

REFRACTORY SOLUTIONS FOR CEMENT



HWI

A MEMBER
OF CALDERYS

HWI

Every day around the world, HarbisonWalker International's (HWI) people and products stand up to the challenges and pressures of every job. And for 150 years, we've been the gold standard for refractory products. We deliver one of the industry's widest, deepest lines of solutions. Our world-class products perform to the highest degree. And by bringing intensity, reliability, and passion to work every day, we're able to provide superior value to our customers and their businesses. Get to know the experts who anticipate, respond, and deliver like no one else. We're nearly 2,000 people with one goal: to keep your business moving forward.



HWI is a leading US supplier of refractory products to the cement industry.

We have one of the widest networks of experienced field sales representatives and application specialists to service your cement kilns and total refractory needs. At our Advanced Technology and Research Center, we're studying how changes in process and material composition are adversely affecting refractory service life in pyro-processes. We're delivering new ideas to optimize refractory products and installations to address today's changing line fuels.



MADE FROM A DIFFERENT MOLD.

Meet our problem-solving, fly-into-action, whatever-it-takes people who are driven to minimize your downtime. We're beyond responsive. We're beyond reliable. Here's how:

Dedicated personnel ready to respond 24/7/365

Manufacturing sites and strategically placed distribution centers throughout North America

Supply partners in China and Europe to support the full range of customer needs

HWI associates and partners strategically located around the world—and ready to take your call

With the right mix of products and technology, HWI has one of the best operations in the world to deliver what you need, when you need it. No one produces more tonnage in the United States, and our manufacturing footprint spans the globe.

What sets the people of HWI apart? We have a burning desire for answers, excellence, and accuracy. We're thorough and meticulous. And absolute accountability is baked into our DNA.

PRODUCTS THAT PASS THE TEST. EVERY DAY.

Have high expectations for your refractory products? We do too. Our products set benchmarks for the industry, including ARMORTECH, DV-38®, VERSA-TECH, CRYLA®, and KALA®

The competitive edge you're looking for starts with us—and with your dedicated HWI application specialist. They're experts who will understand every inch of your process and who will work intensely to optimize your refractory performance.

With the right products identified, we deliver with lightning speed—the products you need, when you need them. We ship around the world at a moment's notice. And we stock our most popular products so that you can have them the same day or the next day. Let us work with you to reduce your potential for downtime.

Want to save time and money? Want to improve your productivity? Talk to your HWI sales representative today. Don't have one? Call 1-800-492-8349.

APPLICATIONS

PREHEAT TOWER

KILN

NOSE RINGS

BURNER PIPES

FIRING HOODS

COOLERS



PREHEAT TOWER

Modern preheat towers need refractory solutions that improve production processes, increase overall output and reduce the cost of making cement that goes into the worlds buildings, bridges, airports and roadways.

PREHEAT TOWER REFRACTORY SOLUTIONS

As a primary supplier to some of the world's largest cement producers, HWI has the process knowledge, proven refractory products, and solutions that deliver energy savings, increased campaign life, and efficiency within modern cement plant preheater systems.

Our customized refractory lining systems are used in all key clinker production areas; upper cyclones, lower cyclones, meal and air ducts, calciners, risers and kiln inlets. Our proven refractory product lines of brick and monolithics provide the highest performance in the most severe environments.

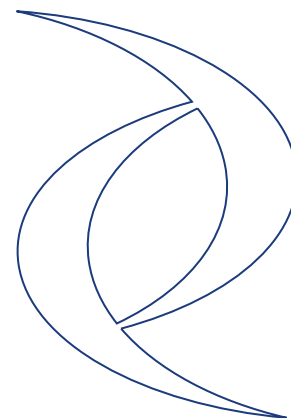
PROVEN PREHEAT TOWER PRODUCTS

SHOT-TECH® 45 LI

Fireclay based, low cement shotcrete mix with a service limit of 2,800°F (1,540°C). Ideally suited for upper cyclones and ducts where abrasion resistance is necessary.

KALA®

High purity, 50% alumina brick with low porosity, excellent high strength and exceptional resistance to alkali attack. KALA® is ideally suited for preheater cyclones and risers where alkali salts are present.





