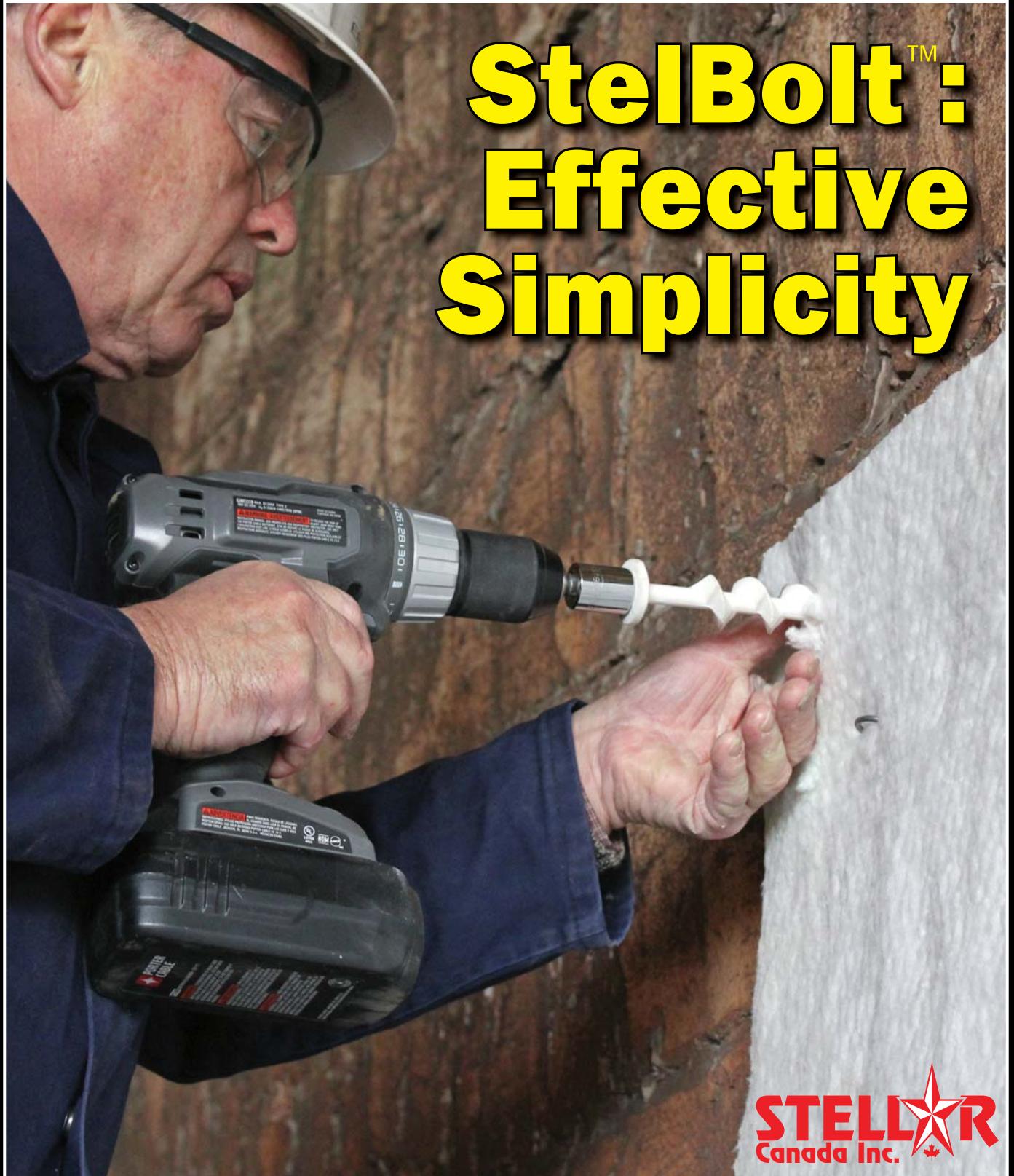


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StelBolt[™] Effective Simplicity



STELLAR
Canada Inc. 

StelBolt™: Effective Simplicity

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Every now and then, a product comes along that changes the playing field of an industry. Stellar Canada has done just that for high-temperature applications with a furnace insulating system that uses a simple, reliable, cost-effective and durable product – StelBolt™.



StelBolt™ (patent pending) allows you to quickly and easily upgrade the thermal insulation of your furnace by adding extra insulation cost-effectively. No overhaul of the furnace lining is required. No significant downtime is created. No messy, hazardous tear-out and disposal of old lining is required.

