BULLETIN VC-517A (Supersedes VC-517)

Ambergum™ 1221 water-soluble polymer powder

Use in Acid and Neutral Fountain Solutions

Ambergum 1221 water-soluble polymer powder is a low molecular weight, anionically charged water-soluble polymer prepared from cellulose. Studies have shown that fountain solutions prepared with Ambergum 1221 water-soluble polymer powder perform excellently during plant trials, giving very good print quality and dark, solid color. These data are reported in Ashland Bulletin VC-519. Further studies to determine the performance of Ambergum 1221 water-soluble polymer powder in fountain solutions used on a Dahlgren-damped Miehle favorite press were conducted. The results are reported here.

Summary of Results in Acid and Neutral Fountain Solutions

Fountain solutions containing Ambergum 1221 water-soluble polymer powder and phosphoric acid had good press latitude and cleaned up rapidly on the scum cycle. These solutions gave better performance than commercial solutions containing gum arabic.

The performance of fountain solutions containing Ambergum 1221 water-soluble polymer powder was not affected by pH; solutions at pH 7.0 and 4.6 both performed excellently.

The performance of Ambergum 1221 water-soluble polymer powder was not affected by the presence of 20% isopropanol in the fountain solutions.

Ambergum 1221 water-soluble polymer powder caused no emulsification or bleeding of the ink. Emulsification curves were similar to those of gum arabic.

Trial Printing Runs

One gallon of each of five experimental fountain solutions was prepared. All contained one fluid ounce of solution concentrate (formula listed in the Appendix), 20% isopropanol and a water-soluble polymer solution. As the formulas show, the solution concentrate used was either acid or neutral. The water-soluble polymer type and concentration as well as the pH of the final formulation are listed in Table I.

Table I
Water-Soluble Polymers Used in Experimental Fountain Solutions

Run	Polymer	pH[a]
1	1 fl oz 8° Baumé gum Arabic solution	4.5
1	1 fl oz Ambergum 1221 solution[b]	4.5
3	1 oz Ambergum 1221	7.0
4	2 oz Ambergum 1221	4.4
5	2 oz Ambergum 1221	6.8

[a] pH of complete fountain solution.
[b] An 8% (by weight) stock solution of Ambergum 1221 was used in all the studies.

The printing trials were conducted on a Miehle favorite (19 by 25-in., single-color) press with Dahlgren damping. (The Appendix lists other details regarding the paper and plates that were used.) The prepared fountain solutions were adjusted to 65° F and poured into the fountain pan just before the start of each run. Normal ink-water balance was established to get good printing quality. The Dahlgren setting was then increased to the maximum or to the point where washout occurred. The Dahlgren setting was then decreased to the setting at which scumming occurred. A "scum cycle" test, which determined the number of sheets that had to be printed before recovery, was run to conclude the printing tests. After the run, sample sheets were visually evaluated for print quality. The results of these evaluations are in Table II.

Table II
Result of Printing Trials Using Fountain Solutions
Containing Ambergum™ 1221 water-soluble polymer

Run	Dahlgren Setting	Visual Evaluation	Cycles to Recovery[(a)]
1	45	One side plugged	No recovery
	90	Density facing	
	100	Density dropped, not really washed out	
	80	Good print	
	60	Good print, but beginning to plug	
	40	Bad scumming	
2	50	Does not clean off once ink is on plate	30
	80	Density dropped	
	50	Print looked better, still filled in	
3	50	Good print	No recovery
	70	Good print	
	100	Good print, no drop in density	
	40	Started to scum	
4	50	Very good print, density 1.55	15
	70	Good print, density 1.4	
	100	Good acceptable print, density 1.4	
	50	Scumming	
5	50	Good print, density 1.55	
	70	Good print, density 1.55	
	100	Good print, density 1.55	
	50	Good print, density 1.60	
	40	Good print, starting to fill in	
	30	Starting to fill in	

(a) Recovery cycles were determined at a Dahlgren setting of 60.

Fountain solution numbers 4 and 5, which contained 2 oz/gal of 8% Ambergum 1221 water-soluble polymer powder solution, clearly had superior performance compared with fountain solution number 1, which contained gum arabic. Press latitude was greater and recovery from scumming much faster. The trials showed that the 2-oz level of Ambergum 1221 water-soluble polymer powder was necessary for excellent printing performance. These trials demonstrated that pH is not an important consideration for the application of Ambergum 1221 water-soluble polymer powder.

Samples of the fountain solution were examined after each run for the presence of emulsified ink. No fountain solution showed any clear signs of emulsified ink or any discoloration of the solution due to ink bleed.