VERSA-TECH THOR® AZS G ON-LINE

A unique high strength gun mix based on mullite with zirconia addition. Engineered for rapid turn-around applications requiring alkali and abrasion resistance. Perfectly suited for repairs to risers and lower cyclones.

SHOT-TECH® 60Z

This high alumina shotcrete mix is specifically engineered for ease of installation while maintaining outstanding physical properties. SHOT-TECH® 60Z is designed for more demanding areas where alkali attack or build-up of calcium sulfates are factors.

LO-ABRADE® GR PLUS

Ideal for general maintenance of upper cyclones where abrasion and erosion are of concern. Excellent gunning characteristics and great physical properties make this product the first choice in cyclone maintenance.



THOR® FAMILY

THOR AZS FAMILY

**ZIRCONIA CONTAINING MONOLITHICS
ENGINEERED TO INCREASE UP-TIME BY REDUCING
ALKALI PENETRATION AND BUILD UP.**

THOR® AZS CASTABLE

Low cement, vibration cast, fused zirconia-mullite based castable with silicon carbide.

THOR® AZSP PLUS

Pumpable low cement, fused zirconia-mullite based castable with silicon carbide. May be installed via shotcreting.

THOR® AZS-PT PLUS

Pumpable low cement, fused zirconia-mullite based monolithic. Does not contain silicon carbide. Designed for optimum alkali resistance in reducing conditions. May be shotcreted.

CS-TECH AZS-ST

Zirconia-mullite containing no cement shotcrete mix. Does not contain silicon carbide.

ROTARY KILN

Rotary kiln operators need refractory solutions to respond to increasing demands from low cost fuels and raw materials, mechanical stresses and thermal loads of today's high-tech burners, while improving on kiln operational efficiency, reliability and up-time.

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PROVEN ROTARY KILN PRODUCTS

ARK-70

A bauxite based, 70% alumina brick with improved alkali resistance. Developed for demanding applications in cement kilns where improved alkali resistance is required. Specifically developed to meet today's increasing demands brought from alternate fuels and raw materials.



MAGNEL® FAMILY

HWI'S MAGNEL FAMILY OF BASIC BRICK ARE DESIGNED, ENGINEERED AND MANUFACTURED TO MEET THE MOST DEMANDING SERVICE ENVIRONMENTS IN TODAY'S ROTARY CEMENT KILNS. COMPOSITIONS WITH FUSED AND SINTERED SPINELS ARE AVAILABLE FOR USE IN ALL BASIC ZONES FOR CEMENT KILNS.

MAGNEL® BRICK ARE PROUDLY MADE WITH QUALITY IN THE U.S.A.

MAGNEL® RS

A combination of high purity, synthetic magnesite, fused spinel and a matrix of reinforced spinel (RS) give this basic brick excellent physical properties. Ideally suited for all basic brick zones in cement kilns.

MAGNEL® ULTRA

Magnesia-spinel brick manufactured from high purity magnesite and high purity, fused spinel. This brick is highly resistant to redox conditions and attack by sulfur, alkali salts and chlorine. Ideally suited for thermally stressed zones in cement kilns or for high wear areas of kilns using waste fuels and/or high levels of petroleum coke.

MAGNEL® ULTRA AF

Designed for use in upper and lower transition zones of cement kiln, this magnesia-spinel brick is manufactured from high purity magnesite and an alumina-rich synthetic, sintered spinel grain. The unique spinel formation and accompanying distribution in the matrix provides excellent coatability. May also be used in kilns with high temperature issue or in kilns with a high silica modulus.

MAGNEL® BZ

High purity, magnesia-spinel brick diffused with coating enhanced additives. A lower spinel content and iron rich matrix provide further enhancement to coating characteristics. Developed for burning zone applications in cement kilns.

KILN NOSE RINGS

Rotary Kiln Nose Rings present the most difficult of service environments for refractories. Mechanical stress, thermal overloading & shock, alkali attack and abrasion often lead to shortened service life, resulting in losses in operating time and production.

ROTARY KILN NOSE RING REFRACTORY SOLUTIONS

Consideration to all the dynamics in the Nose Ring system is critical to gaining increased service life in this highly-stressed area. Through determined examination of the nose ring dynamics, HWI has identified the key elements to successful nose ring installations; Product selection, Anchoring and Design (PAD).

