AUSTRALIAN
BULK HANDLING REVIEW

www.BulkHandling.com.au
Volume 19 No 7 January/February 2015

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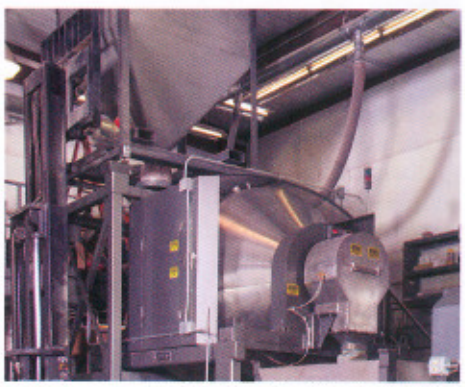
KOCKUMS Bulk Systems

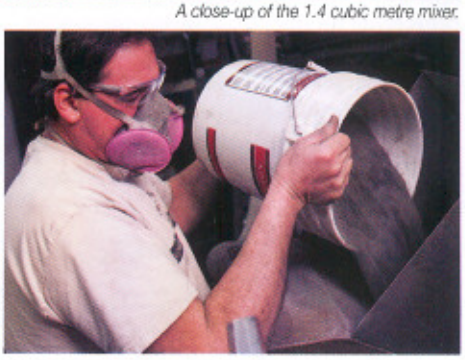
Decorative concrete producer takes blending in-house to solve colour problems

Pennsylvania-based decorative concrete specialist Concrete Texturing Tool & Supply (CTTS) decided to set up its own materials manufacturing arm, after experiencing a decline in quality from its original supplier.

The heart of Kingdom Products' blending capability is its two Munson mixers. A forklift lifts tote of ingredients to load into the mixer.



A close-up of the 1.4 cubic metre mixer.



An operator introduces hand additives.

CTTS president Bart Sacco recalls receiving complaints from customers when ownership of its original manufacturer of decorative concrete materials changed hands.

"We were in a situation beyond our control, with colours fluctuating dramatically," Sacco told ABHR. "Formula changes in products like hardeners affected their workability and coverage rates and our installers experienced colour shifts in the hardeners."

To respond, Sacco founded Kingdom Products, to be CTTS's own materials manufacturing arm.

"We constructed a state-of-the-art blending facility that allows us to create colour hardeners and other decorative concrete products free of colour drifts from batch to batch," he said.

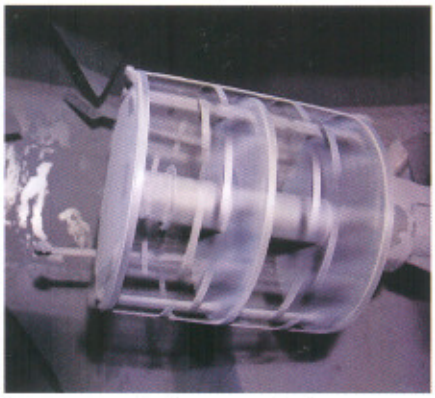
Three years on, Kingdom Products is manufacturing a variety of products for the decorative concrete and general masonry market, including high-performance countertop mixes, colour hardeners, release agents, overlays, micro toppings and lightweight vertical stamp mixes.

The company recently added a second stainless steel 1.13 cubic metre Munson rotary batch mixer to join its existing 1.4 cubic metre one, to support the operation and offer toll manufacturing services. Key to Kingdom's operation is its blending capability, and Sacco took the selection of the new blending equipment very seriously; "We wanted long-term yield and excellent blend," he said.

"We specified stainless steel for the blenders since we didn't want a porous material when working with pigments. We also thought that stainless would help with clean-up. And we chose rotary over a ribbon-style blender because it reportedly offers five times more life."

Each rotary batch mixer consists of a horizontal rotating drum with a stationary inlet and outlet at opposite ends. As the

Jim Sacco takes batch samples from an inspection port for quality assurance checks. The mixer yields uniform blends in two minutes with no segregation of ingredients, according to Munson.



A pin intensifier at the discharge end of the mixer creates a high energy zone assuring a homogenous blend.

drum rotates, internal mixing flights and lifters tumble, fold, cut and turn the material in a multidirectional manner. The gravity-driven process produces a uniform mix in just two minutes, regardless of the difference in bulk densities of the ingredients, according to Munson.

The lifters in the continuously rotating drum elevate the material, preventing segregation of the batch upon discharge through the stationary plug gate valve, as well as promote total evacuation with no residual.

Kingdom's 1.4 cubic metre mixers include an optional pin intensifier, which Munson describes as critical to homogenised blending of pigments throughout a batch of cement.

