

THE ProcessEngineer

TECHNOLOGY SOLUTIONS FOR TODAY'S PROCESS ENGINEER

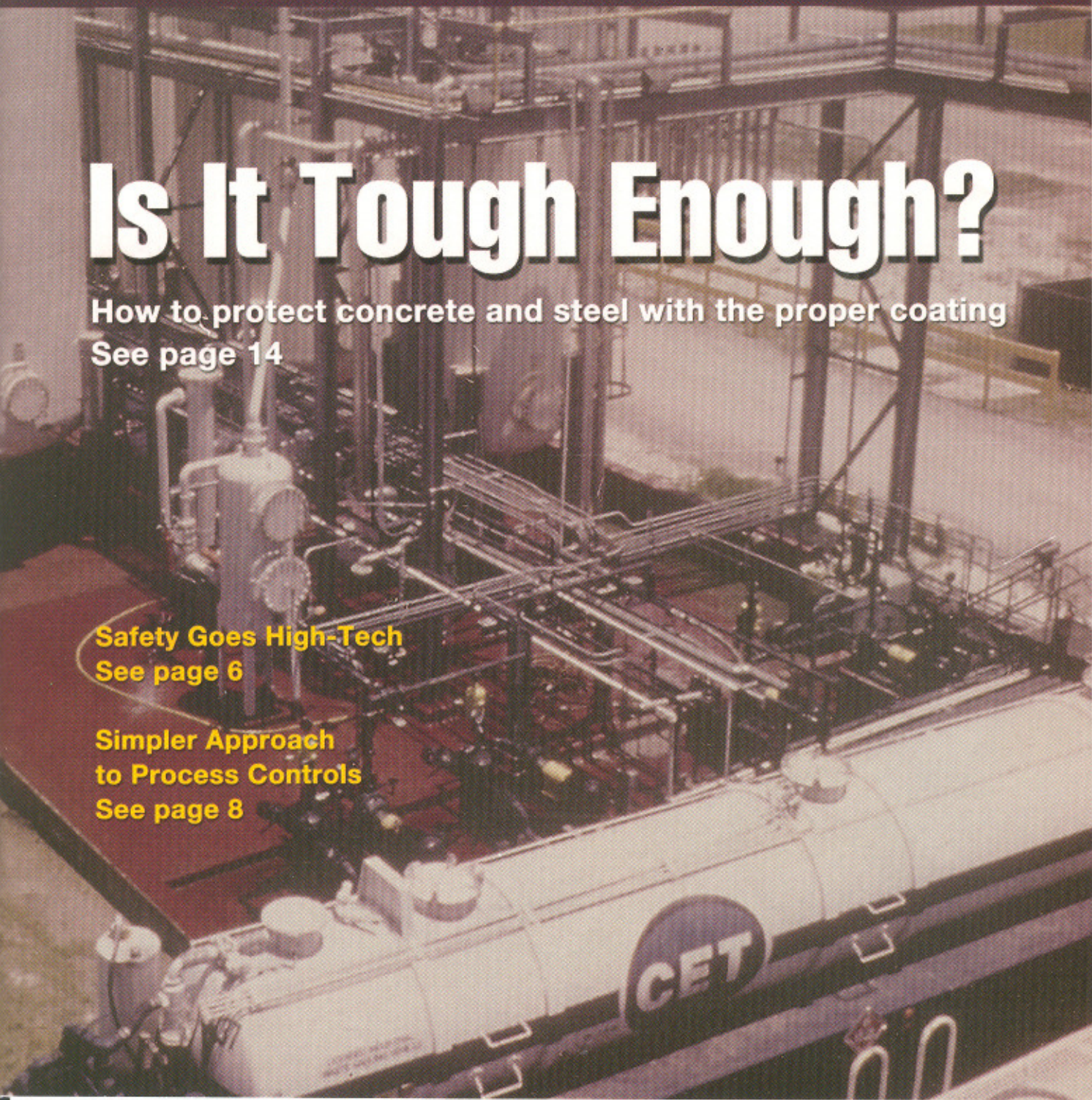
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Drum Mixer Compounds Wide Range of Particles

