



VERTICAL LIME KILN UTILISES NEW SUSPENDED WORK PLATFORM

Looking down on the suspended platform.

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Bricking Solutions, USA, and
Trident Industrial Services
describe a unique solution to
refractory maintenance on
a vertical kiln, borrowing an
example from the
sugar industry.

Going vertical

Bricking Solutions has been supplying refractory installation equipment to the cement, lime and other process industries for over 40 years. Until just recently, the company's equipment has been designed primarily for horizontal kilns or furnaces. The only venture into vertical vessels was to supply high strength aluminium support beams and beam installation systems used to build scaffold support floors in cement preheater tower cyclones.

Amalgamated Sugar in Paul, Idaho, USA, recently installed a new Eberhardt Lime Shaft Kiln KR8.0. JT Thorpe & Son, Inc. installed the six component brick lining using staging in conjunction with a construction elevator and internal hoist. Once the brick was installed and kiln



The vertical lime kiln at Amalgamated Sugar.

operational, Amalgamated Sugar needed a way to occasionally inspect and repair the refractory. The only method available for them to inspect and repair the brick is a complex scaffolding system. Previously it took the plant at least two full days and a complete crew to set up the scaffolding for its 97 ft. tall lime kiln. Another obstacle is that there is only one entry point into the kiln at 80 ft. from grade, which means all items need to be lifted by a crane and must fit through the 54 in. high x 36 in. wide entry point.

This installation method is not only costly in terms of labour hours, but also shuts down the kiln much longer for inspection and patchwork. Vertical lime kilns are the second most popular kilns aside from the rotary kiln in the United States and Amalgamated Sugar knew there had to be a better way to move up and down their kiln. Working with Amalgamated Sugar, Bricking Solutions came up with a custom design that greatly decreases the kiln downtime and is both safe and efficient.

Bricking Solutions uses high strength, lightweight 6061 T6 aluminium in its products. The company is best known for its "Ez Flexx" bricking machine and kiln access ramps. Bricking Solutions design engineers utilised their expertise in aluminium fabrication to design a lightweight 22 ft. dia. suspended aluminium work platform with a net load capacity

of 6000 lb (2722 kg). The platform is suspended by six Safeworks LLC "Spider SC-1500" 1500 lb capacity hoists. Hoists and cables can be purchased or rented. Amalgamated Sugar chose to rent both in order to avoid the recertification requirements of the hoists and also reduce the inspection and maintenance requirements of the cables. The hoists can be configured to run on one cable, requiring each person on the platform to have their own safety line or the hoists can run an additional emergency brake line that allows the operators to tie off on the platform itself. Amalgamated Sugar chose the latter for ease of manoeuvre of the personnel.

Putting plans into action

The suspended platform was shipped at the end of February 2013 and commissioned on 28 – 29 May. Bricking Solutions provided a 5-person commissioning team, including two Bricking Solutions certified design engineers, BBS Technical Services Manager, Bricking Solutions Production Manager and Mark Keller of Trident Industrial Services Inc. (a corrosion and refractory consulting services company).

Before the new suspended platform could be installed, Amalgamated Sugar filled the kiln with cold limestone to

Testing the suspended platform with a Brokk 100.



gradually cool it to prevent the shell from warping. With the only entry point into the kiln at 80 ft. from grade, the limestone was removed after the kiln had cooled to just below the entry point where it formed a "basement" to allow the assembly of the platform. Since this is a new method of installation, stainless steel rigging anchors were welded to the vessel wall above the heat shield at the top of the vessel. A Bricking Solutions engineer surveyed the vessel wall and determined it would be sufficient support for the 6000 lb capacity suspended platform.

While the rigging anchors were being installed, the platform frame sub-components were hoisted to the access level and manually passed into the kiln through the man access door. For ease of access and assembly, Bricking Solutions designed the modular components weighing 45 lb or less that easily fit through the 36 in. x 54 in. door. The frame was assembled on the floor, the six hoists were connected to the frame and the cables were installed.

Once the frame was completed and the hoists operational, the suspended platform was lifted a few feet off the floor to be able to easily install the decking. An opening in the centre of the platform allows workers to stand in the middle and the decking can be laid on top of the frames. After all the decking – excluding the middle section – was installed, the suspended platform was raised to a little over head height from the basement stone and final fasteners were installed. It is important to note that all connections were made by pin connectors except the connection of the 'Spider Hoist' to the frame.

Once the suspended platform was completed, final electrical connections to the special control box designed by Bricking Solutions were made. The control box allows all six hoists to be run by one operator.

After all the cables (including extra safety brake cables) and electrical connections were made, the suspended platform was successfully tested by running it up and down the kiln with a total of nine people wearing safety harnesses with lanyards. Surveying and welding the rigging anchors is a one-time installation and will be used with each operation of the suspended platform. Excluding this time and the electrical connections, the total set-up took about two hours with a 10 person crew.

