

Introduction to Rheology Behavior and It's Impact on the Production Process




By:

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Rheology – Ceramic Systems

The science of the flow of matter and its deformation character. In this presentation, the ceramic system will be defined as an aqueous suspension of clay and non-plastics possessing characteristics of both an elastic

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- Deficient Cast Rate
- Soft Cast – **distorted ware**
- Brittle Cast – **improper trim**
- Cast Spots
- Premature Mold Release – **cessation of dewatering process**

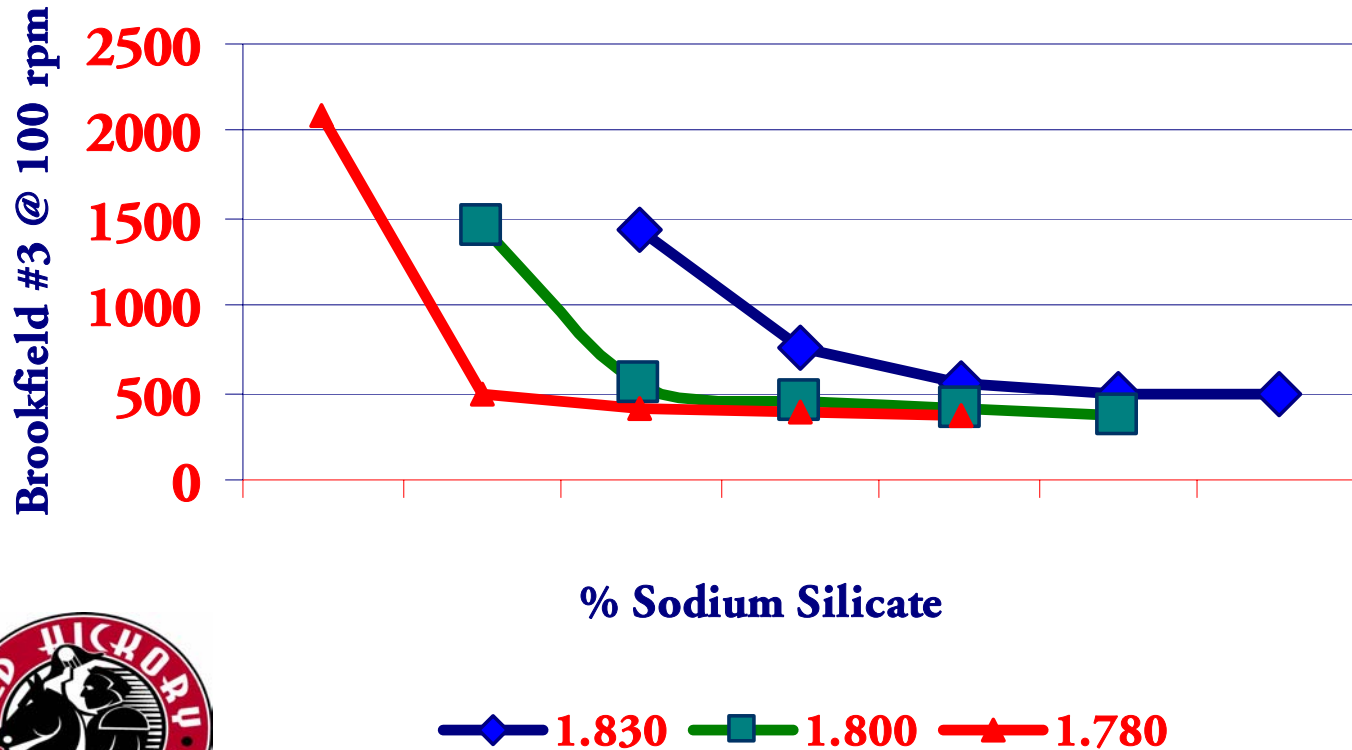


Key Factors Influencing Rheology of A Slip's System

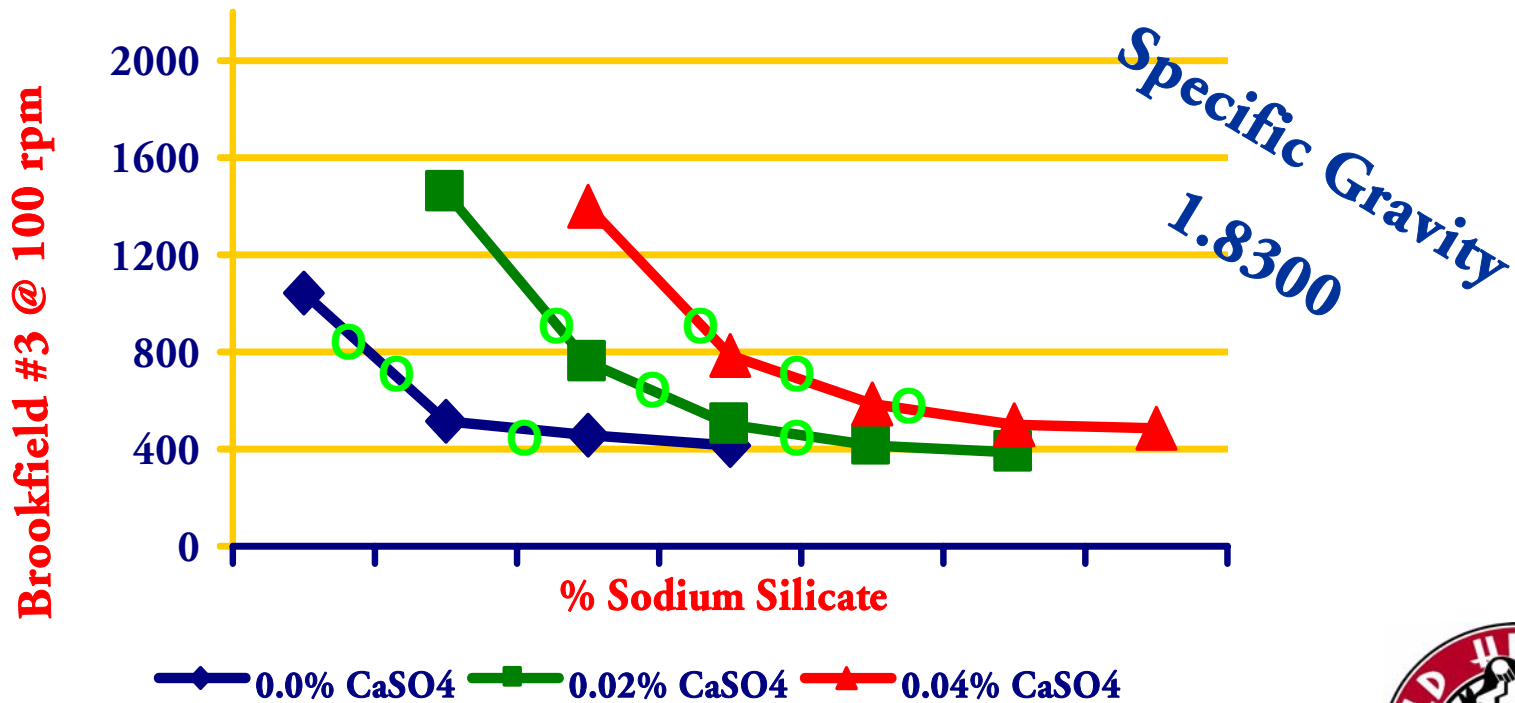
- Solids : Water Ratio – specific gravity
- Deflocculation Level
- Chemical Modifiers – type and level



