are different, too, a test spinning will show the best working method.

Occurring Defects

The difficulties in the manufacturing process specified in the table below have been removed by a permanent improvement of the PC fibre. Should one or the other defect occur, however, due to improper treatment, this table will be useful to find out the suitable remedy.

Defect	Cause	Remedy
Strong fly formation	too little thread curling or electrostatic charge	Re-oiling
Rust formation on machines, particularly on spinning rings	a) Disintegration of acid constituents from the fibre b) Unfit oiling	a) In general no remedy; an experiment of oiling with tri-ethanolamin (3% on fibre) resulted in a reduction of the rust formation
Sticky coat on thread guide, deflection machine, pressure roller, etc.	Smearing of the preparation	Keep thread guide as smooth as possible (chromium-plated). Clean the components with 10 grams of trilon per litre of water
Fleece rupture on card	too little curling	Attach a guide sheet or re-oil
Strong winding and sticking at iron parts	Electrostatic charge	Re-oiling

Spinning of PC Fibre Mixtures

PC fibre mixtures are best manufactured in the flock, as it is generally known that this mixing technique which comprises a pre-mixing and a further intermixing on the card, guarantees an utmost mixing intensity. In case of PC-cellular wool mixtures, this mixing method has the advantage that the leakage of the electrostatic charge arising at the treatment of PC will be favourably influenced by the added cellular wool. Admixtures of PC up to 30% have not caused any manufacturing difficulties.

Yet for technical and economical reasons it will sometimes become necessary to mix the single fibre components on the headway.

Inclination to Crumpling of the Yarns

It has been mentioned before that, apart from other advantages, the PC fibre is little inclined to crumple. Seeing that the elastic properties depend on the applied raw material and that, consequently, the method of weaving has only an additional influence, thorough tests as to crumpling inclination of the various mixed PC yarns compared with cellular wool and pure PC yarns have been made.

The figures given in the following table show in comparison to cellular wool that already small PC admixtures may improve the crumpling properties. All figures of the pure PC yarn prove most clearly the advantageous crumpling properties of this fibre.

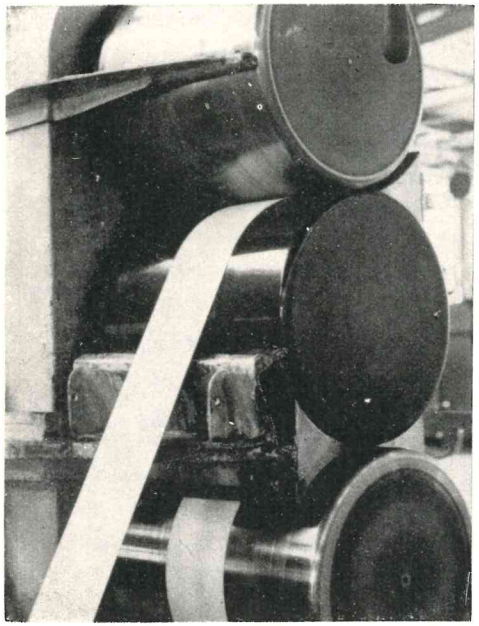
Yarn Crumpling Angle of a Yarn belonging to Nm 40 (505 T/m) of PC-Cellular Wool Mixtures

Load at winding: Standard load = 20 g/100 den
Spinning time on the frame: 1 h; recovery time: 24 h

Designation	Number of measurings	Crumpling angle in degrees		Recovery %
		immediately measured average values	after recovery average values	
Vistra WKR . . . . . Nm 3300	100	64,3	89,1	21,6
10% PC Nm 2400 . . . . . 90% WKR Nm 3300	100	81,1	114,3	31,0
20% PC Nm 2400 . . . . . 80% WKR Nm 3300	100	82,7	114,4	32,3
30% PC Nm 2400 . . . . . 70% WKR Nm 2400	100	89,8	122,7	36,5
PC Nm 2400	100	97,8	130,7	40,0

Dying of the PC Fibre

As described before, the fibre is completely insensitive to water and therefore to a certain degree resistant to the penetration of dyes. Moreover, a temperature of 70° C must not be surpassed at the dying process. Thus an addition of a swelling agent (eulysin PC, remol PC, etc.) will be required, whereas the dispersion dyes, f. i. celliton fadeless dyes, are particularly preferred for dying.



From the manufacturing process of the PC fibre:
Part of the band street

For dying an admixture of 1—2% eulysin PC, related to the weight of the fibre to be dyed, is employed. Before adding the dye it is recommended to pour eulysin PC slowly into the hot dying bath and to stir it thoroughly, thus obtaining a milky emulsion. The celliton fadeless dyes are put on with at least ten times the water quantity having a temperature of max. 40° C. Then the fibre is dyed at a temperature of 60° C without any further admixtures.

