Introduction of New Product

Pasty Monolithic Refractory TOMBO™ No.5675 "FINEFLEX BIO™ CAST"

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1. Introduction

Cracks and joint openings on the furnace wall of industrial furnaces deteriorate insulation performance and decrease energy efficiency. However, since full renovation is costly, partial mending or repairing of problematic spots is performed to prolong functional life.

As a repair material for such use, NICHIAS has already launched TOMBO™ No. 5420 "FINEFLEX™ FIBERCAST" to the market and has received the support of many customers for its ease of use.

However TOMBO™ No. 5420 "FINEFLEX™ FIBERCAST" contains refractory ceramic fiber (RCF) that is regulated by REACH. This report introduces TOMBO™ No. 5675 "FINEFLEX BIO™ CAST" made from alkaline earth slicate wool (AES wool), which we introduced as a product not regulated by REACH.

2. Overview of "FINEFLEX BIO™ CAST"

2.1 Product Overview

"FINEFLEX BIO™ CAST" is a paste product made by wet mixing "FINEFLEX BIO™" (AES wool uniquely developed by NICHIAS) with an inorganic binder and other materials (Figure 1). This repair material can be used immediately after unpacking and is easily available for construction into special shapes and complicated positions. As listed in Table 1, the product lineup includes two general-purpose types (standard and high-density) suitable for troweling construction, and one type for pumping construction, which can be selected depending on the application.

Figure 1 TOMBO™ No.5675 "FINEFLEX BIO™ CAST"

Table 1 "FINEFLEX BIO™ CAST"

TOMBO No.	Product name	Application
5675-400	FINEFLEX BIO CAST 400	General-purpose (standard type)
5675-700	FINEFLEX BIO CAST 700	General-purpose (high-density type)
5675-400P	FINEFLEX BIO CAST 400P	For pumping construction

2.2 Advantages and Applications

2.2.1 "FINEFLEX BIO™ CAST 400" and "FINEFLEX BIO™ CAST 700"

Of the two general-purpose products, the standard type is for repair and joint filling, and the high density type is for lining. They offer the following advantages.

<Advantages>

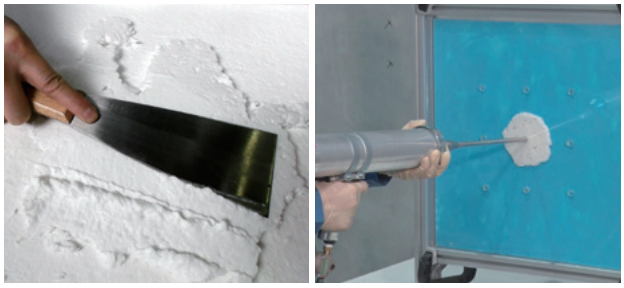
- Being a soft paste product, troweling and tamping construction are easy.
- Repaired surfaces gain increased intensity and excellent wind resistance after being dried and heated.
- Easy construction into special shapes and complicated positions
- Can be used to repair various furnace walls.

<Applications>

- Skid pipe host section of a steel heating furnace
- Ceiling and side wall of casting heating furnace
- Outer wall seal of glass tank kiln heat-storage chamber
- Burner tiles
- Repair of existing refractories

2.2.2 "FINEFLEX BIO™ CAST 400P"

This product can easily be pumped immediately, because its viscosity and adhesion properties are suitable for pumping injection and spraying construction methods.



Troweling　　Pumping injection

Figure 2 Construction images

Table 2 Comparison of physical properties between "FINEFLEX BIO™ CAST" and TOMBO™ No. 5420 "FINEFLEX BIO™ FIBERCAST"

Product name		FINEFLEX BIO CAST			FINEFLEX FIBERCAST		
TOMBO No.		5675-400	5675-700	5675-400P	5420-400	5420-700	5420-400P
Advantages		Troweling construction	Troweling construction	Pumping construction	Troweling construction	Troweling construction	Pumping construction
Fiber used		AES wool			RCF		
Chemical composition		SiO_2, MgO, CaO, and others			Al_2O_3, SiO_2		
Color hue		White to light white			White		
Maximum heat resistant temperature		1300			1400	1500	1400
Consistency［1/10mm］		220	220	325	225	225	355
Density［kg/m^3］	Normal state (before drying)	1160	1320	1160	1100	1200	1100
	After drying at 110℃	450	750	480	450	700	450
24 h heat shrinkage rate［%］	1100℃	1.5	1.3	1.5	2.0	1.9	1.7
	1200℃	1.5	1.4	1.5	2.4	2.8	2.8
	1300℃	1.5	1.6	1.5	3.5	4.4	4.1
Bending strength［MPa］	After drying at 110℃	0.63	0.92	0.87	0.50	0.52	0.90
	1200℃	0.39	0.85	0.37	0.30	0.93	0.50
Thermal conductivity［W/(m·K)］600℃		0.19	0.20	0.22	0.15	0.18	0.21

<Advantages>
- Effective for extending furnace life through pump injection into cracks and joint openings on the furnace wall.
- Allows high-efficiency construction by using a dedicated pressure pump, injecting machine, and spraying machine.
- Can be easily injected into special shapes and complicated positions, and after it dries, the repaired section keeps high strength.

