Technical Data Sheet

Techniset® NFZ

INTRODUCTION:

Techniset® NFZ is the system of choice for non-ferrous applications. This patent-pending system is a recent development in no-bake core-making technology. The 3-part system consists of a modified polyol, polyisocyanate component, and a third part catalyst. This system contains no aromatic solvents and no VOC's. When combined with sand, the system produces a mold or core with improved erosion resistance, while providing excellent breakdown. Ultimate strength development of this system is excellent.

ADVANTAGES OF THE SYSTEM:

- Improved Core Strength
- High Ultimate Tensile Strength Extremely Low Odor Characteristics Easy to Draw Patterns
- Low Smoke on Pouring Metal Increased Erosion Resistance Reduced Need for Coatings Better Shake-out
- No Phenol or Formaldehyde Reduced HAP's and No VQC's

APPLICATION OF THE SYSTEM:

Mixing can be done in either batch, low speed continuous, or high speed continuous mixers. Mixing times depend on the equipment but must be long enough to guarantee a consistent and complete distribution of the chemicals on the sand. In the batch mixer, typical mixing times are two (2) minutes with the resin and catalyst and two (2) minutes with the coreactant. Whichever type of mixing is used, the final sand mix must be free of "resin balls" and unmixed sand.

TYPICAL SAND MIX:

100# sand
0.48# Part 1 20-260
0.72# Part 2 23-227
0.024# Part 3 17-973

1.2% total, 40/60 Part 1/Part2 + 5% Part 3 (based on Part 1)

CURING:

The Techniset® NFZ undergoes an initial cure and extended plastic stage. The molds/cores must be allowed to harden prior to stripping. At typical pouring temperatures, additional curing may occur due to the unique chemistry of the Techniset® NFZ system, resulting in significantly improved hot strength characteristics.

PHYSICAL PROPERTIES:

	20-260 RESIN	23-227 COREACTANT	17-973 ACTIVATOR
Physical State	Liquid	Liquid	Liquid
Color	Water White	Dark Brown	Yellow
Visc, cps@77°F	197-367	150-250	94-174
Operating Temp, °F	60-90	60-90	60-90
Storage Temp, °F	60-90	60-90	60-90

RESIN PART I:

Techniset® NFZ resin is a medium viscosity polyol that contains no aromatic solvents, no VOC's and no HAP's. The resin composition provides both high hot strength and good collapsibility. Typical binder levels are 1.0 to 1.5 % (BOS) at a 40/60 Part I/Part II ratio. Depending on productivity requirements and ambient conditions, Part III is added at 5-15%, based on Part I. Factors requiring an increase in resin content are sand with a high grain fineness number, angularity, impurities, or dry additives to the sand.

COREACTANT PART II:

The coreactant is a polyisocyanate that contains no aromatic solvents or VOC's. In the polyol-isocyanate reaction, the reactive groups of the polyol must be in chemical balance with the reactive isocyanate groups of the coreactant to achieve maximum bond properties. The Part I/Part II ratio should be maintained at 40/60 to maximize hot strength and tensile strength.

ACTIVATOR:

The Techniset® NFZ reaction is controlled by the addition of the Part III Activator, 17-973. On silica sand, 17-973 at 3-5% based on resin weight (BOR) is typically added. The chemical characteristics of the sand must be balanced with the composition of the catalyst to give the required cure rate. Lake or other sands with high ADV's require more catalyst.
In order to achieve proper mixing of the activator, it is recommended that the activator enter the mixing chamber of a continuous mixer via the resin line. This is accomplished by inserting a T-valve in the resin line just prior to entry into the continuous mixer head. The Activator can be pre-mixed into the resin immediately prior to use if a third part pump system is not available; however, it is not recommended that this pre-blend be stored for extended periods.

Note: There is some variability in the work time and strip time measurements caused by the plasticity of the system in the early stages of the curing process.

PART I/PART II RATIOS:

The hot strength characteristics of the Techniset® NFZ system can be changed by altering the Part I/ Part II ratios. For maximum hot strength and erosion resistance Part I/ Part II ratios of 40/60 to 35/60 are recommended. For quicker break down and better shakeout Part I/ Part II ratios of 45/55 to 50/50 are recommended. The effects of changing the Part I/ Part II ratios on sand properties are summarized in the following table**.**

Effect of changes in Part I/ Part II ratios

20-260 Part I/ 23-227 Part II/ 17-973 Part III 1.5 % binder, 5 % Activator BOR

Part I/Part II	35/65	40/60	45/55	50/50
Work Time, min.	8:30	5:12	4:06	5:15
Strip Time, min.	14:48	12:24	11:36	9:20
Tensile Strength, PSI				
1/2 hour	189	115	129	148
1 hour	189	257	270	214
2 hour	143	419	341	212
overnight	337	543	488	171
Retained Strength, PSI				
3 min. @ 600ºF	305	287	244	79
6 min @ 600ºF	231	223	154	62
9 min @ 600ºF	203	145	77	68
12 min. @ 600ºF	170	160	72	54

BINDER LEVELS:

Binder levels may be adjusted over a wide range to meet foundry requirements.
Because of Techniset® NFZ high tensile strengths, binder levels as low as 0.8% BOS may be used in some application. Use of low binder levels minimizes stickiness of the sand mix. The following table compares the strengths of cores made with 1.2% and 1.5% binder.

