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Environmental-restoration product manufacturer requires fast, uniform, gentle blending of powdered microbes, enzymes and nutrients

The microbial formulations that United-Tech produces are used to break down or detoxify a broad array of complex, often-toxic organic compounds, greasy spills and other contaminants in a variety of environments, leaving behind carbon dioxide and water.

The company's powdered formulations, which look and feel like flour, contain proprietary blends of microbial cultures, enzymes, various micro- and macronutrients and flow-enhancing additives.

"These products are designed to speed the bacterial degradation processes that already occur in nature, without the addition of any chemicals and with no further damage to the environment," says Art Barnard, who founded the company in 1993.

Blending of bacteria with additives in ratios as low as one part to 40 presents unusual challenges. The bacteria will be destroyed unless handled gently and blended rapidly, yet, the distribution of bacteria throughout the batch must be 100 percent uniform. Also critical is the ability of the blender to fully discharge each batch and to sterilise quickly and thoroughly between runs of different products. After evaluating several types of blenders against these criteria, Barnard decided in favour of a rotary-style batch mixer.

GIVING NATURE A BOOST

While most environments contain indigenous bacteria capable of degrading a range of organic compounds, the particular microbes at a site are often not the best suited or voluminous enough for the particular contaminant load. So-called bioaugmentation schemes aim to maximise natural bacterial degra-



ABOVE: "We guarantee consistent ratios and uniform distribution of ingredients," says Barnard. "Whether customers buy a 23 kg box, a 55-gallon drum or a tote of our products, they typically use it just 0.5 kg at a time, and must be assured that it contains bacteria, enzymes, nutrients and other additives in the correct proportion."

dation processes by delivering a targeted bacterial population and supplying micro and macro nutrients to sustain the bacterial population, and enzymes that act as catalysts, promoting and accelerating the bacterial degradation of complex organic compounds.

Today, United-Tech's bioaugmentation formulations are being used to treat chemical- and petroleum-laden soil and groundwater, to remove unwanted organics and reduce sludge volumes in both industrial and municipal wastewater-treatment facilities, to remove organic sludges from drain lines, grease traps and septic systems, and even to clean floors in settings such as automotive repair facilities, machine shops and restaurants that are prone to grease build-up.

In recent years, these formulations have also been adopted by operators of commercial shrimp farms and fisheries, and are being used to improve the water quality and break down organic bottom sludge in decorative ponds, swimming pools and spas.

BACTERIA, ENZYMES REQUIRE GENTLE BLENDING

To give its products a long shelf life and make them easy to transport, store and apply, United-Tech produces its BZT and OBT product lines as powdered formulations that are typically mixed with water and sprayed on the contaminated media. United-Tech first cultivates the target bacterial cultures in sterile biofermentation reactors. After harvesting this biomass, the desired bacteria cells are

concentrated through gentle centrifugation.

A two-step freeze-drying process then removes 95% of the moisture, creating a dry, powdered form of the bacteria that is then easily blended with other ingredients. This freeze-drying, coupled with a patented micro encapsulation step "puts these rugged little guys into a state of suspended animation or dormancy," says Barnard, and protects the bacteria from potential damage or deactivation that might otherwise occur during periods of extended storage.

For years, United-Tech had been outsourcing the blending of its raw ingredients into the finished formulations to a third-party vendor. But in 2002, to save money and streamline its manufacturing operations, the company brought its blending in-house.

United-Tech evaluated blenders according to their ability to

provide:

- precise and consistent blends containing its target microbial load
- rapid mixing to maximise manufacturing throughput
- rapid, thorough cleaning for rapid changeovers
- gentle blending with minimal friction and shear to protect bacterial cells and other friable ingredients from mechanical degradation

After rejecting various types of ribbon and paddle blenders – "too much friction," says Barnard – and V-cone blenders "excessive cycle times", United-Tech chose a Model MX-10-SS Mini Mixer from Munson Machinery. The rotating mixing drum of the unit has a total volume of 623 litres and a blending volume of 311 litres. Designed for laboratory mixing, pilot plant applications, pre-blending operations and relatively small production runs, the



ABOVE: Munson's Mini Mixer is a proportionally scaled version of the company's Rotary Batch Mixers. Six different sizes of this small-scale mixer are available, for small batch operations, and laboratory and pilot plant applications.

unit is a scaled-down version of Munson's Rotary Batch Mixer which ranges in blending capacity from 283 to 17,000 litres.

