

Determining the Dispersant-Viscosity Relationship

OR

How to make the world's best stick-up slip

Stage 1

- 1) Set up 10 containers
- 2) Put 200 grams of mixed dry clay body in each
- 3) Add 80 grams of water (preferably distilled water) to each; mix well to make a paste (a *very* thick slip). Record the amount of water. (40% d.w.b.)

d.w.b. \equiv dry weight basis

d.w.b. = (water/dry clay)*100

- 4) Add drops of dispersant (Darvan 811, or a Sodium Silicate solution) to each sample in increments of 2 (e.g., 2 drops to container #1, 4 to container #2, etc.).

Dispersants coat the surface of the clay particles making them repel each other reducing the viscosity of the suspension.

- 5) Mix each sample well, preferably with a motorized mixer.

You should see a substantial change from high viscosity to low viscosity in Step 4. In Step 5, the suspensions should become more homogeneous.

- 6) Determine which sample is the most fluid

6a) The most fluid sample should be too thin to be used as a stick-up slip. If not too thin, add water to thin the slip to a level that is not acceptable for stick-up slip use. Record the amount of water added, as noted above in step 3.)

More Fluid \equiv Low Viscosity

Less Fluid \equiv High Viscosity

6b) If the most fluid sample is container #9 or #10, add 5–6 drops of dispersant to each of the 10 samples (to ensure that the most fluid sample is within the range of samples tested).

(For casting bodies ignore staged 2!!!)

Stage 2

- 7) Prepare 10 samples of the most fluid suspension (identified in step 6) keeping the water and dispersant level constant for each sample. Total volume \sim 100 ml

The addition of salt (Stage 2) should cause an increase in viscosity.

- 8) Add drops of *saturated Epsom salt* ($\text{Mg SO}_4 \cdot 7\text{H}_2\text{O}$) solution to each sample in increments of 1 drop.

A saturated solution is one that contains undissolved salt in the container. For Epsom salts, this is \sim 100g $\text{Mg SO}_4 \cdot 7\text{H}_2\text{O}$ per 100g water.

- 9) Determine which sample has the best application thickness.

- 10) This is your final Stick-Up Slip with:

- higher greenware adhesion
- more fluidity for the water content
- higher solids loading (much less shrinkage)
- higher melt adhesion (more glass phase)

Consistency should match your application needs (i.e., brushing, dipping, trailing, etc.).

After completing this experiment, it is recommended to determine the water content in the stick-up slip for future reference.