Proper selection of products for the nose ring is a key part to success. HWI offers a series of proven products for nose ring applications that meet the demands of any operation, time and time again. Our Advanced Engineers provide anchoring systems and design layout to ensure all aspects of nose ring installations are thoroughly addressed.



FEATURED NOSE RING PRODUCTS

NARCON® 65 CASTABLE

The low cement content of NARCON® 65 CASTABLE provides extremely high strengths to withstand the erosive effects of hot dust laden gases. It's homogeneity of structure makes NARCON® 65 much less susceptible to thermal shock damage than conventional castables.

THOR® AZSP PLUS

This low moisture, fused-zirconia mullite castable contains silicon carbide to enhance alkali resistance. THOR® AZSP PLUS exhibits excellent thermal shock resistance, extremely good abrasion resistance and excellent hot strengths. THOR® AZSP can be pumped or shotcreted in place for quicker installations.

THOR® AZS CASTABLE

Low cement, vibration cast, fused-zirconia based castable with silicon carbide, offering superior resistance to alkali attack, outstanding abrasion resistance and thermal shock. THOR® AZS is the ultimate in protection for nose ring applications.

BURNER PIPES

Burner pipes present daunting challenges for refractory suppliers. Thin linings, abrasive dust laden gases, alkali attack and thermal shock are all contributing factors to burner pipe service life.

BURNER PIPE REFRACTORY SOLUTIONS

HWI has developed a unique solution to extending the operational life of burner pipes. Anchor alloy, appropriately placed expansion joints and material selection are all part of the HWI solution.



FEATURED BURNER PIPE PRODUCTS

ULTRA-GREEN® SR

This high purity alumina based, ultra-low cement castable possesses high hot strength for resistance to hot load deformation and hot abrasion. The addition of andalusite provides superior resistance to thermal shock making this an ideal product for burner pipe applications, specifically for the tip area.

ULTRA-GREEN® 80

ULTRA-GREEN® 80 is an ultra-low cement castable that exhibits high hot strengths and resistance to hot load abrasion. HWI utilizes the zoning approach for burner pipes, which makes ULTRA-GREEN® 80 ideally suited for the body of burner pipes.

ULTRA-GREEN® 60 PLUS

This 60% alumina, low-cement castable, designed to be vibration cast, is well suited for the service environment of burner pipe bodies. High density and hot strengths provided excellent protection from hot, dust laded process gases.





A BLISTERING COMPETITIVE EDGE.

FOR ALMOST 100 YEARS,
WE'VE PIONEERED REFRACTORY
CEMENT SOLUTIONS THAT
CONTINUE TO OUTPERFORM
INDUSTRY EXPECTATIONS.

FIRING HOODS

Temperatures in the firing hood area can exceed 2,012°F (1,100°C) and depending on fuels, chemical attack, specifically potassium, is often a concern. This combined with the high concentration of clinker dust laden gases provide for a severe service environment. HWI offers a full line of brick and monolithic solutions to solve firing hood issues.

HOOD WALLS

HWI offers several solutions for firing hood upper walls and arches. From pressed brick in tongue and groove orientation to gunned products that can be applied for emergency repairs.



PROVEN HOOD WALL PRODUCTS

KALA®

High purity, 50% alumina brick with low porosity, excellent high strength and exceptional resistance to alkali attack. KALA® is ideally suited for hood walls where alkali salts are present.

VERSAFLOW® 60

This 60% alumina castable is based on Alabama bauxitic calcines. It is ideally suited for general maintenance in areas of high abrasion and thermal shock.

SHOT-TECH® 60Z

This high alumina shotcrete mix is specifically engineered for ease of installation while maintaining outstanding physical properties. SHOT-TECH® 60Z is designed for more demanding areas where alkali attack or build-up of calcium sulfates are factors.

PLASTECH® 70P

PLASTECH® 70P is a high alumina, phosphate-bonded, mullite based plastic refractory. Can be fast fired due to its Plus Rated characteristics. PLASTECH® 70P is ideal for bullnoses and cooler hoods.