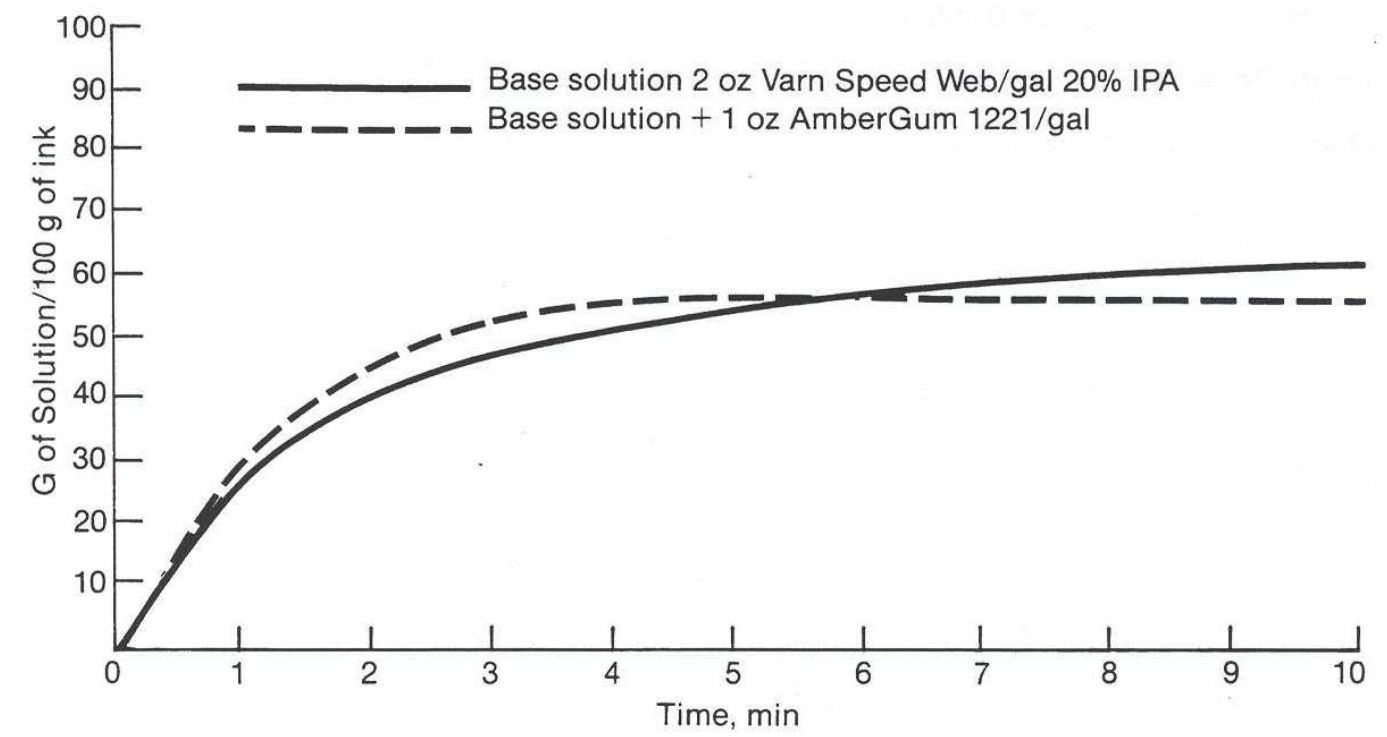
Ink Emulsification

The Surland test method for determining ink emulsification was used to evaluate Ambergum™ 1221 water-soluble polymer powder. A commercial magenta web ink was used. The pH was 4.5 to 5.0 during the test.

A commercial acid fountain solution concentrate containing gum arabic was used as the test model. The Ambergum 1221 water-soluble polymer powder solutions (8% by weight) were added to this concentrate to determine any increase or decrease in ink emulsification due to the Ambergum 1221 water-soluble polymer powder present.

Figure 1 presents the results. A normal range of 40 to 60 was found for Ambergum 1221 water-soluble polymer powder.

Figure 1
Ink Emulsification Curves
Gum Arabic vs Ambergum 1221 water-soluble polymer powder/gum Arabic



Appendix

Materials and Equipment

Press	Miehle favorite – 19 by 25 in., single-color – Dahlgren damping
Ink	Braden Sutphin Freedom black ink
Blanket	714 Reeves compressible
Paper	International 60-lb label stock, coated on one side
Plates	Enco N50 (ENCO Printing Products); normal processing with single packing subject

Fountain Solution Formulations

Acid solutions:	90 g Zn $(NO_3)_2$ + 2.5 ml 85% H_3PO_4 in 1 liter of water; pH = 4.5
Neutral solutions:	31 g KNO_3 in 1 liter of water; pH = 6.95

Printing Press Setup

Form rollers set to a 3/16-in. strip.
Plate-to-blanket squeeze was 0.006 in.
Ink film thickness was 0.45 by the Gardner ink film thickness gauge.
No recirculation system was used.