Lower PVC formulation costs

with Eastman TXIB™ formulation additive

Manufacturers of PVC plastisols are constantly looking for ways to reduce costs. One of the most common ways to reduce formulation cost is the addition of a filler, mainly calcium carbonate. However, the addition of a filler can increase the plastisol's viscosity above that which is desired for proper processing. Eastman TXIB™ formulation additive can significantly lower the viscosity of the plastisol when substituted for a portion of the primary plasticizer. Thus, the addition of the filler along with the correct amount of Eastman TXIB can reduce the overall formulation cost while holding the viscosity at the desired level.

Formulations

Plastisol formulations were created using PVC dispersion resin, a primary general-purpose plasticizer (Eastman 168™ non-phthalate plasticizer), a mixed-metal heat stabilizer, Eastman TXIB™ formulation additive, and calcium carbonate filler (see Table 1). The formulations listed were based on a design of experiment (DOE) used to determine the effects of Eastman TXIB substitution and filler addition. Tests 2, 4, and 6 were replicates of the center point of the DOE.

Formulations were mixed on a paddle-type mixer for 25 minutes and then deaerated for 10 minutes. The plastisols were then acclimated to 25°C in a constant-temperature bath for 1 hour. Brookfield viscosity was checked at 20 rpm with a #4 spindle. Viscosity measurements were obtained and statistical methods applied to determine the ratio of filler to Eastman TXIB required to maintain the viscosity in Test 1 (Figure 1).

Formulation cost benefit

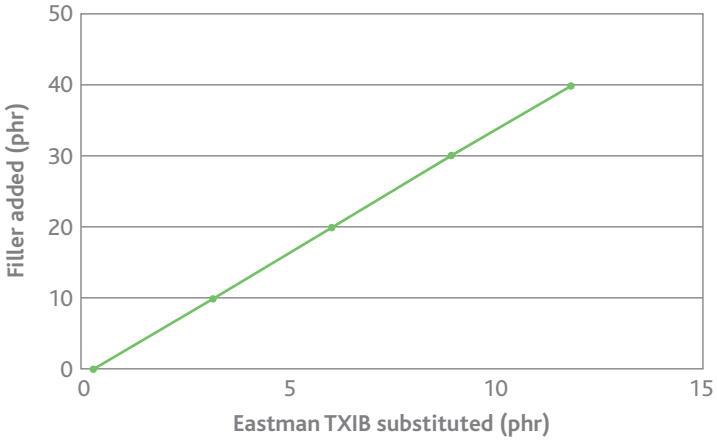
Substituting Eastman TXIB formulation additive for some general-purpose plasticizers, along with the addition of the filler, can reduce plastisol formulation costs.

Table 1 Plastisol formulations reported in parts per hundred resin (phr)

Material	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7
PVC homopolymer dispersion resin (k-value = X)[a]	100	100	100	100	100	100	100
Eastman 168 plasticizer[b]	50	45	40	45	50	45	40
Akcrostab® LT 4798 heat stabilizer[c]	3	3	3	3	3	3	3
Eastman TXIB formulation additive[b]	0	5	10	5	0	5	10
Hubercarb® 325 calcium carbonate[d]	0	20	0	20	40	20	40

[a]*Occidental Chemical Corporation* [b]*Eastman Chemical Company* [c]*Valtris Specialty Chemicals* [d]*J.M. Huber Corporation*

Figure 1 Eastman TXIB formulation additive: Filler ratios required to maintain equivalent viscosity



Effects of Eastman TXIB formulation additive and filler on physical properties

Samples of the plastisols made in Table 1 were fused into vinyl sheets for analysis of physical properties, including tensile strength at break, tensile strength at 100% elongation, total elongation, hardness, and specific gravity. Substitution of Eastman TXIB for a portion of the general-purpose plasticizer in all cases showed negligible changes in plasticizing effect. Introduction of the filler into these formulations did change each of the properties. As calcium carbonate levels increased, the tensile strength and elongation properties all decreased, while hardness and specific gravity increased. See Figures 2–6 to observe the changes.

Figure 2 Tensile strength (psi) vs. filler level (phr)

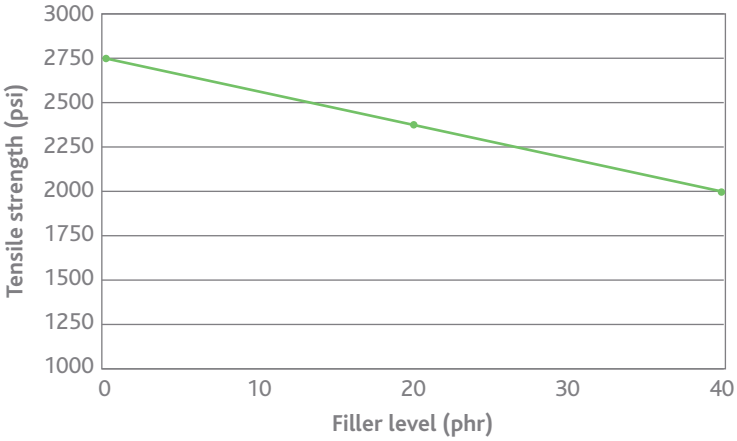


Figure 3 Tensile strength (100% elongation) vs. filler level (phr)