CLINKER COOLERS

Modern, high efficiency coolers can see temperatures in excess of 1,832°F (1,000°C) requiring refractory and anchor selections that are capable of protecting assets in a wide range of temperatures. In many cases combining ceramic anchors with metallic is required. Highly abrasion resistant materials that are considered in all areas of clinker cooler applications from curbs and side walls to bull noses and drop walls.

HWI offers installation options of monolithics, pre-cast shapes, and tongue and groove fired brick. All engineered to provide refractory solutions to today's high efficiency coolers



PROVEN CLINKER COOLER PRODUCTS

UFALA®

A 60% alumina brick with high domestic calcines. UFALA® possesses low porosity, high hot strengths, and exceptional abrasion resistance, making it an ideal choice for brick shapes for cooler installations.

KALA®

High purity, 50% alumina brick with low porosity, excellent high strength and exceptional resistance to alkali attack. KALA® is ideally suited for cooler walls where alkali salts are present.

VERSAFLOW® 80C PLUS

Impact resistance, abrasion resistance and high hot strengths are all desirable in coolers. VERSAFLOW® 80C offers superior results in all of these categories. An 80% alumina product with coarse grain for the ultimate in impact resistance.

THOR® AZS CASTABLE

Low cement, vibration cast, fused-zirconia based castable with silicon carbide, offering superior resistance to alkali attack, outstanding abrasion resistance and thermal shock. THOR® AZS is the ultimate in protection for nose ring applications.

SHOT-TECH® 60Z

This high alumina shotcrete mix is specifically engineered for ease of installation while maintaining outstanding physical properties. SHOT-TECH® 60Z is designed for more demanding areas where alkali attack or build-up of calcium sulfates are factors.

VERSAGUN® 60Z

The addition of zircon to this 60% alumina gun mix increases its resistance to alkali attack. VERSAGUN® 60Z ADTECH is general maintenance gun mix with exceptional gunning characteristics.

VERSAFLOW® 55/AR C PLUS

With a focus on alkali resistance (A/R), this product also delivers great abrasion resistance. Whether vibration casting, pouring or pumping, this product delivers great protection for your assets.

A construction worker wearing a blue long-sleeved shirt, dark pants, and an orange hard hat is standing on a wooden structure. He is looking towards the right and has his right hand near his face. In the foreground, the back of another worker's head wearing a blue shirt and an orange hard hat is visible, looking towards the same direction. The background shows a complex structure of wooden beams and concrete, possibly a bridge or a large industrial building under construction. The lighting is warm and focused on the worker in the middle ground.

**AS RESPONSIVE AS IT GETS.
WE WON'T MELT WHEN THE
HEAT IS ON. OUR QUICK
RESPONSE TIMES MINIMIZE
OUTAGES AND DOWNTIME.**





CS-TECH SHOTCRETE

HWI is proud to introduce CS-TECH, a family of cement-free colloidal silica (CS) monolithics. These materials use a colloidal silica liquid that acts as the bond phase in the matrix. This allows for better adhesion to existing refractory linings than other no-cement formulations, while offering the traditional benefits of no-cement products.

Colloidal silica bonded refractories benefit from the absence of calcium aluminate cement. They exhibit outstanding alkali resistance and excellent hot strengths compared with typical cement-bonded materials. Additionally, the detrimental reaction between calcium aluminate cement with environmental factors, such as chlorine, is eliminated. Another benefit of this binder system is nano-technology, allowing for excellent adhesion to existing refractory linings.

APPLICATIONS

- Kiln inlet / riser / feed shelf
- Calciners
- Lower stage cyclones
- Lower stage riser ducts
- TAD connections at calciner
- Coolers
- Preheaters



INSTALLATION

Installation options for CS-TECH products are casting, pumping or shotcreting. For all application methods, dry-out and heat-up can begin as soon as a hard set has been achieved.