Effect of binder level on strength

20-260 Part I/ 23-227 Part II 17-973 Part III 5 % activator BOR, Silica Sand

Binder% BOS	1.2	1.5
Work Time, min.	8:15	6:15
Strip Time, min.	12:43	10:35
Tensile Strength, PSI		
1/2 hour	138	194
1 hour	256	279
2 hour	326	343
overnight	357	363
Retained Strength, PSI		
3 min. @ 600ºF	167	171
6 min @ 600ºF	106	123
9 min @ 600ºF	82	103
12 min. @ 600ºF	59	66

SANDS:
This system is sensitive to sand chemistry. Proper level of activator is critical for curing.

METALS:
This system has been designed specifically for aluminum and other low temperature metals. Techniset® NFZ is generally not recommended for ferrous castings. However, it may give acceptable performance with thin section, lightweight iron castings.

CLEANING SOLVENT:
A special cleaning solvent, 19-339, is recommended for use with this system. Cleaning solvent 19-339 is effective in cleaning pumps and lines containing Part I, Part II or the Activators. Cleaning solvent 19-439 may be used to clean the Part II lines and pumps. Solvent 19-439 should not be used to clean the Part I or Activator pumps and lines.

RECLAMATION:
Mechanical reclamation is recommended for this system. However, tests should be run to confirm that a foundry's reclamation system works acceptably with Techniset® NFZ.

STORAGE AND HANDLING:

RESIN
The resins are neutral and may be stored in mild steel tanks or steel drums. They can be stored below 80°F for up to one year with no loss in properties. Storage at lower temperatures will increase the viscosity of the resin, making mixing difficult. Drums should be sealed to prevent moisture pickup.

Spills on clothes and the skin should be washed off immediately with soap and water. Clothes should be removed and washed before reuse. Chemical resistant cloves and eye protection should be used when working directly with the resin. Cloth gloves will provide adequate protection of the hands when working with the sand mixture.

If resin is splashed in the eye, rinse immediately with large volumes of water and consult a physician. Solvents should not be used to wash off the skin since chemical components could be carried through the skin and result in systemic effects. Read Material Safety Data Sheet for further information.

COREACTANT
The coreactant should not be in contact with skin or eyes for any length of time.

Chemical-resistant gloves and eye protection must be used when working directly with coreactant. Cloth gloves will provide adequate protection when working with the sand mixture. Spills on clothes and the skin should be washed off immediately with soap and water. Clothes should be removed and washed prior to reuse. Spills should be cleaned up with an absorbent material and removed to the outdoors. Minor spills may be neutralized with a 10% solution of ammonia and water. Avoid prolonged breathing of vapors. Read Material Safety Data Sheet for further information.

The coreactant is a polymeric isocyanate, which will react with water to form a urethane polymer and carbon dioxide gas as a by-product. All coreactant drums are sealed with a metal bung cover prior to shipment. This will help prevent moisture from entering the drum during storage.

It is not recommended that this material be stored outside or in direct sunlight. Water can build up on the drum surface, and during the heating/cooling cycle can be aspirated into the material through the seam or bung opening. If stored outside, the material should be covered with a protective, waterproof tarp. Drums that are stored in direct sunlight will reach temperatures of up to 150°F. This could cause a loss in reactivity and produce a viscosity build-up. Aluminum and copper bearing alloys should not be permitted to come in direct contact with isocyanates, since a reaction will occur. Coreactant can be stored for up to one year in a sealed container at temperatures below 90°F.

ACTIVATOR
The Activators should be stored in sealed containers and out of direct sunlight.

The activator should not be in contact with the skin or eyes for any length of time. Chemical-resistant rubber gloves and eye protection must be used when working with the activator. Cloth gloves provide adequate protection when working with the sand mixture. Spills on skin and clothes should be washed off immediately with soap and water. If a skin reaction is noted consult a physician. Spills should be cleaned up with absorbent material and removed to the outdoors. If splashed into the eye, rinse immediately with large amounts of water and consult a physician. For additional health, safety and handling information, consult Material Safety Data Sheet before using this product.

TECHNICAL SERVICE:

Proper selection of a binder system that meets your specific needs is key to achieving maximum performance benefits. HA International, LLC provides in-depth technical assistance and a wide range of foundry binder systems. Both our in-house and field experts are available to assist you in your most challenging foundry applications. Please contact your HA International, LLC representative so that we may assist you in putting together a binder system and foundry team that will help you.

DJH 1/21/05