

The
HILL
and
GRIFFITH
Company

PLAINTIFF'S EXHIBIT

H&G-4

Technical manual

H & G BONDING CLAYS

H & G has a complete line of foundry clays which are available in 100 lb. bags, or bulk cars as required. Can also be shipped in 100 lb. bags L.T.L. or truck loads.

H & G WESTERN BENTONITE — is of the highest quality produced in Wyoming. It is a Sodium Montmorillinite swelling type of clay. We maintain multiple sources to insure adequate supplies packed in 100 lb. multiwall paper bags. Widely used in mechanical system operations, has high green strength, dry strength and hot strength for proper sand bonding. Used with all metals, specified for steel usually, the basic bond for other ferrous metals. Used to a less extent in non-ferrous applications. H & G Western Bentonite is a good addition for hot sands.

H & G SOUTHERN BENTONITE — comes from carefully selected mining sites in the Mississippi area. The Southern Bentonites are non-swelling Calcium bearing Montmorillinites. It is easy to blend into foundry sands. Has high green strength, lower dry and hot strength than Western Bentonite. Packed in 100 lb. multi-wall paper bags. Gives easy shakeout and high flowability. Widely used in non-ferrous and light ferrous sands. Also used with Western to reduce sand lumps and improve shakeout.

FIRECLAY — Cedar Heights Bonding Clay — 50 mesh or 200 mesh. From the excellent clay pits of Lawrence County in Southern Ohio. These clays are recognized for their high refractoriness and excellent plasticity. The Bonding Clay is used in many foundry sand systems, facings and other applications. Well adapted to heavy casting sands. Often used with other clays to add moisture retention properties.

H & G REFRACTORY PULVERIZED FIRECLAY — for use in cupolas, furnaces, spouts, ladles and other metallurgical department applications. Cedar Heights Clay Company produces H & G Refractory Fireclay in standard 8, 12, 16, 20 and 30 mesh grinds. The high plasticity and low shrinkage give outstanding performance.

AVERAGE ANALYSIS

	Refractory Fireclay	Bonding Clay Grade
Silica	63.70	57.32
Alumina	21.13	28.50
Ferric Oxide	1.62	1.23
Lime	.55	.08
Magnesia	.11	.22
Titania Oxide	.30	1.98
Phosphorous	.07	—
Sodium Oxide	.47	1.18
Ignition Loss	8.24	9.39
PCE cone	30	31
	3,000°F	3,055°F

ALKABOND — A most unique clay for bonding foundry sands. Made under license from Casting Materials Corporation Div. of Meehanite Metal Corporation. Developed by their research people, produced by us. Alkabond is used as the total clay additive, mixes easy, mulls fast, produces high flowability, has greater durability, sands are smoother, softer and casting finish is improved. This is a blended product with certain chemicals added for control. This is the most uniform of all clay products. Alkabond is the pioneer to future clay additions.

SPECIALTY PRODUCTS

H & G makes many products for special applications. Here are listed the important ones. If you have a "special" problem, ask — there may be a product to help you.

1. **ENDOFACE** — The Moldable Chill. A dry, heavy, dark, granular, sand like product when mixed with the liquid catalyst, produces a moldable material used to promote directional solidification thru heat extraction. Can be used in areas of molds or cores where required. Packed in drums.

2. **PAN-X-TROL** — A molding sand additive used to control expansion problems in green sand. Eliminates rat-tails, buckles and scabs. It is a dry white powder — add 1% to molding sands for best results. Packed in 100 lb. bags.

3. **H & G CARBOGRAPH SAND ADDITIVE** — Where an increase in flowability is wanted, this dry, finely ground, air floated graphite added to the sand will help improve casting finish. Particularly good for small intricate castings. Used with fine synthetic sand shows measurable casting improvement. Packed in 50 lb. bags.

H & G TUBE-LUBE

A molding sand release agent designed for air transport systems. Also very useful in conventional sand systems, elevators, hoppers and tanks to make molding sand flow and handle easier. Keeps sand-air piping systems clean and lubricated. Does not effect performance of sand additives.

HOW TO USE

Air transport systems usually are equipped with an automatic injector for system lubrication. Tube Lube is a significant improvement over kerosene, liquid paring or conventional sand oils. The lubricant is added to the molding sand in the transporter. The agitation of the sand by the hi-pressure air is sufficient to distribute the Tube Lube in the air system.

USAGE

Normal usage is approximately 1 pint per ton of sand. For unusually long piping systems, slightly more may be required.

Foundries not equipit with automatic oilers can add Tube Lube directly by hand to the transporter. For brand new systems, it is suggested that about ½ to 1 gallon of Tube Lube be blown through the system to thoroughly coat all parts to prevent rusting. Also at the end of the operating day cycle, it is good practice to blow a quantity through the system to prevent rusting, improve start-up performance and lower maintenance costs. Low cost — effective — improves sand workability.

SEPARATE ADDITIVES vs. PREMIX

There is a lot to be said for either adding the materials separately or adding as a Premix.

The flexibility of separate material additions should not be over-looked by the user. The variation in core sand infiltration at the snakeout plus the new sand addition makes a change in additive requirement. The new sand takes a different proportion of clay to carbon than does the old shakeout sand. In fact, the proportion changes from one to one for old sand to two to one or more for the new sand portion. Therefore, a fixed ratio as would be obtained in a premix would preclude changing the ratio until the present stock was depleted. The question then is how often can it change? It can change as often as your type casting requirement. For the best sand control, the two ingredients, clay and carbon, used as separate additions will make the best casting.