<Applications>
- Joint injection and furnace wall spray heat insulation construction of steel heating furnace
- Back filling of air-heating furnace bricks
- Various joint filling constructions in general industrial furnaces

2.3 Physical Properties

Table 2 shows the comparison of physical properties between "FINEFLEX BIO™ CAST" and TOMBO™ No. 5420 "FINEFLEX™ FIBERCAST" (hereinafter "FIBERCAST"). The physical properties are the same as the conventional "FIBERCAST".

However, the maximum heat resistant temperature of "FINEFLEX BIO™ CAST" is 1,300°C due to the characteristics of AES wool. Also, the storage period is 6 months after manufacturing, if it is stored unopened in a cool and dark place at 4°C or higher.

3. Construction Example of "FINEFLEX BIO™ CAST"

We have verified that the workability of "FINEFLEX BIO™ CAST" is equivalent to that of conventional "FIBERCAST".

The following is an example of injection construction with an air type caulking gun.

In this example, a plastic bag cartridge filled with "FINEFLEX BIO™ CAST 400P" is loaded into an air type caulking gun, and then injected into the target positions (Figure 3). This method is effective especially when the construction targets are scattered or for construction with a medium amount of material.

Figure 3 Air type caulking gun and cartridge loading

In this example, an injection hole was made in the casing located at the furnace wall hot spot, and a test was conducted to simulate repair by injection into the gap between the heat-insulation material and the casing. Figure 5 shows a scene where "FINEFLEX BIO™ CAST 400P" was injected into the test equipment shown in Figure 4.

It can be seen that in this test condition, the injection spreads the material to about 30 cm in diameter. Thus, construction of a wider range is possible by injecting into multiple places.

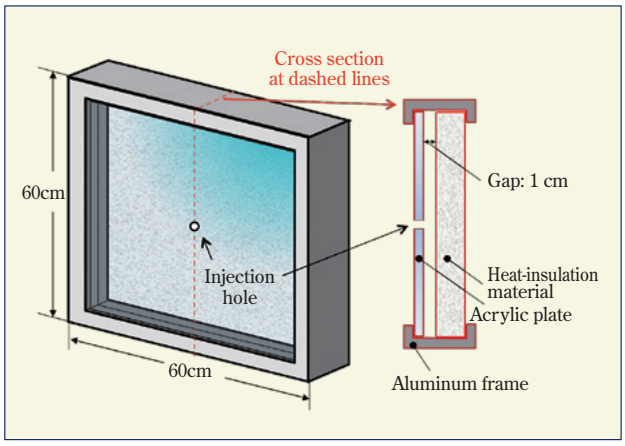


Figure 4 Injection test equipment

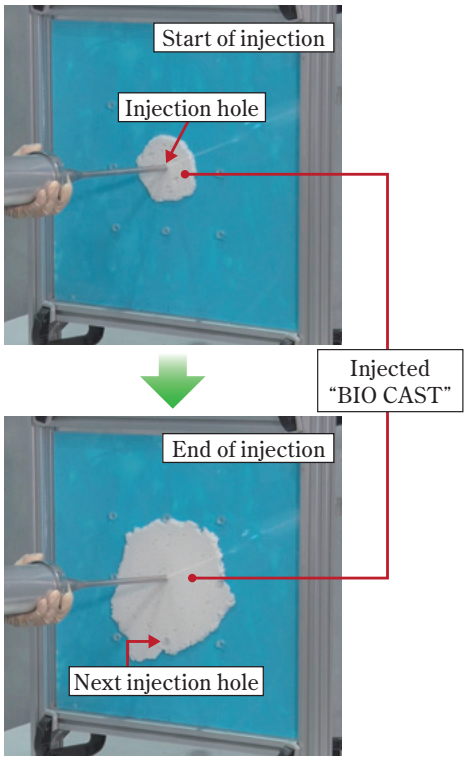


Figure 5 "FINEFLEX BIO™ CAST" injection test

4. Conclusion

This report introduced "FINEFLEX BIO™ CAST" using AES wool "FINEFLEX BIO™", uniquely developed by NICHIAS.

Products with environmental safety and energy saving considerations will see increased demand in the future.

We're committed to making a positire contribution to both our customers and society through our current products as well as further technological developments.

For inquiries regarding this product and related ones, please contact the Energy-Saving Products Technology & Development Group, Industrial Products Division.

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