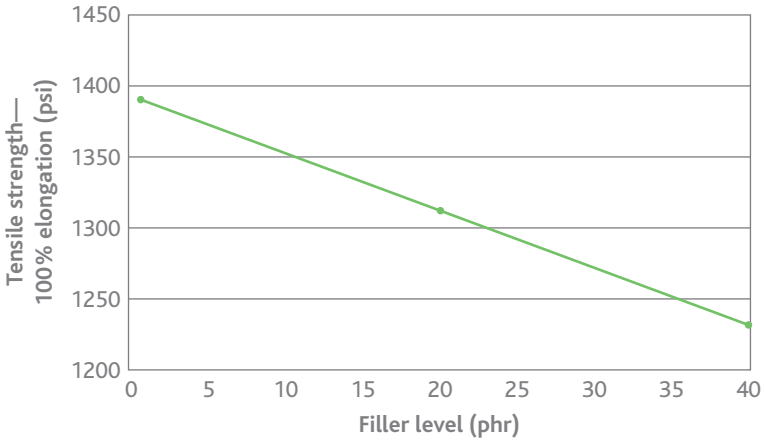


Figure 4 Total elongation (%) vs. filler level (phr)

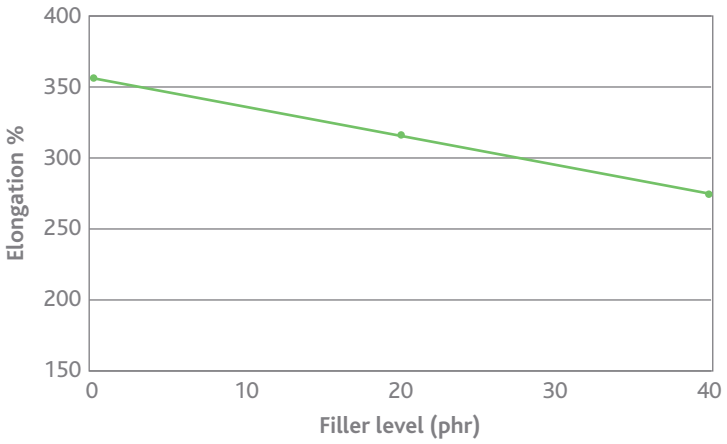
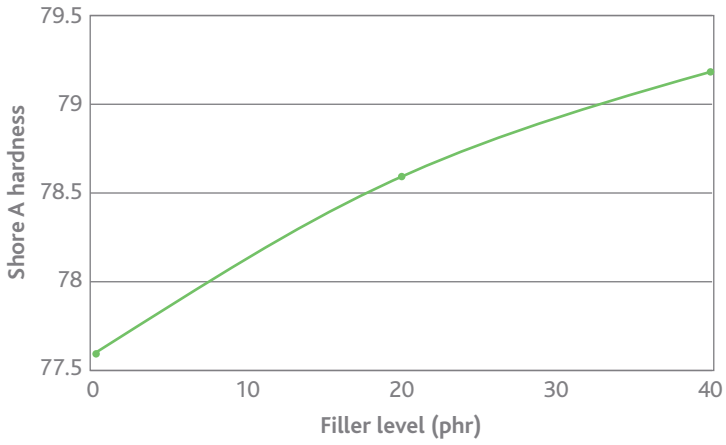


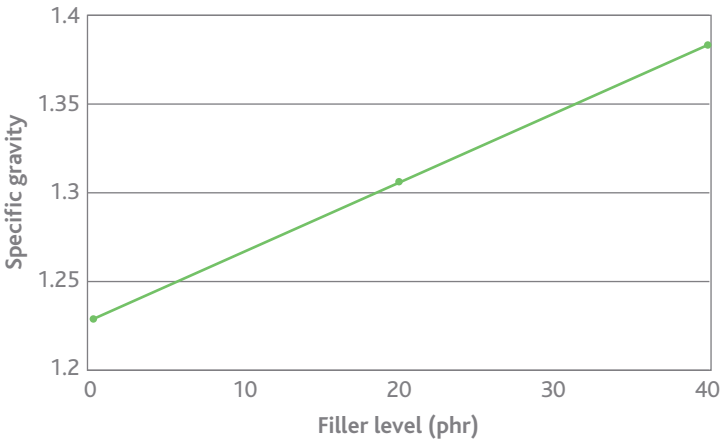
Figure 5 Shore A hardness vs. filler level (phr)



Choose Eastman TXIB today

The use of the proper ratio of Eastman TXIB and calcium carbonate fillers can reduce formulation cost while maintaining the required process viscosity. The substitution of TXIB did not diminish the plasticizer efficiency. The addition of a filler affects many of the physical properties, including tensile strength, elongation, hardness, and specific gravity.

Figure 6 Specific gravity vs. filler level (phr)



To find out more about the cost benefits of Eastman TXIB™ formulation additive, call your Eastman representative today or visit www.EastmanPlasticizers.com.

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