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# Strawberries and cucumbers

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*What do strawberries, cucumbers and river water have to do with Holcim's new state-of-the-art cement plant at Ste Genevieve? Of course a key element to this plant is Mississippi river access for distribution and receipt of low-cost fuels and raw materials (coal, petcoke, gypsum, fly ash), but what about strawberries and cucumbers? Read on!*

Strawberries are approximately 90 per cent water, cucumbers are approximately 90 per cent water and river water is only approximately 90 per cent water, yet no one fills their swimming pool with strawberries, and one seldom makes a desert out of cucumbers, while no one makes a salad with river water. So what's the point? The point is that, it is the little details that make the difference, not only between strawberries, cucumbers and river water, but in the operation of a state-of-the-art cement plant like Holcim's Ste Genevieve plant.

## The importance of refractories

The refractory in a cement plant qualifies as one of those details that make a difference in the successful operation of a cement plant. It has been estimated that up to 50 per cent of unscheduled kiln outages in the cement industry are caused by refractory issues. Therefore, for this reason refractory selection and proper installation are serious topics of discussion for the overall operation of a plant.

Taking this premise one step further, there are four critical factors affecting the effectiveness of a refractory programme in a cement plant:

- proper selection of refractory
- quality of the refractory material
- operation of the plant
- proper installation of the refractory.

Selection of the refractory, its quality and the operation of the plant are all subjects that are often discussed, but the detail of proper installation and the equipment used for the installation are often lost or assumed to be taken care of by the refractory contractor chosen for each maintenance outage.

## Ste Genevieve project

### Circle of refractory maintenance

To Holcim's credit, it did not leave to

chance the detail of what installation equipment would be used for refractory installation in the kiln. Holcim purchased top-rated refractory lining installation equipment to be used in its cement plant. This followed the plant design philosophy of efficient equipment that would lower operating costs.

Holcim chose to follow the Bricking Solutions "Circle of Refractory Maintenance" philosophy by starting with efficient kiln access – purchasing a four-part aluminium kiln access ramp to span its cooler opening of 6500mm (21ft-4in). The ramp is manufactured from 6061-T6 (certified welders weld to AWS D.1.2 specifications) aluminium to take advantage of aluminium's light weight and its steel strength characteristics. The design reduces unwanted aluminium flex, while maintaining a live load capacity of 6800kg (15,000lbs). The ramp features a 3350mm (11ft) lead up section to a 915mm (3ft) flat than transitions to a 23ft 6in bridge section to a 3048mm (10ft) taper extension to ensure that the supporting wrappers do not fall on the kiln nose taper. The ramp finishes off with

a radiused 1675mm (5ft 6in) long-nosed designed to fit the profile of the kiln brick ID diameter. All slopes are kept under 10° to ensure proper traction for the wheeled vehicles. The lightweight aluminium ramp makes for a faster and more efficient installation thus helping to reduce kiln outage time while providing a safe and also efficient entry into the kiln.

The next piece of the "Circle of Refractory Maintenance" to be considered was a Bricking Solutions Bedding Cart. The  $\phi 6.6m$ , 6m nose and taper must have the bottom refractory (bottom half of the kiln) laid before a brick lining machine can install the tops. Consideration had to be made on how the installers would be able to reach the kiln's centre line to install brick up to the point where the brick lining machine could begin installation of the top half of the kiln.

The Bedding Cart is a work platform on polyurethane castors with room for brick storage and stairs on each side that allow the masons to install brick at the higher elevations unreachable otherwise. This equipment is also manufactured with lightweight 6061-T6 aluminium. The



Figure 1: Bricking Solutions' four part kiln access ramp



Bedding Cart features a storage area for brick, rides on four gimbaled/rotatable castors. Each castor has a load capacity of 2722kg (6000lbs). The gimbaled feature allows the castors to perfectly match the curvature of the kiln diameter even taking distortion into account. The side stairs are adjustable to allow the masons to install the bottom up to the 6m and 6.6m kiln diameter centre line.

### EZ Flexx

The final piece of the Bricking Solutions "Circle of Refractory Maintenance" purchased by Holcim was a state-of-the-art brick lining installation machine. The EZ Flexx brick lining machine design allows the flexibility to install brick in the 6m section of the kiln, the taper and the 6.6m section of the kiln. Adjustments are fast and easy to the varying diameters being able to be made on the fly while in the kiln. Like almost all of Bricking Solutions Products the 'EZ Flexx' is manufactured from 6061-T6 Aluminium to take advantage of the light weight yet strong material. The EZ Flexx has many modern features to ensure safe, efficient and proper installation of lining to reduce outage time.

