Eco-Friendly Cat Litter Pellets Moved Gently With Flexible Screw Conveyor

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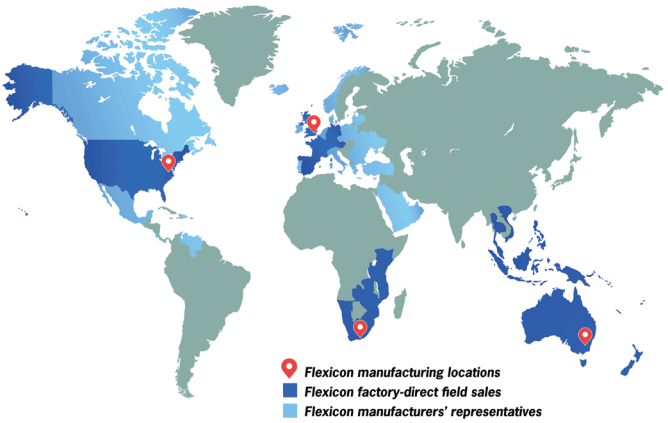

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SALT LAKE CITY, UTAH — Cat litter is usually made from sodium bentonite clay, a material that is relatively inexpensive and highly absorbent, but obtained by environmentally harmful strip mining.

A new sodium-bentonite-free cat litter produced here by PURR-fect Solutions, LLC (PFS), is made from fly ash, a byproduct of coal-fired power plants that is normally dumped into landfills another environmental concern.

PFS is a spinoff from Ceramatec Inc. (also of Salt Lake City), which is a research and development company that developed the process, in which fly ash (a fine powder consisting mainly of alumina and silica oxides) is formed into pellets by mixing it with an aqueous solution.

The fragile wet pellets are conveyed by a Flexicon flexible screw conveyor to a circular fluid bed dryer, which reduces their moisture content from about 5 wt% to 0.3 wt%. The pellets are then mixed with clumping agents and odor control ingredients to obtain the final product. The litter's absorption properties are similar to those of bentonite and it is cost competitive with other products on the market, says Chett Boxley, general manager of PFS and a former Ceramatec researcher.

Conveying the wet pellets to the dryer is a critical part of the process, he says. "The pellets are somewhat fragile, and when you transport them it's very important that you preserve the morphology and size distribution of the particles."

Flexible conveyor with special screw geometry prevents degradation

PFS found an appropriate machine in the flexible screw conveyor. It consists of a rotating, flexible steel screw in a 10 ft long (3 m) by 4 in. (10 cm) OD tube. The screw is rotated by a 2 hp (1.5 kW) electric motor with gear reducer located at the top end of the conveyor above the discharge point, eliminating material contact with seals.

A key feature of the design is that the screw automatically self-centers within the tube, providing clearance between the screw and the tube wall. This provides sufficient space for particles to flow without damage.

The cat litter manufacturing process begins with pneumatic conveying of fly ash from a storage silo to a pan pelletizer, where it is mixed with an aqueous solution that contains an activator to promote pellet formation. The resultant pellets contain about 5 wt% moisture, as noted earlier, and range in size from around 100 to 6 mesh (140 to 3,350 µm).

The newly formed pellets drop into a small hopper, pass through a transition adapter and into the inlet of the flexible screw conveyor, which conveys the pellets at a 45° incline to the fluid bed dryer.

Open-Chute Box Dumper empties a Gaylord into the large hopper from which pasta moves on a vibratory tray feeder into the smaller hopper and inlet adapter of the Flexi-Disc® tubular cable conveyor.

Screw design is critical

As it happened, PFS learned by experience about the importance of the appropriate screw geometry. “Originally we bought a used unit whose spiral we thought would work,” says Boxley, “but the pellets rubbed against the wall at the entrance to the conveyor. This smeared the wall and caused the screw to bind.”

“We told Flexicon about it and they upgraded the conveyor to a spiral with specialized geometry to handle materials with difficult properties.” PFS has been running the conveyor since the startup of its pilot plant in November 2012 and has had no trouble, says Boxley.

The tube interior does not require any cleaning, he adds. It can be evacuated by reversing the screw and removing the pellets from the bottom of the conveyor, but PFS doesn’t have to do that. “At the end of a production run we just throw in a bucket of dry pellets to get the last of the pellets out of the tube,” he says.

At present the start-up company is producing about 650,000 lb/yr (295,100 kg/yr) of cat litter, which is sold to regional pet stories. The pilot plant is operated for only a few hours per day and production can be easily tripled by going to an 8 hour shift.

PFS runs the motor at only about 90 rpm, but it can operate at twice that speed without harming the pellets, says Boxley, noting that the speed is dictated by the capacity of downstream equipment.

Operator empties into the hopper the fragile, wet pellets that the flexible screw conveyor gently transports while preserving morphology and size distribution of the particles.

PURR-Fect Solutions manufacturers its eco-friendly cat litter from fly ash rather than from sodium bentonite clay which is obtained by environmentally harmful strip mining.

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