Safety first

Notable features of the suspended platform are its light weight yet strong aluminium components, modular construction mostly with pin connectors for easy handling and transportation through access constraints; the six Safeworks LLC hoists that raise and lower at 35 ft./min and exclusive lever operated preloaded guide wheels. With the suspended platform, inspections are more thorough, giving the inspector 360° access at any given height, as opposed to other means, such as a Manbasket or Bosun Chair, which have to be moved from anchor point to anchor point around the circumference of the vessel, which is very time consuming. The distances between these anchor points are not easily accessed and thus overlooked and not inspected. Compromised areas of the refractory lining can be missed and go undetected, which may cause lining failure and very costly

Platform system specifications

Hoists

- This platform requires exactly six hoists of a specific configuration for proper operation.
 - » Note: It is recommended to acquire a seventh hoist as a backup in order to prevent downtime in the case of a hoist failure.
- Hoist model and configuration:
 - » Spider SC-1500.
 - » 208VAC single phase.
 - » With dual rope feed.
 - » With bottom remote control plug.
 - Note: If hoist is an older model with side remote connector then an adapter cable will be needed.
 - » 125% current limiting is an option but it is not necessary for your platform.
- Hoist specifications:
 - » 1500 lb capacity.
 - » 208VAC $\pm 10\%$ single phase (motor rating is intentionally lower voltage to account for lower voltage of some countries and also for voltage drop due to long extension cables commonly used).
 - » Current draw @ 1500 lb capacity: 9.9A.
 - » Current draw @ start-up: up to 20A.
- Hoists and related equipment can be rented through Safeworks LLC.

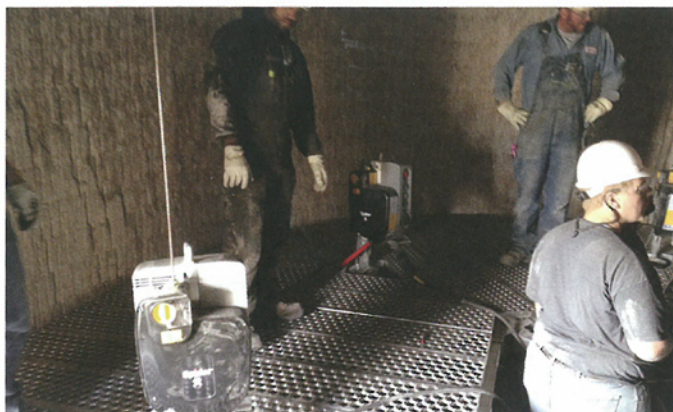
Rigging

- Rigging anchors will be welded to the vessel wall just above vessel heat shield.
- Platform requires 12 cables (2 per hoist) 5/16 in. steel rope with eye on one end.
- The length of the cables should be enough to run from the anchor shackle down to the floor of the vessel. If the cables run longer, care must be taken to allow them to twist without getting tangled as the platform is loaded.
- The redundant brake cables must be weighted with at least 25 lb in order to run through the hoists.
- Each cable requires its own shackle; 12 shackles total.
- Variations in rigging are an option. These details will be explained by Bricking Solutions. These details will also be in the assembly and operator's manual.

Power (see electrical schematic)

- Hoists require 208VAC $\pm 10\%$ single phase electrical power each.
- Power splitters are available to pair hoists.
- Maximum cont. current per hoist: 9.9A.
- Maximum start-up current per hoist: 20A.

Installation.



repairs and lost production costs. Even scaffolding tends to inhibit proper inspection due to the fact that the inherent design of the scaffold places the standards (uprights) and the ledgers (horizontal pipes) too close to the wall of the vessel. The octagonal design of the scaffold structure also causes the inspector to have to reach out at the midpoint of the ledger section to be able to inspect the vessel wall.

The platform is also the safest option over other methods for repairs. The Manbasket and Bosun Chair options are only effective for very tight areas, such as small diameter stacks, and only useful for very small repairs in any circumstance regardless of diameter. Scaffolding used for repairs usually entails manually handling materials

(bricks, tiles and mortar) from landing to landing up the scaffold. This opens up the risk of materials being dropped and skeletal/muscular injuries to workers from repetitive handling and reaching out to place the new materials. The suspended platform allows the workers to be able to constantly work at an ideal and comfortable height with an unobstructed 360° access to the work area. The elevator-like operation also allows the entire crew to ride the platform up and down for work breaks, which is quicker and eliminates the potential for slips, trips and falls. The suspended platform can also be pre-loaded with materials before it is lifted into position at the working height, increasing efficiency and decreasing the time taken to get the required materials to the work height.

In addition, the lever operated preloaded guide wheels provide stability to the suspended platform (generically called “swing stages”) when engaged and are able to retract to allow the suspended platform to navigate past any obstructions on the kiln interior surface, such as distortions, anchors or instruments.

Bricking Solutions’ next challenge for the suspended platform will be a larger platform with a load capacity of approximately 10 000 lb (4500 kg) with an open centre to allow material to be supplied by a separate material basket. The platform will have to be adjustable to different diameters. Bricking Solutions hopes to apply this suspended platform concept to preheater tower cyclones in the cement industry. 🌐