Background

If you've been using ceramic fiber to line your industrial furnace, you are probably aware there has been little new for the application of this material for decades. The last major development in fiber application came in the 1970s when ceramic-fiber modules were introduced as an alternate method to layered blanket (a.k.a., the wallpaper method) impaled on alloy pins.

Wallpaper linings are very cost-effective since lesser-grade materials can be used at the cold face where temperatures are lower. In addition, given the perpendicular fiber orientation to heat flow, wallpaper linings can offer a 10% improvement in cold-face temperatures and heat loss when compared to an identical lining of ceramic-fiber modules (Fig. 1).

The exposed alloy wallpaper anchor pins were a major shortcoming of this system since they were prone to oxidize at elevated temperatures. Modules, with their buried anchoring system, readily solved this problem. However, the construction

of the module mandated the use of the same fiber grade and density throughout the module thickness, making them a less cost-effective alternative.

A Third Option Now Available

In 2007, a new lining technique was developed using high-alumina ceramic bolts to attach additional ceramic-fiber blankets, vacuum-formed boards or ceramic tiles to existing or new linings. Armormax Refractories in New Castle, Pa., has been exploring the use of this new technique and has used these “ceramic bolts” to solve numerous insulation problems for their customers.

“At first I was extremely skeptical that a fiber lining would offer enough strength to accept a bolt screwed into it,” said Matt Perry from Armormax. This skepticism was quickly dismissed when a test was conducted by hanging weights from a lag-style bolt screwed into a 20-year-old module lining (Fig 2). “This single bolt held 35 pounds for several hours before we stopped the test, and I knew then that this simple concept would have endless possibilities for ceramic-fiber linings,” Perry said.

StelBolt holds equally well in both wall and roof applications. A similar trial using insulating firebrick as the substrate yielded holding power of more than 70 pounds on one bolt. The integrity of your new lining is unquestionably reliable given that alumina-fiber insulation is only about 1.3 pounds per square foot.

The mullite bolts are offered in a “lag

style” for use in IFB or board linings and an “auger style” for wallpaper linings or ceramic-fiber modules. Having this ability to mechanically attach additional insulating materials to new or existing linings now offers a wide range of cost-saving solutions that could never be considered before.

Repairs Made Simple

In the past, repairing a damaged lining often required complete removal and replacement of the damaged materials with new blanket or modules. New anchors are usually required, which now involves the need of a welder or special stud gun to complete the repairs. Repairs of this nature are now greatly simplified by packing the damaged area with fiber and bolting on a covering patch to complete the repair. All of this can be accomplished in a matter of minutes without the need of special installation tools. If you can turn a bolt, you can fix your furnace (Fig. 3).



Fig. 2. Photo of bolt with weight hanging from it

Fig. 1. Chart of heat-flow comparison

2300°F hot face	Cold-face temp. (°F)	Heat loss (btu/sq. feet/hour)
9 inches of 8# blanket “wallpaper”	215	312
9 inches of 8# folded module	235	380
9 inches of 8# stacked module	251	416



Fig. 3. Drilling bolt into a lining

Restoring an Old Lining

Bolting new blankets or ceramic-fiber boards to an existing lining can provide a simple and cost-effective method to restore a worn-out or badly shrunk lining. By bolting multiple layers to the existing hot face, the layers can be staggered to effectively eliminate any straight-through joint to the furnace casing. The additional layers will also help with heat loss and potentially allow the furnace to be operated at higher process temperatures.

Establish a Sacrificial Layer

Certain processes generate alkaline conditions known to chemically attack ceramic fiber and dramatically affect lining longevity. A sacrificial layer(s) can now be bolted to the hot face and easily replaced once attack becomes severe. This system helps protect the existing lining and can greatly extend the life of the back-up insulation. In essence, the back-up lining becomes a high-temperature bulletin board for the sacrificial hot face to be anchored to. Once attack of this layer has reached the critical level, the damaged material is unbolted and a new layer bolted back in its place. Provided the ceramic bolts are not mechanically damaged or dropped, they can be reused almost indefinitely.

Attaching Boards or Tiles

Several refractory contractors have used these ceramic bolts to attach vacuum-formed ceramic-fiber boards in areas of high wear or burner erosion. The fix is simple and only takes minutes to accomplish using a cordless drill with a socket attachment. A similar fix is also employed when furnace cleanliness becomes an issue to minimize surface defects in finished parts. Ceramic-fiber shot (the unfiberized glassy particles in ceramic fiber) has been known to leave surface defects in both batch and continuous furnaces. By bolting low-shot blankets to the hot face of these linings, the particulates can be contained, resulting in reduced product reject rates.

