Technical Data Sheet

CHEM BOND SILICATE NOBAKE SYSTEMS

DESCRIPTION AND OPERATING INSTRUCTIONS

Chem Bond no-bake binders are two component liquid binder and catalyst (hardener) systems that can be easily adapted to any type of foundry sand system. The Chem Bond binders differ from competitive no-bake sodium silicates in that working life and strip times can be adjusted without affecting the throughcure of the sand mass.

Chem Bond no-bake binder systems have a number of advantages compared to furan or oil no-bake binders. They are primarily inorganic; this results in very low gas and smoke emission in the foundry. Mixed sand has very little, if any, odor and the cured sand mass releases easily from pattern or core box. Neither binders nor catalysts are toxic. There is no need for special packaging. Chem Bond bonded sands possess good flowability and a high ratio of working life to strip time.

The Chem Bond no-bake systems are being used to produce castings in all types of ferrous and non-ferrous foundries. They are used to produce medium to large cores and molds. They are also used as a mold facing backed with system sand, either by slinging or ramming.

Chem Bond no-bake sands can be used in the foundry to replace normal green sand molding operations and other no-bake binders. They provides improved casting dimensional control and casting finish. Also, casting defects caused by gas as well as expansion defects can be reduced or eliminated.

The Chem Bond no-bake systems are competitively priced against other no-bake binder systems. They offer considerable savings in reduced labor, reduced incidence of casting defects, higher production, and improved dimensional control. Compared to other no-bake systems, these products offer a significant improvement in the foundry environment. Smoke, odor, and fume emissions from the Chem Bond processes are either absent or at very low levels.

PRODUCT DESCRIPTION

Chem Bond binders are off-white opaque liquid, based on sodium silicate. As with any chemical binder system the use of personal protective equipment, such as chemically resistant gloves and goggles, is recommended.

Chem Bond binders are packaged in 55-gallon mild steel closed top drums. Since this is a water-based product, Chem Bond binders should be stored at temperatures above freezing. The products should be allowed to reach room temperature before use.
Chem Bond Catalysts are used in the ratio of 10% by weight of the Chem Bond resins in the sand mix. Variation of the catalyst percentage in relation to the binder will not increase the cure rate of the mixed sand. In other words, 20% of the Chem Bond Catalyst by weight of binder will cure at the same rate as 10%. Reduction of catalyst level below 8% binder will result in lack of throughcure and subsequent collapse of cores and molds.

Temperature of the sand and ambient temperature in the foundry will affect the cure speed obtained with each catalyst. Lower temperatures result in slower cure times and higher temperatures result in faster cure times.

Strip times in between those obtained with each specific catalyst can be obtained in the foundry by mixing two catalysts together in varying proportions. For instance, Chem Bond Catalyst 210 and Chem Bond Catalyst 250 may be mixed together in any proportion to obtain a complete range of strip times.

Chem Bond Catalysts are packed in 55-gallon mild steel closed top drums. Catalyst strip speeds are as follows:

CATALYST	STRIP TIME ON 75°F SAND
Chem Bond Catalyst 210	75-85 min.
Chem Bond Catalyst 220	45-55 min.
Chem Bond Catalyst 230	35-40 min.
Chem Bond Catalyst 240	20-25 min.
Chem Bond Catalyst 250	10-15 min
Chem Bond Catalyst 260	6-10 min.

Chem Bond Catalysts may be stored indefinitely under normal conditions.

Chem Bond binders that differ only in the amount of organic additives can be used with these catalysts.

Product Name	Shakeout	Hot Strength
Chem Bond 490	5	1
Chem Bond 490E	5	1
Chem Bond 4905	4	2
Chem Bond 4910	3	3
Chem Bond 4915	2	3
Chem Bond 4920	1	5

Rank 1-5 with 1 being the best

Mixing

Chem Bond binders are normally added at 3% by weight of 50-70 GFN sand. As the amount of fines in the sand increases, the percentage of Chem Bond binders should also be increased. Large or chunky cores may require less handling strength, offering opportunities for decreased binder levels. Medium to large size cores have been made with 2½% Chem Bond binder using washed and dried silica sands.

As in any sand mix, the use of dry additives will increase the percent of Chem Bond binder necessary to produce an acceptable core or mold, due to the increased surface area of sand plus additive. Additives such as iron oxide, Kaolin Clay, cereal, wood flour, and others have been used with Chem Bond 4905. Normally, an increase of ½ to 1 ½ % in the amount of Chem Bond 4905 is necessary to produce an acceptable core or mold surface. Different types of sand such as zircon, olivine, and chromite have been used with Chem Bond binders with no difficulty. The percent of binder should be adjusted according to the grain fineness and bulk density of each type of sand.

Chem Bond binders and Chem Bond Catalysts can be mixed in all conventional mullers and mixers or in continuous mixing equipment. For low speed mullers and mixers, mix an additional 2 minutes. In many cases, this time can be reduced to one minute each for catalyst and for binder. In high-speed mullers, heat buildup can be a problem. Mixing time should be 30 seconds each for catalyst and binder. Normal mixing procedure is to add the catalyst to the sand and mix, then add the resin and mix. This will insure thorough wetting of the sand grains with both catalyst and binder.

