



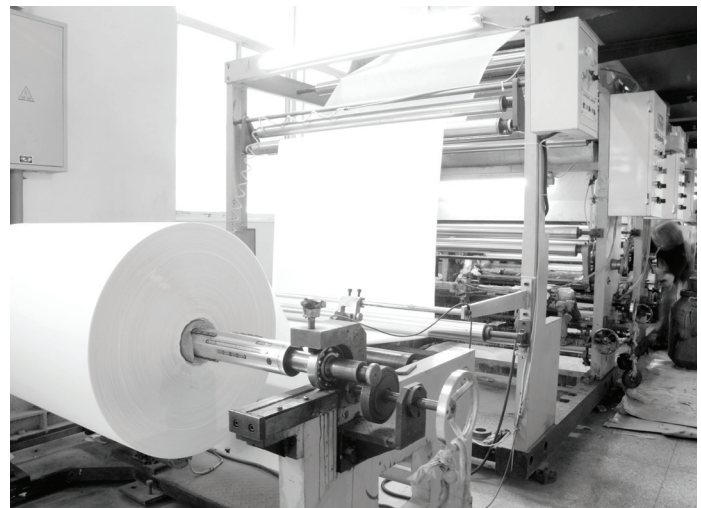
# SELVOL POLYVINYL ALCOHOL AS A CARRIER FOR OPTICAL BRIGHTENERS AT THE SIZE PRESS

Polyvinyl alcohol (PVOH) is recognized worldwide as the most effective “carrier” for optical brighteners (OBs). In high-quality coated printing grades, PVOH is used almost exclusively to achieve the highest whiteness possible from the OBs. While the mechanism for the interaction between PVOH and OB is not fully understood, it has been suggested in the literature that PVOH acts to prevent penetration of the OB into the base paper, thus optimizing its effectiveness at the surface of the sheet.

It is known that OBs are used in substantial quantities at the size press, primarily on wood-free, uncoated papers, but also on some coated grades. Starch is usually the selected carrier for OBs here. However, the function of starch is to impart strength to the sheet; the material does little to enhance the performance of the OB.

The concept of using PVOH in place of starch offers potentially many advantages:

1. Brightness synergy—Higher brightness or less OB.
2. Higher strength—PVOH is the strongest surface binder in the paper industry.
3. Greater efficiency at the size press—Eliminate wet end OB additions.



## LABORATORY STUDIES

Surface sizing studies were conducted on a wood-free sheet using a laboratory Keegan size press. Selvol 165 PVOH, a super hydrolyzed, high-viscosity grade, was compared with three different starches as OB carriers. Tinopal PT was formulated with all of them at the same rate of 15 gals/1000 gals of carrier solution. The Selvol 165/OB system was applied at 3% and 6% solids, and the starch/OB systems at 6% and 10% solids.

The results in Figure 1 show clearly the superiority of Selvol 165 PVOH, which demonstrates a fluorescent component (UV brightness minus TAPPI brightness) ranging from 3.9-5.4 versus 2.5-3.1 for the three starches.

Figure 2 compares the effectiveness of Selvol 165 PVOH with hydroxyethylated starch as carriers for Phorwite P at the size press. In this study, the OB was added at 20 and 100 gals/1000 gals carrier solution. The results show that at 20 gallons OB, the Selvol 165 system was 2.5 UV brightness units higher than the starch system, and at 100 gallons OB, 2.2 units higher than the starch.

The table below shows the very significant strength benefits that can be achieved by using PVOH versus starch at the size press.

## RHEOLOGY

In all of this laboratory work, the higher hydrolysis grades, such as Selvol 165, 125, 350 and 325 PVOH, performed better than the lower hydrolysis grades in terms of OB brightness response. From this group, Selvol 165 PVOH was consistently slightly better. However, the lower viscosities of Selvol 125 and 325 PVOH make them rheologically favored on paper machines running in excess of 1000 ft/min or on size presses that have proven to be rheologically demanding.

## ECONOMICS

Following are several cost/benefit scenarios using PVOH in place of starch:

**Scenario 1:** Total replacement of starch with PVOH; same level of OB.

**Advantages:** Brightness increase of 2-3 units, much stronger sheet.

**Cost:** \$25-\$75/ton over the starch control depending upon size consumption rate, OB level and raw material costs.

**Scenario 2:** Total replacement of starch with PVOH; reduce level of OB to maintain same brightness level as obtained with starch.

**Advantages:** Equal brightness, stronger sheet.

**Cost:** Possible cost savings (i.e., \$5-\$10 ton) based on laboratory work. Would need to be defined in mill situation.

**Scenario 3:** Partial replacement of starch with PVOH.

**Advantages:** Compromise in OB performance and runnability.

**Cost:** Compromise in cost.

TABLE 1: Selvol Polyvinyl Alcohol Strength Benefits

Carrier/Binder	% Solids Applied at	Mullen Burst (lbs)	Dry Tensile (lbs)	M.I.T. Fold (no.)
Selvol 165	5	20.3	26.2	121
HE Starch	10	11.2	21.1	53

FIGURE 1: PVOH vs. Starch as an OB Carrier at the Size Press with Popular OB

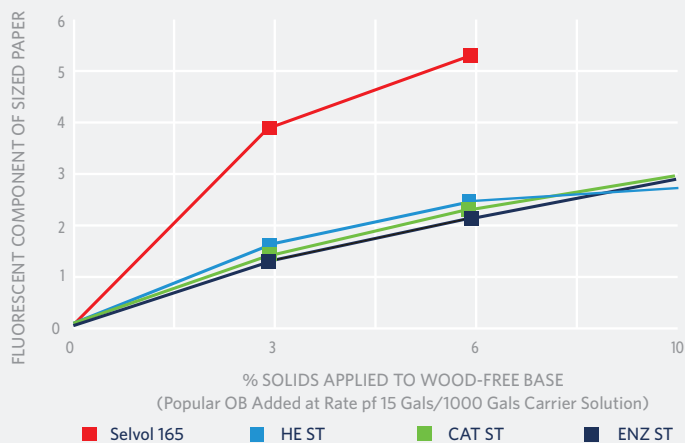
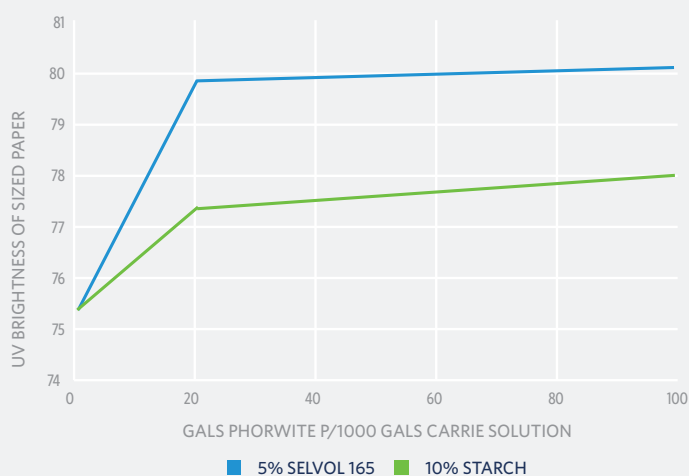


FIGURE 2: PVOH vs. Starch at the Size Press with Phorwite P



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