EHT BINDER

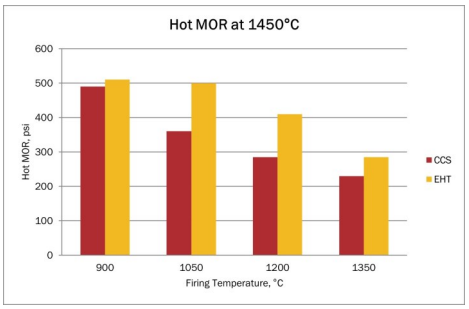
Manufactured for Use in High Temperature Aerospace Applications

EHT binder is a polymer-free, water-based colloidal silica sol backup binder, specially manufactured for use in high temperature aerospace applications; providing casters with:

- High hot strength
- Excellent green strength and edge strength
- Excellent creep resistance properties

High Hot Strength

Regardless of firing temperature, EHT binder exhibits high hot strength when compared to conventional colloidal silica. An independent testing laboratory* confirmed EHT binder's superior hot strength property when compared to other commercially available binders, ranking EHT binder #1 for hot strength properties in their group testing.



Excellent Green Strength & Edge Strength

EHT binder outperformed other products in independent testing, demonstrating better flat bar (3 point bending test) and edge strength results.

Excellent Creep Resistance Properties

EHT binder showed excellent creep resistance properties when compared to conventional colloidal silica, regardless of testing or firing temperature.

Due to its shell strength characteristics, EHT binder is an excellent choice for foundries that put shells through adverse temperature applications. EHT binder works well at foundries that pre-fire shells, allow them to cool and then reheat them to cast at 1832°F (1000°C) or higher. EHT binder is also proven in directional solidification and single crystal casting applications.

Typical Material Properties**

Binder Specific Gravity	Total Binder Solids	Binder pH	Na2O Content	Surface Charge	Defoam
1.262-1.276	37.5-38.5%	10.0-11.0	<0.50%	Negative	<20 seconds

*R&R and independent laboratory testing results are detailed in The Development and Application of a Specialty Colloidal Silica Sol for High Temperature Applications, presented at the 54th Annual Technical Conference of the Investment Casting Institute.

**These results are based on the testing methods, frequency and procedures of Ransom & Randolph or its approved suppliers. The levels referenced herein are only for general guidance and do not constitute a firm specification.

RANSOM & RANDOLPH

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Investing with Innovation™

EHT BINDER

Formulations

Due to the unique nature of the product, the formulation implemented will vary from foundry to foundry. This flexibility allows the foundry to obtain the maximum number of benefits from EHT binder.

For specific slurry formulations, please call our Technical Department at 800.800.7496 to discuss your specific application and to obtain the proper formulation to fit your needs.

Application Recommendations

1. Remix the EHT binder prior to use to ensure a homogeneous blend of material.
2. For best results, weigh all ingredients when making up a new slurry or making additions to an existing slurry.
3. When building the slurry, add the refractory last. If more than one refractory is used, add the lowest density refractory first: fused silicas (2.2 g/cc), aluminosilicates (2.7 g/cc), zircon (4.5 g/cc). Add refractory slowly for best results.
4. New and makeup slurries must be prepared with a propeller mixer, not in a rotating tank. This ensures proper dispersion of the refractory particles. The propeller mixer must be of adequate HP and RPM. Excessive mixing action can introduce air into the slurry and cause erratic viscosity and/or bubbles in the slurry coat.
5. As with any slurry, the viscosity of the slurry must be stable before use. A stable viscosity is one that does not change by more than 1 second when checked at 1 hour intervals. Viscosity can be increased by adding more refractory and decreased by adding more binder.
6. It is required to replace water lost to evaporation. When water is needed (based on test results for viscosity and/or binder solids), use distilled or deionized water as opposed to tap water, which can contain contaminants that can negatively affect slurry life.
7. Antifoam, wetting and bactericide agents are already formulated into EHT binder and other additions may not be compatible. Contact R&R's technical team before making these additions to the slurry.

Slurry Control Procedures

Slurry Control Worksheets are available for download at www.ransom-randolph.com. Slurry Control Worksheets allow you to input data directly and help you calculate values.

Note: When centrifuging slurries made with EHT binder, R&R recommends a maximum of 3,500 rpm and only centrifuge one cycle.

Slurry Testing Frequency

R&R recommends running the following tests accordingly.

Slurry Test	Recommended Testing Frequency
Slurry Viscosity	Two Times Per Shift
Slurry Density	Weekly
Refractory Solids	Weekly
Binder Solids	Two Times Per Week
Binder pH	Weekly

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Target Binder Solids Range

The target binder solids range for EHT binder is 37.7-38.5% by weight.

Specific Gravity	Binder Solids	Specific Gravity	Binder Solids	Specific Gravity	Binder Solids
1.248	36.4	**1.258**	**37.5**	1.268	38.6
1.249	36.5	**1.259**	**37.6**	1.269	38.7
1.250	36.6	**1.260**	**37.7**	1.270	38.8
1.251	36.7	**1.261**	**37.8**	1.271	38.9
1.252	36.8	**1.262**	**37.9**	1.272	39.0
1.253	36.9	**1.263**	**38.0**	1.273	39.1
1.254	37.0	**1.264**	**38.1**	1.274	39.2
1.255	37.2	**1.265**	**38.2**	1.275	39.3
1.256	37.3	**1.266**	**38.3**	1.276	39.4
1.257	37.4	**1.267**	**38.5**	1.277	39.5

Storage & Handling

Protect from freezing. EHT binder must be maintained above 35°F (2°C) to prevent the material from precipitating irreversibly and making the product unsuitable for use. Keep in a cool, dry, well-ventilated area. Keep containers tightly closed. Binder stored in transparent or translucent containers should be sheltered from direct sunlight. Shelf life is 1 year from date (MMDDYY) in batch lot number on label. Rotate stock to maximize shelf life.

Safety

OSHA-approved respiratory protection should always be worn to avoid inhalation of respirable silica dust, which can result in an irreversible lung disease, silicosis. Such exposure includes slurry makeup, casting, knockout and cleanup. See SDS for more information.

Technical Tips

For additional information and recommendations, refer to the Shell Building, Slurry Control, Autoclaving and FlashFire Dewax Method Technical Tips available for download at www.ransom-randolph.com.

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