Since the rotary batch mixer is engineered specifically to blend without degrading particles, the intensifier is required to impart shear into the batch to break apart agglomerated pigments and other non-free-flowing materials into discrete particles.

The pin intensifier is mounted at the discharge end of the mixing vessel interior. As it rotates, all batch materials are continuously directed towards the discharge and through the 'high energy' zone of the pin intensifier several times throughout the mixing cycle, assuring uniform distribution.

Kingdom blends four to six batches per day.

"We use different grades of quartz sand aggregate," Sacco explained, "from 100, 200, and 325 mesh all the way up to 7.93 mm and 9.52 mm chunk rock. The finest is down in the silicate flour range."

The company also runs a variety of additives such as pigments and plasticisers, plus a variety of concrete restoration products, GFRC (glass fibre reinforced concrete), plaster mixes, and even sculpting clay blends.

Raw materials arrive in tankers and are stored in five silos inside the Kingdom Products facility. Three are filled with U.S. Silica — fine, medium, and coarse grades of crushed quartz aggregate — one of Essroc Grey and one of Federal White Portland.

"By keeping the silos inside and maintaining consistent temperature throughout our facility utilising radiant floor heating, we control the humidity in our dry goods," Sacco explained. "I built our entire facility to suit the blending operation, even having our silos custom manufactured to fit inside the building."

From each silo, an auger conveyor feeds material through a collection hopper and into a tote resting on a weigh station. Sacco described: "That way, if we have a problem with too much sand or too much Portland, we have control over it."

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Kingdom Products develops and tests new mix designs with its 0.1 cubic metre capacity Munson mini mixer.

Raw materials and pigments for decorative concrete, clockwise from top: fine vermiculite, cobalt blue pigment, 4.7 to 7.9 mm stone, red iron oxide pigment, 9.5 mm local crushed stone, chromium oxide green pigment. Center: 70 mesh (0.21 mm) quartz.

The Kingdom Products facility.

Totes are moved via forklift to the blending station where the material is introduced into the mixer. Additive mixtures, including pigments, are then added and run through customised blend cycle operations to reach a final product. Some products require a gentle blend while others require a more aggressive blend.

"Once we've blended thoroughly, we do our quality control check through an inspection port welded into the machine. Then we discharge into a tote and move it to our finished goods station. Using an air packer, we can package the end product in anything from pails, buckets, bags, etc."

Typically, Kingdom's products are packed in 23 to 27kg bags or 18.92L pails.

Clean-up is minimal, Sacco added. "We only run dry materials. In fact, our blender never sees water. Between batches, we brush everything down inside, and vacuum it out with a HEPA vacuum."

Many of Kingdom's new formulations are market driven. "We have developed good communication with installers using our products in the field in order to get feedback about what they want in product performance," explains Sacco. "Whether it's a finer aggregate or a longer open time, we can adjust the additive mixture to give our customers the products they want."

For instance, the company recently introduced a vertical stamp mix: "Some of our customers wanted a material with improved adhesive strength – something that would cling better and wouldn't dry out as quickly.

"All of our formulas are developed by me or my brother Jim. When we develop the new formulation, we first run it in our lab blender, which is a 0.1 cu m Munson mini mixer. It's equipped with the same intensifier, and represents what we will get on the larger blender."

New formulations are ramped up using the mini mixer from a few hundred grams to a few hundred kilograms (used for field and other testing), before production moves to the 1.4 cubic metre mixer to produce 2041kg batches, or the 1.13 cubic metre mixer to produce 1362kg batches.

Sacco purchased the used 1.13 cubic metre mixer with plans to expand Kingdom Products' toll manufacturing operations.

"Even though it had been sitting outside for more than two years, the mechanics exhibited no wear," he said. "We reconditioned it, repainted the framework, put in new seals, and installed it in January 2014.

"Rock aggregate – countertop mixes – can be mixed without the intensifier, so a lot of items we manufacture are well suited for the 1.13 cu m machine," Sacco said.

"We placed the mixers head to head for our next step of expansion. We will convert our current fill station to a stationary weigh hopper, and then add a tubular drag conveyor to feed raw goods directly into the two mixers. Blended materials are discharged into a tote and transported the way we do it now.

"Adding the second stainless steel Munson rotary batch blender to our original equipment allows us the utmost flexibility in blending. We can add as much or as little shear into manufacturing the products, giving us flexibility to blend just about anything without degradation of particle size.

"Since most of our products are coloured, the two blenders allow us to manufacture both pigmented and non-pigmented products simultaneously, doubling daily production. With the second Munson on line and hooking up the future tubular drag, we can increase our production again by more than 100 percent. We are ready for the future." ■

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