

FOSECO, INC.

DEVELOPMENT WORK FOR STEEL MILL PRODUCTS DIVISION
Commercial Development Department

Material Development (cont.)

Asbestos Free Profax

Research on Low-Asbestos and Zero-Asbestos Profax was renewed during this month. The 1% low-asbestos recipe XS-1385B from April 1971 is still the best such recipe to date. XS-1385B uses a crysotile asbestos-clay suspension system. The recipe and some properties are:

131D	75.5%	suspension agents:	117,319
447	0.7%	high temp. fibers:	X2772,319
177A	4.3%	form time:	5.5 sec. @ 30 PSI
117	1.0%	transverse strength:	188.5-213.0 PSI
X1790	4.0%	density:	0.754-0.755
546	10.5%	60 min. heat loss (4/71)	7400 BTU/FT ²
X2772	3.0%	green strength	low
319	1.0%		

The present problem with this recipe is that X-2772 has been superceded in our plant by X-3198 which is 11c/lb. cheaper. New recipes with X-3198 have a lower percentage of the fiber because the final product seems less dense with X-3198. XS-1385D has the following:

2.5% of X-3198 (76.0% 131D)
density = 0.747
trans. strength = 231.7 PSI
60 min heat loss (=4/72) = 9760 $\frac{\text{BTU}}{\text{FT}^2}$

Except for the insulating values the amount of X-3198 in XS-1385D seems good. It is not yet clear whether other raw materials changed between 4/71 and 4/72 have changed the insulating properties or if it is due to the X-3198. Work is continuing.

In reference to Zero-Asbestos Profax, it has been found that a paper-clay-surfactant system may be substituted for the suspension system used in the XS-1385 recipes. Several artal pads have been tested using the following suspension system:

1.0% Hammermilled 267
1.0% 117
0.1% X1281

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(graph #5) gave near equivalent results on the Amitec using the same corrected background loss for both.

Field tests of XS 1385E #376 hot tops at U.S. Steel, Lorain were reported to us as being successful. A larger scale test will be our next step with emphasis placed on eliminating the poor corner filling experienced on the last production run. Slurry dilution may solve the problem but Arquad will not because it was already tried in the plant with no success. High forming and D.W. timer were experienced because of the incompatibility with the bentonite and the corner filling did not improve at the same solids level.

Asbestos Replacement in Profax and Proflex

Suspension has been the greatest problem of asbestos replacement. Some of the replacement methods and materials have been:

SOLIDS	GELLING AGENTS	FIBERS
Vermiculite: adds to suspension especially in high fiber recipes, slags between 1000°C and 1300°C	RM 117: Works well at 1% -2% except with Arquad; cheap, thixotropic. RM 252: Works well at 0 to 0.5%; non-thixotropic; very expensive. RM 445: Not as effective as 117, expensive.	X2782 sheared: extensive shearing results in very bulky flowable fiber. 1/4" carbon fibers: still being tested, expensive. Calfil: Good suspension 0 to 6%, very high form times Milled Fiberglass: still being tested, 42c/lb.

Another approach to the suspension problem has been to maximize the light weight fillers and minimize the heavy fillers. X2286 is a light-weight filler now in use, but its 1300°C sintering temperature means it has a limited use. X2295 has been tested as a replacement; has excellent high temperature properties but is so fine that it powders. Other fillers are being ordered from Eagle Pitcher.

High shearing has been discussed and a recipe utilizing sheared fiberglass was made in our lab with an osterizer and at FIL using a 40 gallon pulper. Results were different and dependent on (1) pulping action, (2) pulping time, (3) blade sharpness, etc. It is agreed upon that this would be a very difficult method of obtaining the desired slurry.

In place of the extensive shearing of X2782 (1/2 or 1/4") we are now sampling some milled fiberglass where the hammermill screens are 1/32", 1/16", 1/8" and 1/4". In truckload or carload quantities this fiberglass is 2c/lb. less than X3198; the price may make it impractical.

We have kept in touch with Foseco Canada, their 8% to 9.5% X2782 recipes have been tried here and at FIL with the results being poor suspension and much segregation.

The following tables show some of the recipes under consideration at the moment. In the Proflex table recipe 47 is Vince Mellows (FIL) solution for a Seal-On material. Our tests so far have not been so successful with this recipe but we are continuing to work with it. The boards made in England with this recipe do look promising.

PROFAX RECIPES			
	PROFAX 31	XS-1385E	LAB RECIPE VM 21
% Asbestos	4.0%	0.9%	0.0%
% Solids	12.5%	12.5%	12.5%
% H ₂ O After 15 min settling	22.7%	18.0%	14.0%
Transverse Strength	200+	252.0	216
Density	0.77	0.83	0.53
Approx. cost/100 lb	\$2.60	\$3.83	\$11.58

	4651B	XS-1439B	SM-6	47
% Asbestos	10.8%	6.0%	0.0%	0.0%
% Solids	7.4%	7.4%	11.1%	11%
% H ₂ O after 15 min settling	NA	14.0%	NA	22%
Compressibility at 19 psi	10-16%	11-16%	26.1%	21.2%
Transverse Strength	24-40	24-40	14.6	10.9
Density	0.47-0.50	0.45-0.47	0.44	0.56

*FIL data

The cost of XSl471 is about the same as EP4651B/Proflex. The suspension properties are not altogether encouraging but all other properties appear to be in the correct range.

Slurry Suspension (Water layer after 15 min.)	- 28%
Transverse Strength	- 31 psi
Density	- 0.49 g/cc
Compressibility (@ 19 psi)	- 14%
High Temp. Shrinkage (1300°C for 1 hour)	- 33%

Tests on the "SAM" machine will be conducted as soon as it is available in the plant.

Los Asbestos Profax®

Poor corner filling on the Mark III remained a problem for EP5254/Profax® (formerly XSl385E) even though the fibers were pulped initially and a very dilute solids concentration of 10.7% was used. Two pallets (56 sets) of #376 hot tops were shipped to the customer where they were tested. The results of the tests were favorable but no metallurgical information was obtained. Improvements in flow characteristics and suspension of the slurry will be attempted. If results look favorable, boards will be made on the "SAM" machine or Mark III whichever is available first.

Asbestos-Free Profax® Development

The most promising recipe to date is XSl472 but because of its high cost (\$5.10/cwt) the recipe is being modified. Suspension and flowability tests are now in progress on experimental recipes since these are two important properties required for proper forming on a multi-cavity tool on a Mark III machine. Hopefully by the end of August the non-asbestos Profax® recipe will be perfected in the laboratory and tried in the plant.

Replacement of Silica Flour in Profax® 31

Work is in progress on the replacement of silica flour in Profax® 31 because of the new laws under OSHA which the federal government has issued. Thus far, 12 samples were tested in Profax® 31 which included Kyanite, Kaolin Clays, Ball Clay and Mullites. Prices ranged from 1.0c to 17c/lb. plus freight. The best samples to date which give the best forming and physical properties for the cost are American Colloid, M5177, M5176 and a 100 mesh Mullite as shown in Table #1. All are higher priced than RM 131D. Further testing will be conducted on only the best samples for the price as time permits.

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