- CS-TECH materials are mixed with CS Binder instead of water.
- Activator N is the preferred set activator for shotcreting.
- Installation guidelines, as well as curing and dry-out schedules are available.
- Cast or pumped linings are PLUS rated (Capable of 100°F (38°C) per hour heat-up rate)
- Shotcreted linings ON-LINE rated (Capable of 100°F (38°C) per hour heat-up rate requiring only 4-6 hour air cure)

AVAILABLE PRODUCTS

VIBE CAST | SHOTCRETE | PUMP CAST

CS-TECH 60-ST

60% alumina, no-cement shotcrete

CS-TECH 60Z-ST

60% alumina, zircon-containing, no-cement shotcrete

CS-TECH SIC5 AZS-ST

special zirconia mullite (AZS), silicon carbide (SiC)
no-cement shotcrete

CS-TECH AZS-ST

special zirconia mullite (AZS), no-cement shotcrete

SERVICE LIKE YOU'VE NEVER SEEN

DISTRIBUTION CENTERS (DC)

- Strategically placed throughout North America providing one of the quickest response times in the industry
- Dedicated sales personnel ready to respond 24/7/365
- Ready-to-ship inventory of our best-selling products
- Usually shipping with same-day or next-day delivery
- Staging and shipping to anywhere in the world
- Inventory solutions tailored to your business

Call **1-800-887-5555** to be immediately connected to the DC nearest you.

VALUE-ADDED SERVICES (VAS)

Enjoy the utmost in service. HWI's dedicated VAS team provides on-site management, installation, equipment, inventory management, and supervisory services. Benefits include:

- Single-source responsibility that delivers cost savings
- Just-in-time delivery of refractory materials, ensuring the freshest product on the jobsite
- Quick response times, minimizing outages and downtime
- More in-depth knowledge of your business, yielding the best refractory solutions

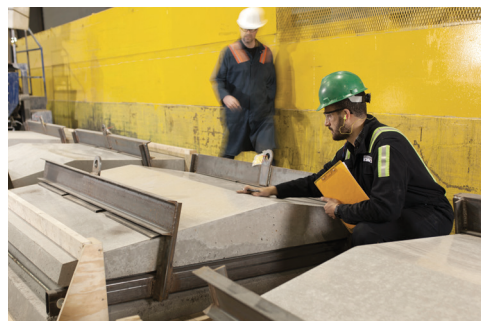
To learn more, contact us at:
VAS@thinkHWI.com

ADVANCED TECHNOLOGY AND RESEARCH CENTER (ATRC)

HWI has two ATRC centers for learning, testing, exploration, and innovation. Here in the United States, ATRC houses some of the brightest minds in the refractory industry. Our team of research and development experts works directly with our customers to design, test, and trial new products and applications.

Services include:

- Research and development of new applications and products
- Customer-focused product development
- Comprehensive technical analysis
- Quality-assurance testing
- Benchmark and failure analysis of refractory material
- Slag analysis
- Postmortem analysis
- Introductory refractory training to more highly customized education that is specific to your business (at your place or ours)



We're the thought leaders. The researchers. The innovators. The tech geeks. We're the refractory partners who won't melt when the heat is on, who live to solve your greatest challenges. Every day at HWI, we design solutions that help improve efficiencies, make installations easier, extend campaign lives, and save customers millions of dollars. And it all begins with our intensely driven service teams.

GLOBAL PROJECTS AND ENGINEERING

The Global Projects and Engineering Team specializes in greenfield construction, manufacturing and plant modernization, and also services the advanced engineering needs of existing facilities. These services include the following benefits:

- End-to-end delivery of refractories: drawings, products, and installation
- Expertise in all applications, including rapidly advancing technologies such as coal gasification units
- Strong conceptual drawing capabilities with meticulous attention to detail

Call **412-375-6920** to mobilize an HWI projects team today.

INSTALLATION, SERVICE, AND SUPPORT

- Support from HWI's network of premier independent contractor/installers
- Small emergency repairs to new plant construction
- Skills, resources, and experience to meet demanding specifications and time constraints

EDUCATION AND TRAINING

- Ongoing educational seminars at our Advanced Technology and Research Center
- Customized, on-site training for aluminum customers upon request
- Aluminum webcasts and video training modules upon request





PUT OUR INTENSITY TO WORK FOR YOU

Every day, our people and products stand up to the challenges of every job. As a global supplier, we'll save you time and money. And our experience in heat containment makes us the safest, most reliable choice for your investment.

We are your one-stop shop for refractory solutions. To learn more, talk with an HWI representative at **800-492-8349** or visit **thinkhwi.com**.



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