Quick and Simple Baffle Walls

Furnace baffle walls can pose some serious maintenance issues for

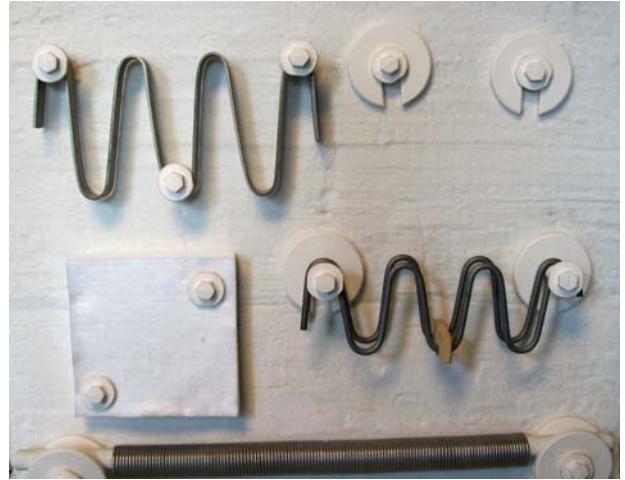


Fig. 4. StelBolt™ supporting element heating systems

operation personnel. Since the wall is immersed in heat, it will often require exotic alloys or water-cooled members for hanging. Water-cooled baffle walls are prone to leak and are a common cause for many unscheduled outages.

Ceramic bolts were recently used to install a baffle wall in a roller-hearth furnace without shell or refractory modifications. This customer needed to rezone his furnace and used ceramic bolts to anchor layers of fiber strip to the roof and construct a baffle wall. The baffle modification only took several hours to complete without the need for water cooling or an expensive alloy hanging system.

Electric Element Retention

In the U.K., a large electric-furnace manufacturer has incorporated the ceramic bolt into an element hanging system. At the moment, they use a complicated system of ceramic tubes manufactured into the fiber modules with a series of hooks, pegs and tray locators. With this in mind, if they need a repair on the lining it becomes very costly and is generally saved for a complete lining, if at all. With the hanging system using the StelBolt, however, it is simple to use and makes repair bills more cost-effective by removing the ceramic bolt, lowering the bank of elements, repairing or replacing the area with standard fiber modules, replacing the bank of elements and securing/hanging back with the bolt (Fig. 4).

Cost-Efficient, High-Temperature Linings

Ceramic-fiber shrinkage is a function of time at temperature. When process temperatures climb above 2150°F, conventional fiber linings will require a diligent maintenance program to keep fiber shrinkage gaps in check. Often, even these best efforts will only provide three to five years of maintenance-laden service before needing replacement. In the past, the long-term solutions in these applications have involved a retreat to conventional dense lining systems or paying the dramatic price jump (10-12X) for polycrystalline or sol-gel fiber systems.

Several forge reheat furnaces were upgraded last year by bolting



Fig. 5. Photo showing a board bolted to a target wall

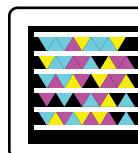
polycrystalline fiber to the existing ZR module lining. The added insulation at the hot face provides for long-term, maintenance-free service at a fraction of the cost when compared to a full-thickness lining of polycrystalline fiber (Fig. 5). Finally, this added insulation was installed in staggered layers, which eliminated any path for direct radiant energy to reach the furnace shell. New lining

installations using traditional 2600 and 2700 rated ceramic-fiber products are being renewed using StelBolt and polycrystalline fiber to eliminate shrinkage gaps and reduce heat loss.

Summary

Ceramic bolts offer a new system for ceramic-fiber users to line and maintain their heating equipment. They provide a hybrid system, combining the best features of layered blanket with the advantages of a modular lining and its buried anchor system. Using the system requires no special skills or installation tools beyond a drill. In short, if you can turn a screw, you can repair, upgrade or reline your furnace or kiln in simple, reliable fashion. The “simple effectiveness” of this system is worth consideration for all ceramic-fiber lining users and will offer solutions to problems not yet realized. **IH**

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Check out this video demonstrating the ease of installing insulation with the ceramic bolt.

Get the free mobile app at <http://gettag.mobi>



Stellar Canada Inc. is a privately owned Canadian company supplying unique licensed and patented refractory technologies. These products and services are made available through exclusive distribution arrangements with strategic partners located around the globe. Our solutions include: Thermbond® Refractories, high-strength and quick-setting for improved turnaround time; FIBERStone “cast-iron refractory”; Ceramite® abrasion-resistant ceramics; and Maftec®, a 3000°F mullite-based polycrystalline blanket to increase efficiencies in reheat and galvanizing furnaces.



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