Presently extensive works in the line of dying technique are going on which justify the expectation that before long a useful and economical solution will be found permitting to dye the PC fibre also with dyes of other classes and to obtain better degrees of fastness in the medium and dark tints.

Achievement of Water-Proofness

For this purpose the usual products on paraffine base with or without addition of argillaceous earth are to be used. The fibres must be treated in the corresponding solutions at temperatures up to 60° C.

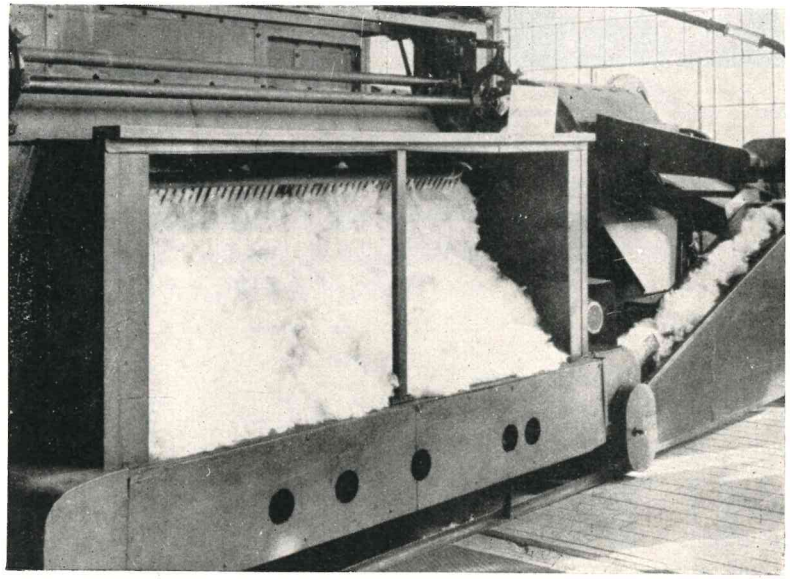
Applications of the PC Fibre

In spite of its outstanding features, the PC fibre was up to now mostly applied in the technical sector.

Because the PC fibre has a low temperature resistivity and starts shrinking at about 70° C, it seemed to be unfit for textile production. If the fibre is suitably used, however, i. e. with regard to its temperature sensitivity and its limited dying possibility, it may serve, owing to its excellent heat reserving capacity, its low inclination to crumple and its good form constancy, as a valuable completion of the already customary textile raw materials.

Applications of PC Fibre Mixtures

The experience meanwhile aquired in mixture spinning of different kinds of fibres has shown that this spinning method combines the advantages of single fibres under consideration of their properties and may thus improve grip, appearance, quality, colour effect and form constancy of the various textiles.

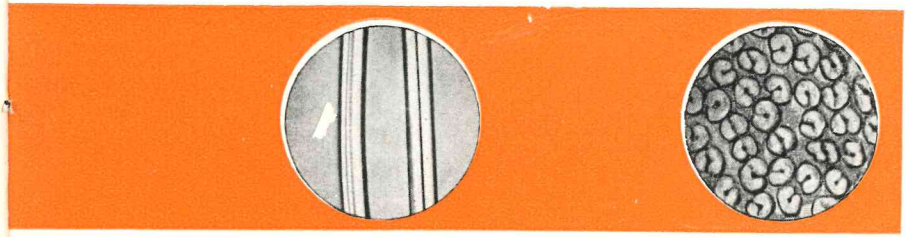


From the manufacturing process of the PC fibre: Part of the drying furnace

Therefore it is to be expected that the admixture of the PC fibre in fixed percentages to the various textile fibres permits to produce yarns resp. tissues which, thanks to their high heat reserving capacity, their low crumpling inclination, their resistivity to moths, termites and beetles etc., their wool-like grip and appearance, possess properties up to now unknown for yarns consisting only of one kind of fibre (fibre component).

The utilization of the shrinking effect, too, which made up till now the application of the PC fibre for textiles uncertain, will mainly in cellular wool-PC-mixtures contribute to achieve a better forming capacity, an easier pleating, a reduction of the fulling times at carded yarn goods with large cellular wool additions and a more favourable manufacture of cloqué tissues. Furthermore spun yarns made of cellular wool are improved by an admixture of the PC fibre in fixed percentages. Compared with cellular wool, these spun yarns have many advantages and resemble extra-ordinarily the mixed wool yarns with a prevailing portion of cellular wool.