Modified paddle mixer solves a tricky problem

By Charlie Divine

In 1985, Mortex Manufacturing Co. Inc. bought a new rotary drum mixer in anticipation of expanding its line of chemical additives that are used to make decorative, non-skid coatings for concrete around swimming pools and on patios. The additives are mixed with white cement and white marble by contractors at the jobsite and the intention was to make a premixed product of additives and cement aggregate that would require only the addition of water. As it happened, the move coincided with an unfavorable change in market conditions, so the company shelved its plans and put the machine in storage.

In 2002, Mortex started making a premixed polymer-cement coating, called Systex, that includes cement, aggregate, acrylic polymer and four other proprietary ingredients. The product is bagged and sold to contractors, who add water at the time of use. The initial production was done on a small scale in a high-speed, high-shear disperser that produced a 300-lb batch. However, the demand soon outstripped capacity, so the company took the drum mixer out of mothballs and started it up.

The mixer, which has a rated batch capacity of 3,000 lbs, was made by Munson Machinery Co., Utica, NY. There was initial apprehension as to how well it would function, since it had been in storage for so long, says Ted Deason, president of Mortex. "Usually if you let a piece of machinery sit that long without being run you have all kinds of trouble when you start it up, but we had a pleasant surprise. We just greased the motor and bearings and it worked like a charm."

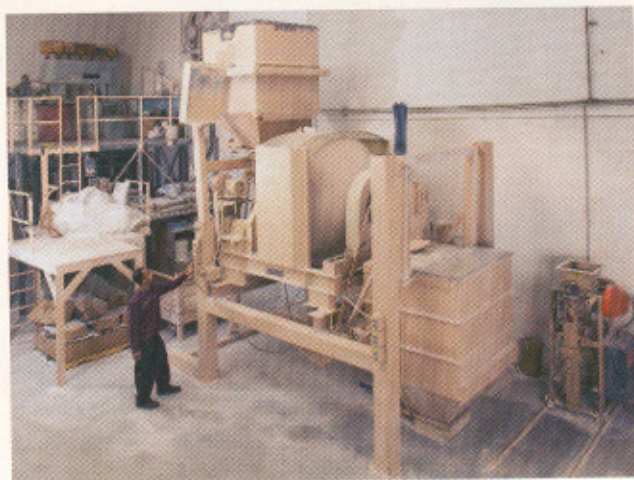
Another concern in moving to the larger machine was whether it could achieve a thorough mix of the seven ingredients. "The individual ingredients range from less than one lb up to 100 lbs, so thorough distribution is critical," says Deason.

He notes that the high-speed disperser produced a thoroughly mixed 300-lb batch in one minute, but the mixing action was violent and tended to grind the material. The Munson mixer was gentler, but has enough action to do a thorough mixing job and doesn't grind the aggregate.

Mortex runs batches of about 2,680 lbs, which is close to the capacity of the Model GB-20 rotary batcher. "A uniform blend could be achieved in two to three minutes, but we run longer because the mixer also serves a secondary function as an attrition device," says Deason. "Some of the chemicals are agglomerates that the mixer separates into discreet particles in approximately 15 minutes, so we run at least 20 to 30 to be positive that we get complete separation."

In terms of power usage, the drum mixer is much more efficient than the high-speed disperser. The smaller machine uses a 50 hp motor to mix a 300-lb batch, while with the drum mixer they are doing 10 times that batch size with a five-hp motor.

Mortex screens all the material that goes into the blender to make sure there are no big lumps, then runs a sample of each mixed batch through a 60-mesh screen to separate the cement and the additives from the biggest portion of the aggregate to determine that there is no unmixed material. Front-end screening is done by a vibratory screen, located on top of the steel hopper that is



The fill hopper to the left of the mixer is in the "up" position as the operator loads a new batch into the mixer.

used to load the blender.