INFLUENCE OF SPECIFIC GRAVITY On Deflocculation Curve



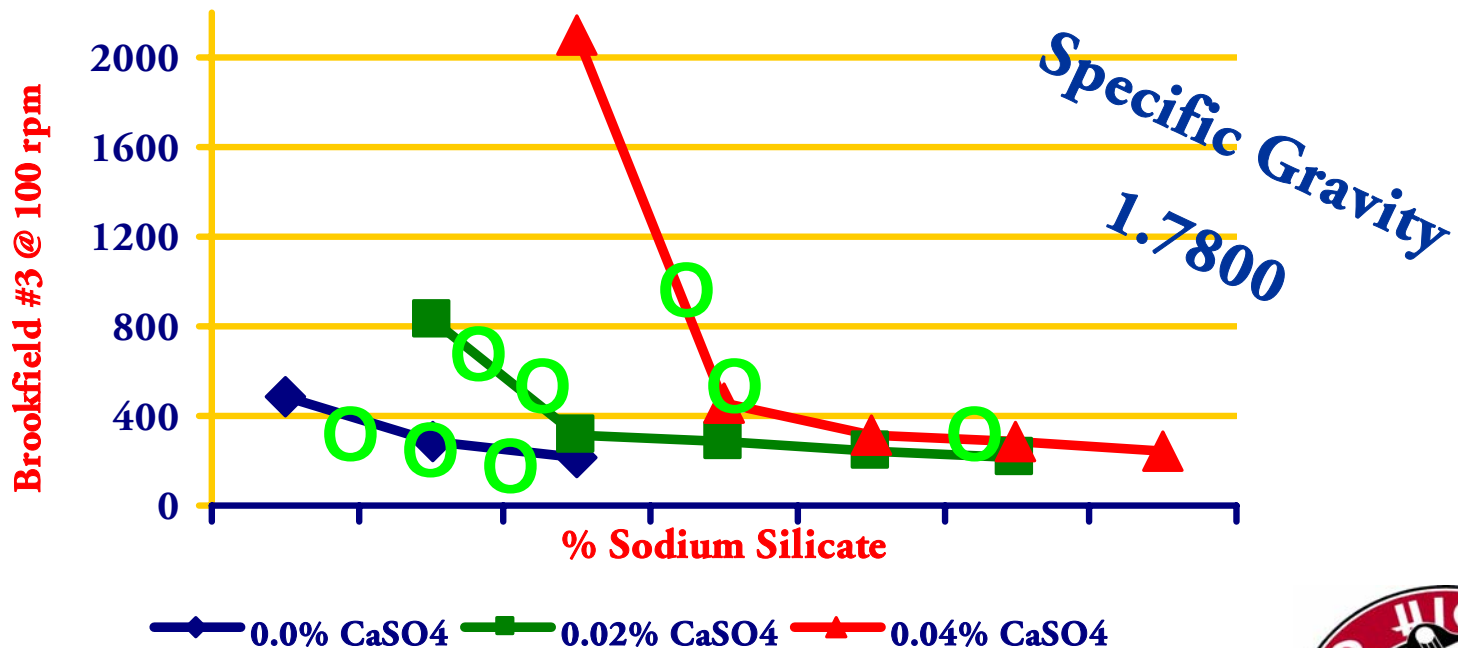
EFFECTS OF SULFATE ADDITION On Deflocculation Curve



O – Cast Points on Deflocculation Curve



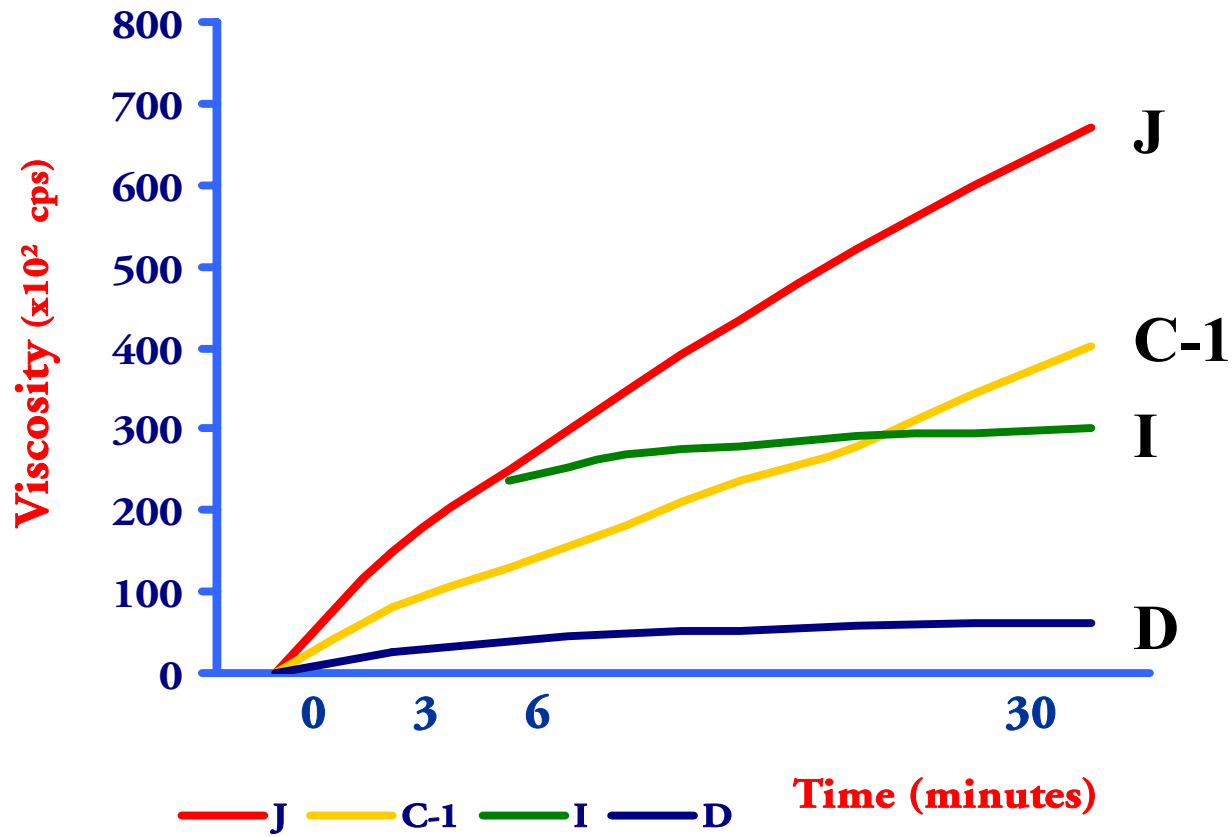
EFFECTS OF SULFATE ADDITION On Deflocculation Curve



