



Common Procedures for Christy Minerals Fused Silica Rapid Cast System

Most Common Slurry Formula

Two common formulas are given in the charts to the right. These formulas may result in a different disc viscosity depending upon your mixing equipment and mixing time.

These formulas have been found to be good starting points to begin testing slurry system use.

Slurry Mixing

1. Add colloidal to mixing container.
2. Turn on agitator (high shear mixer, propeller mixer, etc). Be sure to follow manufacturer's recommended RPM, blade sizing and blade positioning for this step.
3. Add Christy Minerals Fused Silica Rapid Cast Flour.
 - a. Flour may be added as rapidly as it is submerged under the vortex created by the agitator.
 - b. This can be done quickly at first, but will slow down as the solids content of the slurry increases, forming flour 'islands.'
 - c. At this point, wait for 'islands' to submerge with no floating dry flour before adding more.
4. Once all Christy Minerals fused silica rapid cast flour is added and dispersed without clumps, add the Christy Minerals Rapid Cast Accelerator liquid component and continue mixing.

Christy Minerals Fused Silica Rapid Cast System Formula 1

Typical Formula	Weight (lbs.)
Nalco 1030 Colloidal	30.1
Fused Silica Rapid Cast Flour	55
Rapid Cast Accelerator	5.4
Total Weight	90.5
Approximate Volume (gal)	7.05
Target Viscosity	3.5"
Silica (%)	25.4

Christy Minerals Fused Silica Rapid Cast System Formula 2

Typical Formula	Weight (lbs.)
Nalco 1130 Colloidal	28.7
Fused Silica Rapid Cast Flour	55
Rapid Cast Accelerator	5.5
Total Weight	89.2
Approximate Volume (gal)	7.04
Disc Viscosity	3.5"
Colloidal (%)	25.2

5. High shear dispersing may continue for 10-15 more minutes but then should be slowed and pumped out for storage in a propeller mix tank or rotating pot.
6. Propeller mixing may continue indefinitely.
7. Slurry does "shear-thin", or acts like a thinner slurry when under shear forces. When shear is removed, the gel structure takes a number of minutes to be fully restored. This can be used to the advantage of the shell building team.

Slurry Viscosity Testings

Equipment:

- 50 ml or greater plastic syringe (often available at tractor/farm supply stores).
- Christy Minerals Viscosity Target Pattern

1. Draw 50 ml of slurry into syringe.
2. Invert syringe with open tip up, then tap and vibrate to help bubbles move toward open end.
3. Once bubbles approach opening, push on plunger to remove bubbles while reducing slurry volume in syringe to 30 ml.
4. With Christy Minerals Viscosity Target on a flat, horizontal and non-vibrating surface, aim the syringe opening at the center of the target (+). Push plunger down slowly, firmly and continuously until empty while remaining centered on the target.
5. Wait thirty (30) seconds. A stopwatch or timer is recommended for consistency.
6. Read the diameter of the resulting puddle using the marks on the target in at least two directions, such as vertical and horizontal.
7. Use the average diameter chart provided to calculate the average value (more than two measurements may be helpful but will require calculation beyond the table provided).

Adjusting Slurry Viscosity/Thin Down

1. Liquid additions should be added to the slurry and allowed to mix in completely. Due to the thixotropic nature of the slurry, it can take time to fully distribute. In a common rotating pot spinning at 40-60 RPM, it is common to wait 30 minutes before dipping. Additional agitation, such as a canoe paddle, can be used to speed up liquid distribution.
2. Liquids should be water, colloidal or a water-colloidal mixture. The correct liquid choice depends on the measured colloidal concentration (see next step).

Slurry Colloidal Concentration Determination

1. Slurry samples should be pulled from the slurry dip tank.
2. Samples should be centrifuged for the time recommended by your equipment manufacturer and per standard operating procedures.

3. Once solids are settled, use a pipette to pierce through the thick white top layer and gather the colloidal liquids underneath. Remove as much liquid as possible without gathering the white layer. Place in a new container.
 - a. Depending upon your equipment and sample size, a second centrifuge run may be needed.
 - b. Once the second run is complete, again remove the opaque colloidal liquid while leaving behind the white layer.

4. The specific gravity is now measured. This may be done with either an Anton Parr meter, or a specific gravity flask or pycnometer:

- a. Fill the Anton Parr device with the supernate and take the reading.
- b. Tare a digital scale with the flask zeroed out, then fill the pycnometer with supernate and record the new weight.
 - Divide the weight by the flask volume to obtain the specific gravity.

5. Using the specific gravity and a 1130 or 1030 Colloidal Dilution Curve and Table:
 - a. Find the specific gravity on the Y-axis (vertical axis).
 - b. Follow that value to the right until it intersects the diagonal line.
 - c. Follow that point down to the X-axis (horizontal axis) and find the % Silica.
 - d. This is your colloidal concentration for your slurry.

Slurry Organic Level/Latex Concentration

This is not easily tested at a foundry. We suggest sending slurry samples in Nalgene containers to the Christy Minerals site for testing and rapid results:

Christy Minerals

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