The hopper sits on a platform that has a scale under it. The major ingredients are fed into the hopper sequentially by a front-end loader and the weight of the whole package is checked with each addition. Minor ingredients are weighed individually, then moved by conveyor into the hopper. "Eventually we will have it fully automated, where conveyors and augers will feed all the ingredients," says Deason.

When the hopper is loaded, it is picked up by large, hydraulically-operated arms and the batch is bottom-dumped into the blender via a slide-gate valve. Following the mixing cycle, the material is dumped through the mixer's discharge valve into another hopper, which is hydraulically lifted and set on top of the packer.

The reason the packing station is located close to the blender is to avoid having to transport the product, given that the difference in particle sizes may cause separation. Mortex has examined product that has been bagged to see whether the packaging operation itself caused any separation, but found no such problem. "We use a high-speed packer," says Deason, "so the violence of the packing operation precludes that there will be any separation in the bag."

Because the products include cement, Mortex doesn't wash the interior of the machine, but uses a vacuum cleaner. Cleaning is a simple matter, says Deason. "After we run colored material, we have to clean out the mixer. The amount of material that is left is so small as to be

insufficient to throw off the color on a 3,000-lb batch. We can also clean the mixer by using a couple of neutral-colored products as purging compounds. Any residual color doesn't hurt those products. We have actually checked for color contamination with our spectrophotometer and found that even if a color is detectable it is below the level that the human eye can distinguish."

After more than two years in operation, maintenance of the mixer has so far entailed simple greasing of moving parts, according to Deason, and there has been no noticeable wear. "Even the urethane gasket that seals the discharge door is still good," he says.

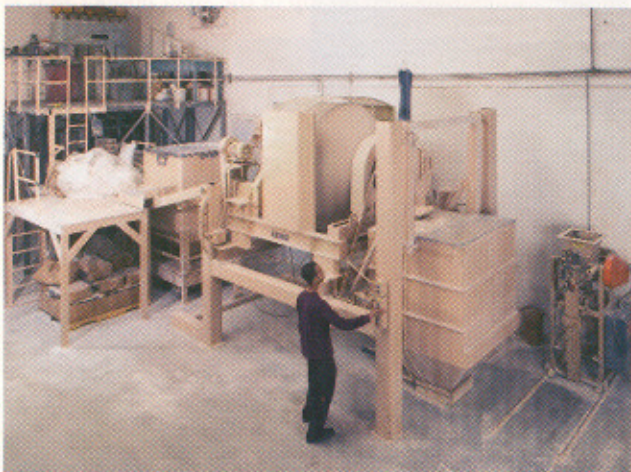
'The individual ingredients range from less than one lb up to 100 lbs, so thorough distribution is critical.'

Paddle Mixer Solves a Problem

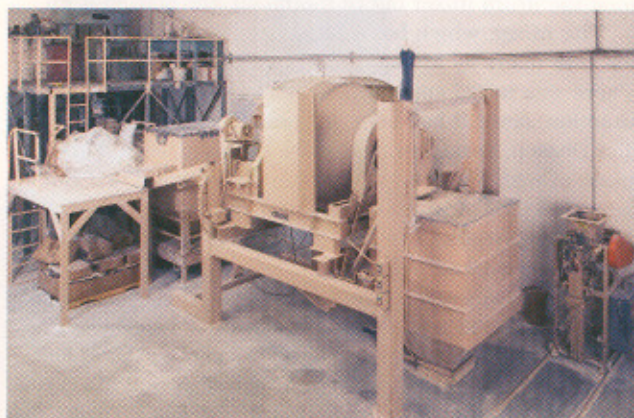
Mortex also makes extruded PVC drains and expansion joints for use with its concrete coatings. About a year ago the company added a new product line, called Channel Rite, in which the PVC is reinforced with short wood fibers, similar to wood flour. This results in stiffer structures that can be made in larger sizes.