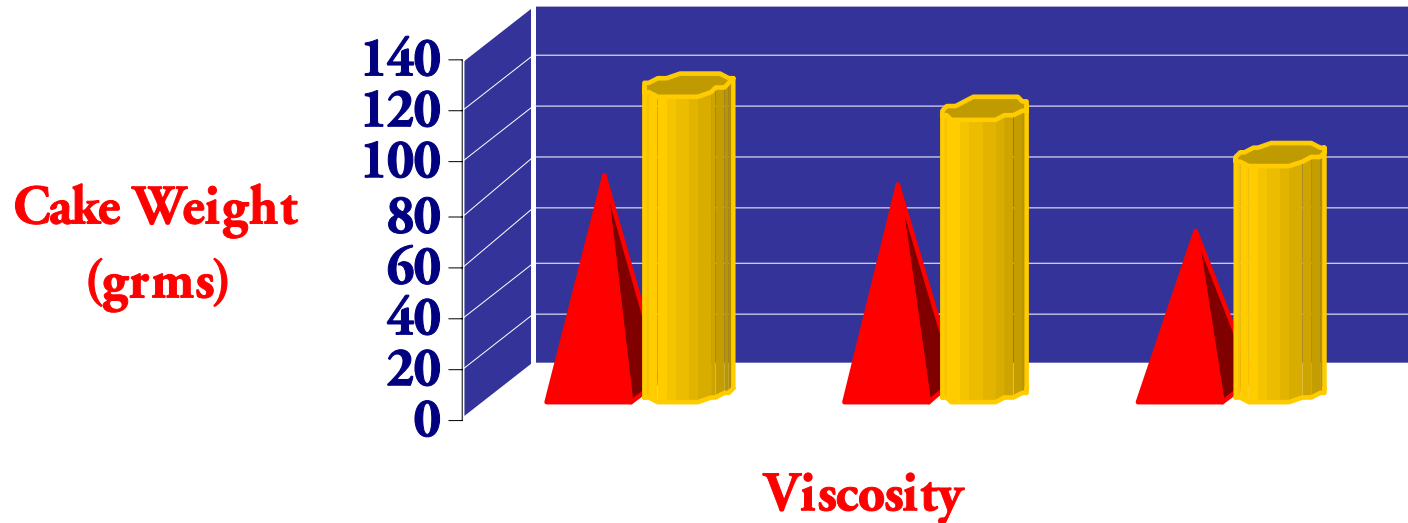
O – Cast Points on Deflocculation Curve



Gellation Curve



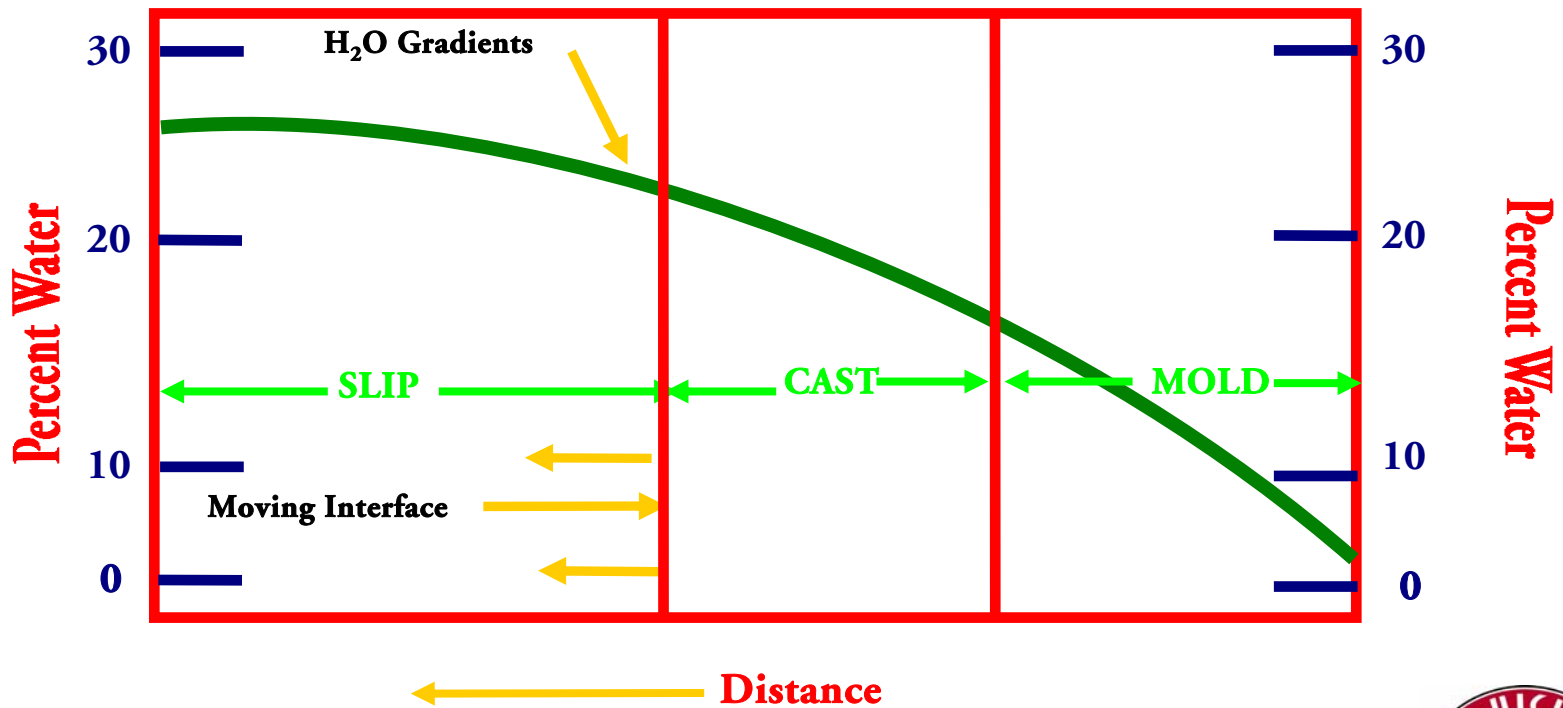
EFFECTS OF SPECIFIC GRAVITY On Cast Rate



■ 1.830 (0.0% CaSO4) ■ 1.780 (0.04% CaSO4)



Water Distribution – Slip Casting



^x Log₁₀ of suction head expressed in cm of water



RHEOLOGY REQUIREMENTS

Standard Drain Cast

- **Specific Gravity Range – 1.80 – 1.83**
- **Soluble Sulfate – 350 – 450 ppm**
- **Deflocculation Level – Mid Range on Curve**
- **Important Slip Performance Features**
 - ✓ **Suitable Cast Rate**
 - ✓ **Clean Drain Characteristics**
 - ✓ **Sufficient Plasticity – Low Moisture Gradient**



RHEOLOGY REQUIREMENTS

Standard Solid Cast

- Typical Specific Gravity Range - 1.83 – 1.85
- Soluble Sulfate - 350 – 500 ppm
- Deflocculation Level – Mid to Upper Level On Curve
- Important Slip Performance Features
 - ✓ Suitable Cast Rate
 - ✓ High Permeability – Well Developed Particle Floccs
 - Particle Floccs
 - ✓ Sufficient Plasticity But Firm – Low Moisture Gradient



RHEOLOGY REQUIREMENTS

Pressure Cast

- Specific Gravity Range – 1.78 – 1.80
- Soluble Sulfate – 500 ppm or more
 - ✓ **Filtration Aid Chemical May Be Desired Option**
- Deflocculation Level – Mid to High Range On Curve
- Important Slip Performance Features
 - ✓ **Maximum Filter Cast Rate**
 - ✓ **Uniform Moisture Distribution**
 - ✓ **Sufficient Plasticity**
 - ✓ **Minimum Segregation of Fine / Coarse Raw Material Components**



CONCLUSIONS



- **Rheology is Equally Important as the Formula In Maximizing Cast Performance**
- **Initial Viscosity Characteristics and Thixotropy Qualities Should Be Evaluated Simultaneously to Comprehend the Rheological Performance Range of a Formula**
- **Rheology Can Attribute Process Suitability of a Formula. When Evaluated In Combination With Raw Material Selections and Percentages It Can Ideally Optimize Yields.**

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