

New Filter Fabrics

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With the price of cotton fabrics nearly tripling during World War II and the advent of the fabulous synthetic fabrics, the beet sugar industry started a search for better filter fabrics, their goal being to reduce costs and reduce down time on equipment for dressing.

In 1947 the Spreckels Sugar Company tried nylon on our toughest service, the hot saccharate filters. Cotton twill blankets lasted only 48 to 72 hours and, since nylon cost 3 to 4 times as much as twill, we had to get over 10 days' service from a nylon blanket to break even—not considering labor and wire costs. No spectacular results were obtained from the first trial but the results indicated that we were on the right track and we gained experience. It was found that cleaning with dilute mineral acid degraded the nylon and it was necessary to keep the blankets wet during interruptions on operations. Later, nylon was tested on the cold saccharate filters and about 90 days' service was obtained compared with an average of 20 days for 15 ounce cotton twill.

In about 1950, the Vinyon N material became available and, because of its chemical resistance characteristics, was not affected by our cleaning acid, and was used extensively on both hot and cold saccharate filters.

Vinyon J-302 was also tested on cold saccharate filters. This particular fabric is suitable for low temperatures only, and phenomenal service life was obtained—279 and 420 days on two blankets. The manufacture of this material in the United States was discontinued, but an equivalent material is available, manufactured under a French patent and is known as Vincel V-1902.

In 1952 the Dynels and Orlons came out. These have proven successful in Steffen filtration, as shown in Tables 1, 2, and 3.

Table 1.—Three-Year Service Record—Cold Saccharate.

No. Used	Style	Avg. Length	Max. Length
7	Dynel No. 2005	175 Days	237 Days
1	Orlon FA-1134	175 Days	175 Days
2	Vinyon N-734	155 Days	181 Days
2	Vinyon J-302)		
3	Vincel V-1902)	277 Days	420 Days
3	15 oz. Cotton Twill	20 Days	

Table 2.—Three-Year Service Record—Hot Saccharate.

No. Used	Style	Avg. Length	Max. Length
6	Vinyon N-734	71 Days	82 Days
12	Dynel No. 2005	97 Days	117 Days
	15 oz. Cotton Twill	2½ Days	

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Table 3.—Three-Year Comparison of Filter Cloth Usage.

Years	Style	Sq. Ft./1000 tons of Molasses	
		Cold	Hot
1943 - 44 - 45	Cotton Twill	719	687
1953 - 54 - 55	Synthetic	47	16

To compare the savings affected by use of synthetic fabrics, we will assume a 100-day campaign of Steffen operation at a 150 ton per day rate, totaling 15,000 tons of molasses worked. (Table 4.)

Table 4.—Savings by Using Synthetic Fabrics.

	15 Oz. Cotton Twill	Dynel No. 2005
Cold Filters out of service	300 Unit Hrs.	12 Unit Hrs
Hot Filters out of service	360 Unit Hrs.	6 Unit Hrs.
Cost of Blankets	\$3360	\$330
Cost of Wire	\$ 820	\$ 52
Additional Labor	\$ 264	\$ 32
TOTAL	\$4444	\$414

Besides the attractive reduction in costs the equipment is available for nearly 100 percent of the campaign.

So far this paper has covered our toughest problem and consideration will be given to the experience with carbonation vacuum filter fabrics.

For preliminary tests of fabrics the 1/10 square foot Oliver disc is often used, but it will only give an indication of filter rates and clarity and not the life expectancy of a cloth. A 1' x 1' drum vacuum filter is also used that can be operated under plant conditions, but if a number of different fabrics are to be compared under identical conditions, a single test unit is not sufficient.

In 1953 Dynel, Orlon, and Vinyon blankets were tested on a full scale filter. These cloths were of the same weave as that used successfully on Steffen filtration, but they blinded after a week or two of operation and the capacity dropped off. The synthetic blankets were tested one at a time so that two of our three filters (dressed with standard cotton) were always available for comparison of results and ready to carry the load. In order to give the synthetics the benefit of the doubt, rather severe cleaning measures were employed, using stronger acid, detergents, and even steam cleaners. After it was finally determined that the weave was improper for carbonation sludge, the blankets were removed and laundered. The Orlon was used for another 131 days on cold saccharate. The Dynel and Vinyon cloths had shrunk and were cut up for hot saccharate filters.

In 1954 materials were obtained to be tested on a 1' x 1' vacuum filter, the materials being five different weight and weave Dynels, one Vinyon, one Orlon, and one Dacron. In order to test the materials under identical conditions, it was decided to forego the test on the small filter

and to sew the foot-wide pieces together and insert them into a longitudinal belt in a 15 ounce cotton twill blanket. To evaluate the pickup through the various fabrics, the cake thickness was measured at specified intervals during the life of the cotton blanket. During the 19 days of the test, frequent visual inspections were made to observe the cake discharge and how the cake pickup carried through between scrubblings.

Table 5.—Cake Thickness in 1/16 Inches.

Style	Thickness
Dynel D-2000	8.45
Dynel D-2002	8.17
Dynel D-2003	9.82
Dynel D-2005	8.57
Dacron DA-2103	9.12
Orlon FA-1103	8.8
Vinyon N-734	8.05
18.4 Ounce Dynel Plain Weave	7.27
Control	8.67

All of the test materials were suitable for additional service when the control twill blanket failed.

The D-2003, DA-2103, and the FA-2103 had better pickup ability than the cotton twill.

Microscopic examination of the fabrics after the test run indicated that in all cases the material was only slightly degraded from its original condition.

From observations the Dynel No. 2003 was selected for further testing on plant scale operations, getting 78 and 119 days' service out of the two blankets tried, with satisfactory filtration rate and filtrate clarity.

Intermingled with the probing for a suitable synthetic fabric and weave, it was learned from an intermountain sugar company that they had successfully relieved a carbonation filtration bottleneck by changing to a basket weave cotton cloth known as Style No. 15. This is an inexpensive, light-weight cloth but tests have proven it has high capacity and the clarity of the filtrate is acceptable. In the last two years, a number of these blankets have been used giving an average service of 31 days with a maximum of 56 days. Apparently the secret for the longer service of this light cotton cloth as compared with standard cotton twill is the fact that it usually does not require acid scrubbing for the first week or more, and after that, the frequency and extent of scrubbing required is less than the heavier twills and synthetics.

Except for some partial tests with nylon on a few Second Carbonation Kelly leaves and Standard Liquor P. & F. frames, the foregoing about covers Spreckels Sugar Company's experience with filter fabrics. In both of these two tests it is indicated that additional trials are justified and more tests are planned on pressure filters completely dressed with synthetics.

One point of interest on cutting synthetics is the use of a carbon arc to ravel-proof the edges without hemming.