The EZ Flexx features include a 5.2m (17ft)-long work deck (the longest in the industry), supported by two frames connected with two support girders that double as rails for a mobile ergonomically stair-step designed work platform. The stair steps are designed to ensure that the masons are at the proper working position for installing the lining at any position on the kiln diameter. The spacious deck has a live load capacity of 6800kg (15,000lbs), which leaves plenty of room for the masons and three pallets of refractory. The larger deck and increased arch movement also means that the rig will not have to be moved as often as more conventional rigs, further increasing the efficiency of the machine.

The work deck also supports the double arch that consists of a down kiln holding arch and an up kiln placing arch. The arches are equipped with pneumatic cylinders and rubber bumpers to hold or place the brick into the proper location. The two arches allow two rings of brick to be worked on at the same time for maximum efficiency. The down kiln holding arch holds the previously installed ring in place while the key bricks are

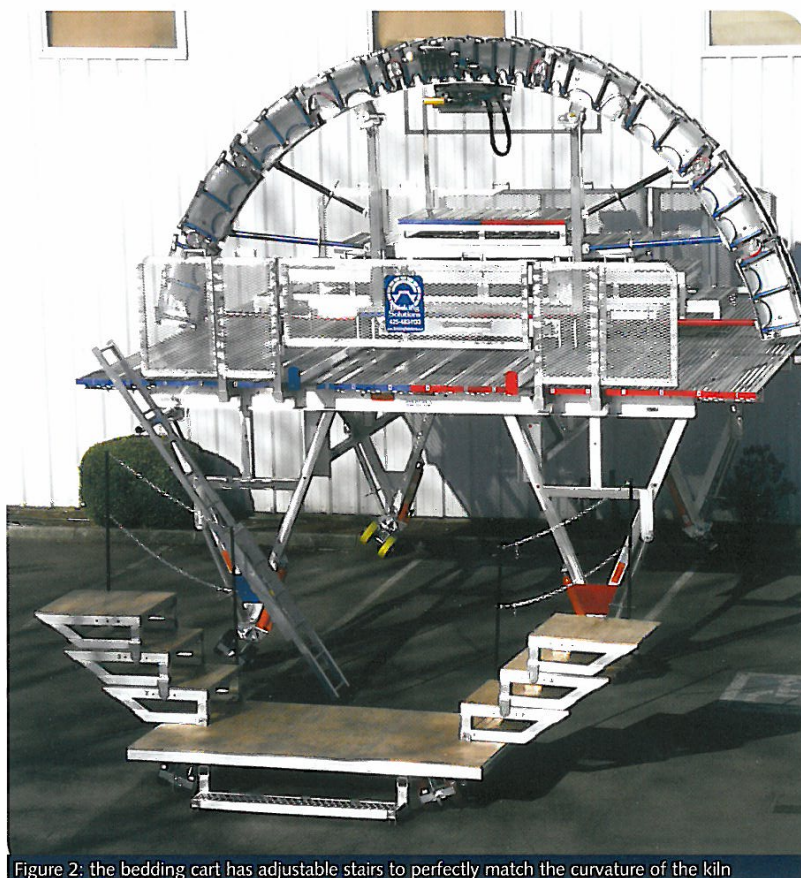


Figure 2: the bedding cart has adjustable stairs to perfectly match the curvature of the kiln

installed. The second ring of refractory can be installed by the masons utilising the up kiln placing arch at the same time. Each arch is equipped with a master valve to allow all of the cylinders to be engaged or disengaged at one time on either arch. In addition, each cylinder on either arch is operable independently. This allows the masons to be more efficient when moving the machine as they do not have to reset each cylinder independently. The arches also have adjustable spacers to allow the distance between the arches to be adjusted to various lining lengths. The up kiln arch has a cut-away section to allow easy access to the down kiln keying area. The arches are complemented with a fingertip control keying jack and pneumatic shim driver.

The EZ Flexx adjustable features are accomplished with telescopic legs adjusted with hydraulic jacks, vertically adjustable arch support telescopic legs with hydraulic jacks and hinged-arch panels adjusted with screw jacks. The EZ Flexx is completed with heavy-duty fall guards – provision to mount access ladders up kiln, down kiln or both up kiln and down kiln, plus removable fall-guard gates for

easy loading of brick pallets, four dual wheel castors with individual kick brakes gimbaled to allow the castors to always meet the refractory flush, and accessory trays for shims, tools and halogen lighting.

### Summary

With the purchase of this refractory installation equipment Holcim has supported the philosophy that paying attention to detail can make a difference. The producer has been consistent in following through with supporting its Ste Genevieve plant with the latest technology for complete kiln maintenance.

Once a plant is operational, refractory maintenance efficiency is normally measured through kiln usage factor, grams of refractory used per tonne clinker produced and outage time. This plant can produce more than 12,000tpd of clinker and 4Mta of cement. With the price of cement at around US\$98/t, one day of outage would result in US\$1,176,000 in lost production or US\$49,000/h in lost profits. The hours saved through the use of the installation equipment described should result in a pay-back in one outage.