

# Refractory References

A look at some recent news and developments.

## York Linings wins more orders in the US

Refractory contractors, York Linings International Ltd, had a busy start to 2007 with a number of cement and lime projects in the USA. The company formed an American subsidiary ten years ago and has established a strong track record in the industry.

One contract, in progress at the beginning of the year, was for a refractory installation for a new facility at the Chemical Lime, O'Neal Plant in Alabama. The plant had a number of new design features and refractory applications. York Linings' contract included the installation of a refractory to a 16 ram preheater and kiln. The installation team was drawn, as far as possible, from local labour. Site management was from the company's American subsidiary, York Linings International Inc., with support from the head office in the UK. Refractory installation started on site in Summer 2006 and was completed, on time, in the first quarter of 2007.



New preheater and kiln, Alabama USA.

York Linings had been active in the cement and lime industry throughout 2006, starting the year with shutdown work on a cement plant in Maryland and refractory repairs on a lime plant in Missouri. This was followed by further work in Missouri to supply and install the refractory linings for a new lime plant.

Refractory installation on the new plant began in late 2005 with completion in mid-2006. The main equipment to be lined was a rotary kiln, a very large preheater, a cooler and the

hot gas ducting. The linings were composed of brickwork and monolithics with approximately 1500 t of refractory installed. A team of 40 people was required on site, at peak.

The company is continuing to develop its presence in the American market and at the present time is mobilising to provide refractory services for a new 2000 tpd cement plant, this time in Florida. Site work begins shortly, with completion in the latter part of 2007.

## Bricking Solutions aims to improve all aspects of refractory maintenance

Bricking Solutions, a division of Brokk, offers a comprehensive system available for kiln refractory maintenance. The Circle of Refractory Maintenance revolves around easy access, rapid tear out, and efficient installation. Valuable production days are lost when any part of the circle is missing. Utilising each step keeps refractory kilns on line longer. Bricking Solutions' goal is to minimise kiln downtime by creating products to improve the safety, speed, and quality of every step in the rotary kiln refractory maintenance process. A lofty goal, but is it being accomplished?

### Improved safety

Essroc's Picton plant and Holcim's Obourg Belgium plant put the Portable Protection Tunnel to the test in 2003. The tunnel system turned out to be an effective tool allowing workers to inspect the kiln within the safety area of the tunnel's cages and pass under coating to effect repairs in the upper transition zones. Radio-controlled Brokk demolition robots

allow the operator to stay a safe distance from falling brick during a tear out. Being electrically powered reduces the dangerous exhaust fumes. Ash Grove Cement in Midlothian, Texas, found the Mult-O-Ring bricking machine and Port-A-Trac brick pallet transfer system not only decreased workers' signs of fatigue – reducing accident probability – but crew members also welcomed an outage due to the ease of machine operation.

### Speed

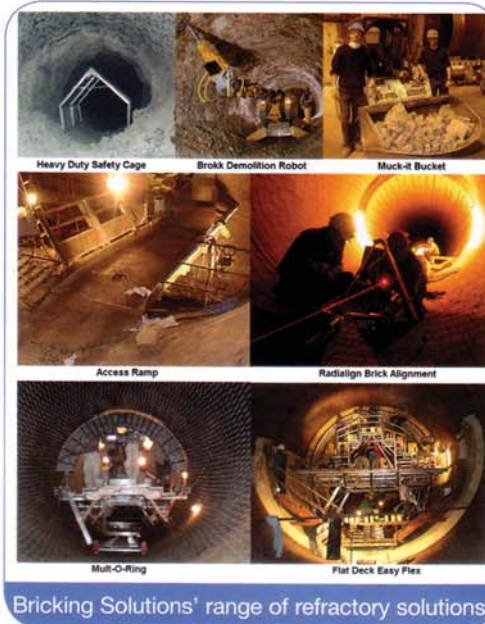
Tilden/Cliffs Mines in Michigan (7.2 m steel nodule kiln) was able to reduce the 3 hour installation of their old steel ramp to 30 minutes through the installation of the new lightweight aluminum ramp. Previously, installation of the fire hose rig took 10 hours with a brick re-installation rate of 2 m per 10 hour shift. The Flat Deck Easy Flex was ready for work in 3 hours with a brick reinstallation rate of 4.6 m per 10 hour shift, with one shift rate at 6 m in 10 hours the first time the Flat