Chem Bond binders and Catalysts are being mixed successfully in continuous mixers. Both catalyst and binder are low in viscosity and can be pumped by any commercial pump furnished on continuous mixers. However, Chem Bond Catalysts attack rubber and plastic components on certain pump models. Chem Bond Catalysts should only be used with pumps made of grey iron, stainless steel, Teflon, high molecular weight polyvinyl chloride, or polypropylene.

Calibration of continuous mixers should be performed daily on both catalyst and binder pumps. A simple calibration procedure is to use plastic bags and catch the amount of catalyst or binder pumped in a given time and weigh on a good quality scale. Weighing of raw sand on a steady flow basis is also necessary. In any mixer, the catalyst should always be 10% by weight of binder.

Mixing equipment must be clean. Contamination from organic binders can affect the performance of Chem Bond binders. Mixing equipment can be cleaned with water. Water will soften the hardened sand residue.

PRODUCTION

Core boxes and patterns intended for use with Chem Bond sands should be coated with an adequate parting. Nix Stix 18, a rapid drying liquid parting is recommended. It leaves a dry

white residue on the core box or pattern surface. This parting gives good release even if the mixed sand has set up.

Dry partings may be used but they do not work as well as liquid partings. In no case should oil type liquid partings be used with Chem Bond binders.
The bench life of the mixed sand is approximately 50% of the strip time. Please refer to the catalyst table (page 2) for strip times with various catalysts and sand temperatures.

Chem Bond binders have a longer work time to bench life ratio than furan or phenolic no-bake systems. This unique feature provides the core maker or molder with that "extra" safety margin for difficult jobs. The ultimate bond develops rapidly after 50% of the strip time is reached. Oil base and furan no-bake binders do not have this property, and sands made with either of these materials result in decreasing tensile strengths as time after mix increases.

As with all no-bake binders, Chem Bond sands are very flowable and do not require ramming to produce high densities. However, the best core and mold surface is produced by some mechanical means of increasing the density of the sand. This can be accomplished with hand tucking, ramming, vibrating, or some other means available to the foundry. Normal use of rods and vents is recommended.

After the core or mold is rammed, the strike-off surface of the core or mold will develop a crust, which is a false indication of the throughcure of the mixed sand. As mentioned before, the cure of the sand mass will be affected not only by the sand temperature, but also by the temperature in the foundry. A lower temperature will slow the cure; a higher temperature will increase the cure.

Care must be taken when removing the core box or pattern so that the draw is even and the strip has progressed far enough to insure sufficient strength of the sand mass. When the core or mold is stripped, the sand surface that was next to the pattern is somewhat plastic. After the sand surface has been exposed to the air, it will rapidly develop a dry feeling and a high surface scratch and hardness.

HANDLING OF FINISHED CORE OR MOLDS

Cores and molds made with Chem Bond binders develop strength very rapidly after strip. Cores will tend to be plastic and delicate lacy cores can deform even if they are stripped at the prescribed time. In this case, it is advised to allow the core to cure further on a plate for another half-hour to one hour. Bulky shaped cores and molds can be handled with some care immediately after stripping. One must remember that the core is still developing ultimate strength and, right after strip, it probably has developed ¼ of its ultimate strength.

Alcohol carried coatings are recommended for coating Chem Bond cores and molds. In many cases, the coatings are not necessary and the casting finish resulting from an uncoated core or mold is excellent.

Alcohol carried coatings may be dried by torching, or possibly, lit off. If a water carried coating is used, oven drying of the core or mold is necessary. Drying should be done at 300° F for 30 to 45 minutes. In addition, heat application to the core after strip will increase the tensile strength of the core. In some cases, this may be necessary for handling. Heating of the core or mold to 400 to 500° F to eliminate possible gas defects in certain metal alloys should be done as soon as possible after strip. Time of exposure at these temperatures should be kept to the minimum necessary to eliminate the possibility of defects. Cores heated after 24 hours of cure will deteriorate rapidly at these elevated temperatures.

Chem Bond cores and molds can be poured anytime after strip; however, it is better to wait two hours after stripping so that the core or mold can develop its full strength and surface properties.

Chem Bond cores and molds have a storage life of approximately two to three weeks under normal foundry conditions. All sodium silicate bonded materials do pick up moisture gradually and deteriorate in strength. Care should be taken not to store cores in direct contact with concrete floors, or under other conditions that would accelerate the deterioration process of the cured sand.

CASTING AND CLEANING

Chem Bond cores and molds produce little or no smoke during pouring. This improves the foundry atmosphere, and is a noticeable advantage of the Chem Bond systems. Being essentially inorganic in composition, castings produced from Chem Bond binders will show a reduced incidence of pinholes or other gas defects.

Shakeout of Chem Bond cores and molds is normally good but some difficulty may be encountered with internal cores, which are surrounded by metal. The shakeout sand is hard but brittle, and it breaks up easily into small chunks and loose sand.

Casting finish, as mentioned before, is good even without the use of refractory coatings. However, the use of coatings is recommended in any areas where burn in and penetration would be a problem.

CONCLUSION

This discussion of the Chem Bond no-bake binder system is intended as an operating aid to provide the necessary information for a successful evaluation of the system. Further questions regarding the Chem Bond no-bake binder system should be referred to your local HA International sales representative or distributor.

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