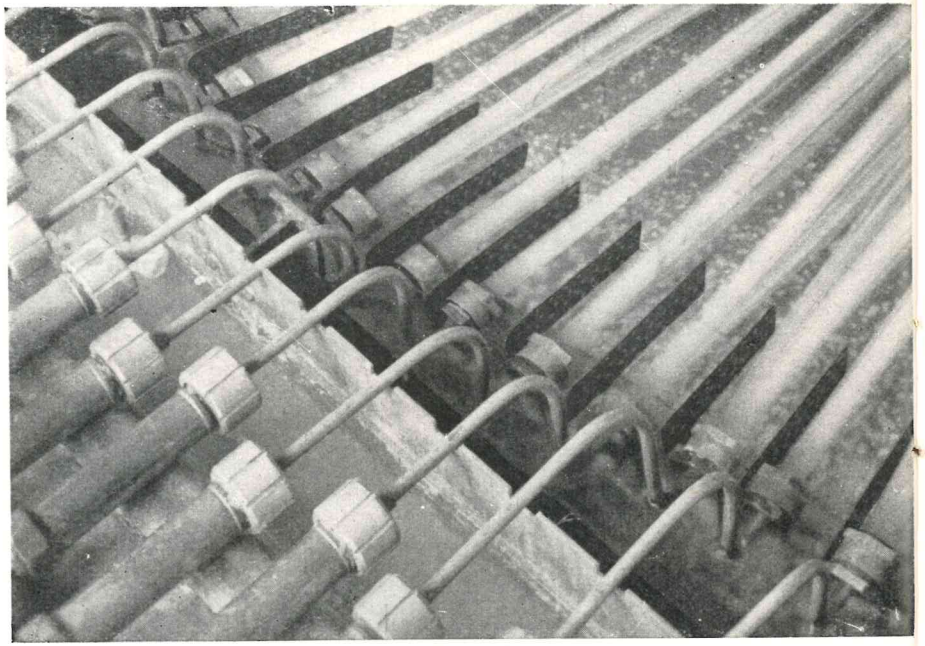
Textile goods made of cellular wool worsted with a portion up to 20% of PC fibre are distinguished by a higher heat reserving capacity, a better grip and a good form constancy. Therefore this material is chiefly used for underwear.



Longitudinal section of the PC fibre in raw-white mixed yarn before manufacturing

Cross section of the PC fibre in mixed yarn after heat influences

The textile industry has the task to check conscientiously the various fields of application with regard to the particular properties of the PC. It stands to reason that the PC fibre with its special features requires new ways of production and equipment. A select working community composed of the fibre makers and a number of dyers and finishers has already yielded good results in technical development and will also solve further problems concerning the polyvinyl chloride fibre. Therefore it can be expected that the PC fibre gains in the textile production an importance similar to that already obtained in technical practice.



From the manufacturing process of the PC fibre: Spinning process

The "Vylan" underwear in the judgement of the physician:

During the experiments with "Vylan" underwear going on since March 1955 we made the following experiences:

The "Vylan" underwear was given to ambulant and to stationary patients suffering from rheumatism as well as to patients with chronically deforming articular diseases. The ambulant patients suffered in most cases from light neuralgic complaints caused by colds and had chiefly pains in the muscular system of the neck and shoulders which radiated to one or the other arm. In several cases a complete cure by wearing the "Vylan" night-gowns twice had been achieved. All patients stated a diminuition of their complaints.

Among the stationa / patients the "Vylan" underwear was distributed to persons suffering from primarily chronically stiffening polyarthritis rheumatica. Besides the night-gowns, knee-protectors, cuffs and kidney protectors, according to the position of the disease, were additionally placed at the patients' disposal. As a matter of course the patients could not be cured from these serious diseases, got, however, essential alleviation which supported the medical treatment in the best way.

Signed: Dr. Taeubner
Medical Superintendent of the Internal Department of the Hospital Leninstrasse
Karl-Marx-Stadt

. . . and what is the opinion of the Research Institute for Textile Engineering?

The "Vylan" products of the nationally-owned hosiery industry have a high portion of polyvinyl chloride fibres (PC).

This fibre is distinguished by a good heat reserving capacity and is inclined to a strong electrostatic charge. The underwear owes its soothing effect at rheumatic diseases to both these features, as confirmed by the examination in the Lenin Hospital, Karl-Marx-Stadt.

A trial test proved a special compliancy, softness and form constancy of the "Vylan" underwear, even after repeated fine-wash treatment. These features of the "Vylan" products, however, are only maintained if temperatures above 70° C are avoided when handling the respective textiles. Otherwise shrinkings of the fibre will occur which cause a hardening of the knitted goods.

Research Institute for Textile Engineering
of the Ministry for Light Industry Karl-Marx-Stadt
Signed: W a l t h e r , Institute Director,
Engineer-in-chief, Deserving Engineer of the People

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