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Deck was used. All in all, the plant experienced a setup time saving of over 7 hours. Brokk demolition machines dramatically increase the speed of refractory tear out. Coupled with a Muck-it Bucket, removal of debris is quick, reducing wear and tear on the operator as well as the machine. At Ash Grove Cement in Midlothian, a crew bricked 35 – 38 rows of brick in 10 hours the first time they used the Mult-O-Ring bricking machine. A year later, they improved their rate to 70 rows, which included keeping two workers busy, constantly sending in brick on the Port-A-Trac system.

## Quality

Use of the Radialign™ laser alignment device ensures radial alignment, reducing lost brick due to errors from manual measurement. It also gives maintenance supervisors instant feedback



on quality control. Standard Shim Driver and Long Jack equipment on each bricking machine ensures tighter, more uniform brick alignment adding to quality installation. Mike Kelly of Ash Grove Cement reported in January of 2007 that with the use of their MOR, not only did the crew complete 13 rows in 60 minutes – 4.6 minutes a row – but the quality of the reinstallation was great. Mike further remarked about the MOR, "This is the only product I've ever been involved with that actually exceeded the sales pitch."

## Improved safety, speed, and quality

This has been achieved through custom designing, engineering, and manufacturing of refractory

maintenance products that solve bricking problems unique to every need, Bricking Solutions' lofty goal is being met and sometimes even exceeded.

## Advances in refractory dampers

Dampers occur at a number of locations in most cement plant operations and these take several forms although mostly performing the same basic function.

Most operate at up to about 1000 °C, although they may have a temperature differential from one side to another. They are also subjected to some positive and negative pressure from side to side as well as being exposed to dust laden gases. The gases frequently contain compounds of sulfur, chlorine and alkalis. These tend to build up in concentration with time and cause chemical attack on the damper in addition to the thermo mechanical stresses in operation.

In metallic spade dampers, the mechanism of degradation is therefore prone to buckling as well as chemical attack. This makes it difficult to open and close the damper affecting the process and this can happen quite quickly in service.

Larger dampers have tended to be designed to be a hollow steel section with forced air cooling inside and a thin refractory veneer on the outside working face. The refractory veneer is held in place by small stainless steel anchors. However, because the refractory is installed in fairly large thin panels with a high thermal gradient from front to back, it is common for cracks in the refractory to allow gases ingress to attack the steel frame. This leads to accelerated



A complete fabrication of a meal chute isolation valve with castable in the duct and NiKast® in the damper, courtesy of N G Johnson.



Typical damage to a conventional design of TAD with castable refractory.



An all Sifca® damper as developed in the USA courtesy of Wahl Refractories.

damage to the refractory and frame in the bottom quadrant.

One advance has been the use of NiKast®, which is a ceramic matrix composite based on Wahl's Sifca® technology. This can be applied as a veneer and held on the same anchors.

The NiKast is hybrid containing ceramic in the form of a fine low cement castable and a high proportion of stainless steel fibres randomly orientated in the matrix. This gives a very high strength refractory that also resists the abrasion of the dust borne gases and the chemical constituents in them.

The same materials with internal reinforcing can be designed into all refractory dampers of various configurations including spade dampers, butterfly dampers, curtain dampers and special configurations such as isolation valves.

This technology can extend damper life in difficult conditions by several times and N G Johnson, a specialist refractories engineering company based in the Midlands, would be pleased to carry out a detailed study and issue recommendations as to how improvements can be incorporated into all cement plants to prolong life and improve cost effectiveness.