The mixing vessel has no internal moving parts rather, its interior is fitted with evenly spaced baffles

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that gently tumble, turn, cut and fold the powdered ingredients as the drum rotates. This cascading action creates a fluidised condition that ensures uniform blending, minimises product degradation, and prevents the formation of stagnant zones.

The lifting action of the mixing flights also serves to direct the material to the discharge spout which, when open, promotes 100% evacuation of the batch. "The mixer consistently discharges completely, leaving no residual material behind," says Barnard. "By comparison, ribbon blenders leave a heel of material along the bottom of the trough," he explains.

"We manually dump raw materials into the mixer and discharge finished blends into the hopper of an enclosed screw conveyor feeding an automated line that fills packages ranging from 0.45 kg Mylar foil pouches to 181 kg fiber drums.

"We can blend 227 kg every 3

to 5 minutes with this blender, and have found it to be equally effective in blending batches that comprise only a small percentage of rated capacity," says Barnard.

"The fact that it unloads quickly and thoroughly maximises the number of batches we are able to blend, the only downtime being between product changeovers when we sterilise the unit using steam and a cleaning solution," he says.

The mixer has run problem free since 2002 according to Barnard, who is ordering a number of the units for United Tech's other facilities. "Once we standardise all of our worldwide mixing operations on Munson's Mini Mixer, our engineers in the US will be able to work closely with their colleagues overseas, to assist in training, operation and troubleshooting," he says. ●

For more information contact Munson Machinery Company on tel: 001 315-797-0090 or visit: www.munsonmachinery.com



ABOVE: United-Tech blends 227 kg every 3-5 minutes. By unloading quickly, the blender maximises the number of batches United-Tech is able to blend. Evenly spaced baffles inside the rotating drum set powdered ingredients in motion with a gentle cascading action.

Increased leather process chemical production

A twin screw feeder developed by solids handling equipment specialists Ajax Equipment is set to significantly boost Leather Process Chemical productivity at Clariant Chemicals, Selby plant.

The new twin screw conveyor replaces a reversible screw conveyor first installed by Ajax Equipment in the 1980s. It is used in the manufacture of a range of Leather Processing Products. The conveyor takes wet slurry cake from a belt filter and discharges it into either a dryer for subsequent packaging or a storage keg where it is used as an intermediate in another process.

However with increasing demand for the intermediate, the existing reversible conveyor was causing a bottleneck as the flow of wet cake had to be disrupted to divert cake to the keg.

Working within the same space occupied by reversible screw conveyor, Ajax is installing a twin screw conveyor featuring two independent screws each driv-



en by their own motor mounted at both ends of the conveyor. With a single inlet chute allowing wet cake to be fed into both screws, the two screws can either operate in the same direction allowing all the cake to be exclusively fed to either the dryer or a new packaging machine

replacing the earlier storage keg.

Alternatively, with both screws operating simultaneously in opposite directions, Clariant is able to maintain continuous transfer of the product to the dryer while being able to convey cake to the packaging machine for subsequent processing when needed.

The new Ajax twin conveyor also gives Clariant an energy saving. Until now the company often had to use some of the dried product instead of the wet cake intermediate to ensure sufficient quantity to satisfy internal production demand.

"Ajax Equipment has come up with an elegant solution to our problem, said Stephen Pywell, process technologist, Clariant. "It will enable us to increase production of the dried product by up to 2 tonnes per day, while still maintaining production of the wet intermediate." ●

For more information on Ajax Equipment call 01204 386723 or visit www.ajax.co.uk.