Prior to getting into the new endeavor, Mortex consulted with Munson on its process options, including one of producing the fiber in-house. Deason decided to outsource that material instead, because in-house production would have required investing as much as \$1 million in equipment.

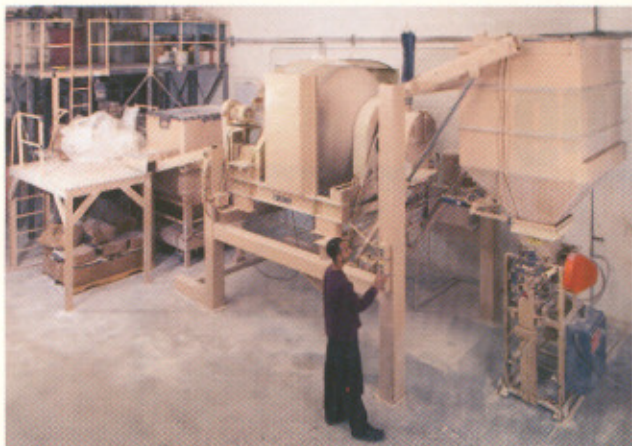
Mortex blends PVC with eight or nine other ingredients in a high-intensity mixer that is specially designed for PVC, then augers the material to various extruders.



A newly mixed batch is released into the discharge hopper by the machine operator.



This rotary drum mixer at Mortex's plant has proved ideal for producing a premixed polymer-cement coating. The feed hopper and the discharge hopper, both in the "down" position, are located respectively on the left and on the right of the mixer.



The discharge hopper, containing a newly mixed batch, is now in the "up" position and placed over the packing machine, which fills 50-lb bags.

However, blending wood fibers into the mix for the Channel Rite products presented a difficult challenge. "We tried a ribbon blender, but it left little balls of material," says Deason.

The solution proved to be a Munson Model HD36MS 40-cu-ft paddle blender, modified to incorporate two high-speed choppers. Each chopper consists of a 10-hp motor and a shaft that has a propeller-type mixer at the end, like a kitchen blender. The choppers are located near either end of the machine and are mounted to one side of the U-shaped trough where the paddles are located. The shaft and propeller of each chopper fits between two sets of paddles, at right angles to the shaft of the paddle blender.

Weigh-batched PVC compound from the high-intensity mixer and wood fibers are augered separately into the blender. The combined action of the paddles and the choppers, which spin at 3,400 rpm, make for efficient mixing. "The machine takes 5 minutes to blend a batch and it does a great job of distributing and mixing the material intimately," says Deason. "Whereas with a ribbon blender, we still had small balls of material after 15 minutes. The choppers added about 50 percent to the cost of the blender, but they get the job done."

Deason notes that the wood fiber is not hard on the stainless steel chopper blades. He is also pleased with the design tolerances of the machine, such as how close the blades come to the wall of the mixer. "They said they'd be within 1/8 in. and the paddles are probably 3/32 in. off the wall, so the accuracy of the drum is very good and there are no dead pockets."

Each batch is unloaded from the paddle blender by the standard bottom dump, then augered to a moveable hopper. The company typically fills six hoppers per day and stores them until the material is needed by the extruders.

The paddle mixer has proved reliable and more eco-



PVC and wood fibers for extruded products are mixed in this Munson paddle blender. PVC is loaded into the blender from the plant's main PVC feed line (the horizontal gray pipe located near the ceiling to the left of the blender). Mixed material is discharged from the bottom of the blender and loaded into a moveable hopper by an auger (the long, white pipe in the foreground).



A closeup of the paddle blender, showing the control panel and the machine's 10-hp motor.

nomical than expected. "I was expecting that the choppers would use a lot of power because they use 10-hp motors — the same as the paddle blender," says Deason. "But the material doesn't take nearly that much horsepower and it's almost like the machine is idling. At the rate it's going, it will last forever."

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