

SYNTOSIL A NEW PAPER-TYPE MATERIAL

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IHB Note. — The Zurich Paper Mill on Sihl sent us the following note written by its assistant director, which we are publishing below for the information of Review readers.

From the very beginnings of paper manufacture until recent times, vegetable fibres — known as *rags* — were used as the raw material. Around the middle of last century, they were more and more replaced by fibres derived from wood — cellulose and wood pulp produced mechanically — which at present constitute the principal raw material.

The advent of man-made textile fibres gave rise to the desire to use this fibre material in the paper industry as well. The reason is that man-made fibres display properties which are in many respects greatly superior to those of natural vegetable fibres.

However, the attempts at producing an adequate fleece from synthetic fibres long failed to succeed. While a suitable grinding process lends natural fibres the property of forming a solid fibre fleece, the man-made fibre, which is of an entirely different nature, lacks this property. The problem therefore arose of developing the bonding power peculiar to the cellulose fibre in the synthetic fibre as well. Close collaboration over the years between the research team of the Société de la Viscose Suisse at Emmenbrücke, the manufacturer of synthetic fibres, and the Zurich Paper Mill on Sihl, finally brought the problem to a happy solution and evolved a process which enables the product to be manufactured in large quantities on a paper machine. A paper-type material manufactured on the basis of synthetic fibres and having unique properties is now marketed under the trade-mark *Syntosil*.

Syntosil is long past the stage of laboratory tests; the Zurich Paper Mill on Sihl now produces it industrially in various weights and colours. According to the selection of the synthetic materials, the desired properties may be modified in certain ways.

The name Syntosil is composed of the words synthetic (synthetic fibres) and Sihl (name of the river which flows into the Limmat in the City of Zurich and on which the Zurich Paper Works are situated).

The history of the Zurich Paper Mill on Sihl can be traced back to 1471. It thus incorporates centuries of a paper-making tradition. Today the Zurich Paper Mill on Sihl is a small, very progressive paper mill specializing in the manufacture of high-grade paper.

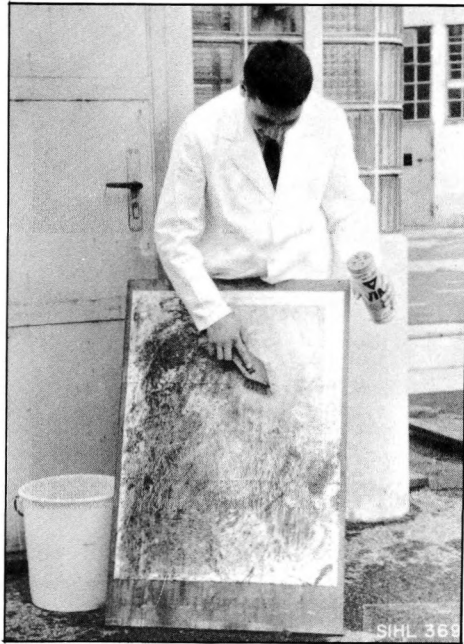


FIG. 1. — Cleaning a map printed on Syntosil.



FIG. 2. — A Volkswagen containing four people hanging on Syntosil.

The outward appearance of Syntosil is similar to that of conventional paper. Like the latter, Syntosil will take writing, painting and printing.

The characteristic advantages of Syntosil reside mainly in its surprising resistance. While normal cellulose paper can be folded, for example, in both directions about one thousand times before breakage occurs, Syntosil will withstand twenty thousand double folding processes in the transverse direction and as much as one hundred thousand in the longitudinal direction. Attached to two rolled-up sheets of Syntosil a Volkswagen holding four passengers can be lifted off the ground.

A very impressive feature of Syntosil is its wet strength. As everyone knows, water has so far been the arch-enemy of paper. With Syntosil, however, the strength increases in the wet condition. While a folded sheet of Syntosil can be torn with some effort when dry, it is almost impossible to do so when it is wet; its tearing strength is doubled. The resistance to impacts of wet Syntosil rises to 140 % of its dry value. Moreover, Syntosil proves to be highly resistant to chemical action. Treatment with 12 % caustic soda or 4 % hydrochloric acid solutions at 20° for 48 hours could hardly affect it, and tensile and tearing strength increased by as much as one third. A further property of Syntosil is its degree of resistance to soiling, quite apart from the fact that it can be washed : a washing process performed ten times in suds formed by dissolving 5 g soap per litre of water at 60° C resulted in an improvement, if anything, in the mechanical properties.

None of these treatments in any way affected Syntosil's ability to take ordinary and Indian ink.

Syntosil is further distinguished by the excellent absorption of printing inks and by its wear resistance. In the usometer, a device for testing wear resistance, the print on conventional map paper in dry condition revealed pronounced damage after 200 abrasive passages, while no such traces of wear could be found on Syntosil. The difference is particularly striking in the wet condition : the test performed on ordinary paper revealed that print and paper were total losses after ten abrasive passages; in contradistinction to it the print on Syntosil showed not the slightest flaw after as many as 120 passages. Another feature of interest to the printer is Syntosil's outstanding dimensional stability.

The applications of Syntosil are numerous. It is the ideal material for geographic and nautical maps in constant use and subjected to particular influences, such as humidity and weather. Neither rain, ice, fresh or salt water nor soil or heavy mechanical action can affect such a map. It will stand up to any abuse in any climate and in any weather. A map printed on Syntosil may be folded in either direction tens of thousands of times and the print will remain perfect at the folds and at their intersections — legible down to the minutest symbols. — In order to demonstrate the enormous resistance of Syntosil, a Syntosil map and a map printed on so-called weather-proof paper were run over several times by a heavy tractor on wet natural soil. Repeatedly, the tractor braked suddenly. When the heavily soiled maps were lifted off the ground, the one on ordinary paper disintegrated; but the Syntosil map was washed with a brush and a

detergent, smoothed and dried. It went through it all without any damage whatever.

All these features make Syntosil the ideal material for plans of surveying agencies subject to hard wear and tear, hydrant location plans for the fire brigade and the like. Moreover, Syntosil is excellently suited for identity cards of all kinds, such as driving licences, membership cards etc. Syntosil renders jackets and similar protective devices for such cards entirely unnecessary. Yet another application of Syntosil is its use for labels subjected to much mechanical and chemical wear (e.g. showing work in process in the textile and engineering industries).

It is not yet possible fully to appreciate all the various uses to which Syntosil may be put. It may be suitable for banknotes, as a material used in book-binding, for punched cards and resistant bags.

As man-made fibres are several times more costly than conventional cellulose fibres, the price of Syntosil is considerably higher than that of ordinary paper. The price per square metre is about that of the lowest-priced textiles.

Synthetic raw materials having joined the ranks of conventional natural materials in many other fields, this development has now embraced the field of paper manufacture. The use of synthetic fibres introduces a new era in paper making and is likely to produce papers having properties as yet unheard of for entirely new applications.



Sample of Syntosil