Now read the PRE-MIX story. The choice is yours. We can furnish it either way, — but we think you need to know both sides.

PREMIX SINGLE PACKAGE PRODUCTS

Blending of clays and carbons into a single package product initiated years ago for use with natural sands was an ideal method of making additions to heaps without mullers. As synthetic sands developed these materials were gradually phased out.

A re-birth of pre-mixed materials has occurred in recent years with two major modifications making them advantageous for use in modern synthetic sand operations. Moisture has been added to make the material dustless, which in turn prevents loss at muller (fully equal to slurry) and makes clay disperse more rapidly due to pre-wetting. With the added moisture producing a dustless product together with the development of bulk tank trucks it permits delivery to the customer in bulk without elaborate dust arresting equipment.

Bulk delivery often permits the customer to install an inexpensive tank near the point of use of material and still adjacent to road for truck delivery. Bulk truck delivery eliminates the cost and difficulty of unloading, frees valuable storage space and permits inexpensive installation of automated equipment* to deliver the sand additive directly into the muller on a measured basis.

The Pre-mixing of materials reduces customer's investment in inventory, and the labor savings usually more than justifies the capital expenditure. The pre-wetting of materials not only makes the material dustless and disperses clays more rapidly, but eliminates segregation due to differential in weights of materials. The fire hazards are virtually eliminated when carbonaceous and cellulose materials are combined with clays.

This system permits the small foundry to move into bulk handling of materials easily and simply with dollar savings in over-all costs. It also can fit large foundries economically when all factors of cost are studied. However, do not overlook bulk buying of clays and carbons as separate items for lowest cost and maximum flexibility and control. Only a careful study will determine the best way.

*Dietert furnishes total systems

SEACOAL FACING

Seacoal is carefully sized, high volatile, bituminous coal of selected grades having the proper physical analyses to be used in molding sand. The addition of Seacoal to molding sand adds carbon to the sand, thereby increasing the refractoriness and also provides reducing gases in the mold to prevent the sand from adhering to the casting, thereby lowering cleaning costs and producing smoother castings that are truer to pattern.

Just any coal will not produce good Seacoal. We have always had several sources which can produce identical chemical and physical analysis and the location of our shipping points guarantees service and competitive prices.

H & G REGULAR SEACOAL is a low ash, high volatile, ground bituminous coal, made in a variety of screen analyses to suit the foundry requirement. This is the type Seacoal that we have furnished for many years.

H & G DUSTLESS SEACOAL is the wax treated version of Regular Seacoal.

ANALYSES AND SCREEN TESTS OF H & G SEACOAL FACING

All of the Seacoal Facings listed below are manufactured from the same high quality of crude coal, the only difference being the texture of grind, as represented by the different gradings.

STANDARD OR DUSTLESS GRADES

ACTUAL AVERAGE ANALYSIS

Moisture	2.35%
Sulphur	.70%
Volatile Matter ..	35.50%
Fixed Carbon	58.60%
Ash	3.96%
(Analysis on dry basis)	

GUARANTEED ANALYSIS

3.00%	(Maximum)
1.00%	(Maximum)
36.00%	(Maximum)
56.00%	(Minimum)
6.00%	(Maximum)
(Analysis on dry basis)	

AVERAGE SCREEN ANALYSIS OF EACH GRADE

CB Grade		Standard CB-120		C-3 Low Fines	
Mesh		Mesh		Mesh	
20	4.0 to 6.0	20	3.0 to 4.5	20	3.0 to 4.0
30	16.5 to 18.0	30	16.5 to 17.0	30	15.0 to 18.0
40	16.5 to 18.0	40	17.5 to 18.0	40	14.0 to 17.0
100	42.0 to 45.0	100	44.0 to 47.0	100	37.0 to 39.0
200	12.5 to 16.0	200	12.0 to 15.0	200	15.0 to 17.0
Pan	7.0 to 10.0	Pan	5.0 to 6.5	Pan	13.0 to 15.0
Standard B-2 or C-3 Coarse		C-3 Standard		D-4 Regular (824) Regular C-120	
Mesh		Mesh		Mesh	
20	3.0 to 6.0	20	2.0 to 3.0	20	Trace
30	10.0 to 15.0	30	5.0 to 8.0	30	1.0 to 3.0
40	10.0 to 15.0	40	10.0 to 14.0	40	8.5 to 10.0
100	27.0 to 33.0	100	30.0 to 34.0	100	36.0 to 40.0
200	14.0 to 18.0	200	24.0 to 27.0	200	21.5 to 27.0
Pan	19.0 to 23.0	Pan	24.0 to 28.0	Pan	28.0 to 33.0
D-4 Medium (830)		D-4 Fine (840)		Standard E-5	
Mesh		Mesh		Mesh	
20	0.0	20	.0	20	.0
30	Tr. to 1.5	30	.0	30	.0
40	3.0 to 3.60	40	1.0 to 2.5	40	Trace
100	32.0 to 36.0	100	28.0 to 32.0	100	18.0 to 20.0
200	21.0 to 26.0	200	18.0 to 24.0	200	32.0 to 35.0
Pan	34.0 to 39.0	Pan	36.0 to 42.0	Pan	45.0 to 50.0
		Standard G-7			
		Mesh			
		20	0.0		
		30	0.0		
		40	0.0		
		100	0.1		
		200	5.0 to 8.0		
		Pan	93.0 to 95.0		