

B BROWN BEAR

COLD-WEATHER COMMUNITY, BEATRICE, NE, PROVES PRACTICALITY OF YEAR-AROUND COMPOSTING

In 1991 when the City of Beatrice, Nebraska, put a Brown Bear auger tractor to work, their aim was to have a machine which could handle the composting of all the sewage sludge and all the yard wastes produced by the community's 12,994 people. It would be a difficult assignment. In addition to a demanding load, the Brown Bear would have to continue work through weather variations similar to other U.S. cities at Beatrice's 40° north latitude: places like Salt Lake City, Philadelphia, Champaign, IL and Columbus, OH. Twenty degrees below zero occurs in winter, over 100 degrees occurs in summer.

Contrary to thinking common at the time, Beatrice's Water Pollution Control Department had learned previously that some of the annual load could be reduced by winter-time processing — which in turn depended on building windrows to a sufficient depth to build and hold heat. Not easy. The sludge turning equipment available to Beatrice before 1991 could not work through material piled to the 3 foot depth found to be the necessary minimum. The type found to be the most effective, modified feedlot mixers, frequently jammed in summer as wet sludge bulked and clumped together. Frozen compost stopped mixing altogether most winters.

A new state law passed in 1990 complicated matters. No longer could yard wastes be placed in landfills. Beatrice's city administration members felt the most cost effective solution to the new demands would be to compost



**Biosolids come in from the treatment plant everyday,
and are mixed with grass, leaves and woodchips.**

grass, leaves, brush and wood chips along with the treatment plant's output of 38 1/2 cubic yards per week. As things then stood, the city's two-person processing crew — one operating the farm-type mixer, one operating a loader and a dump truck — couldn't keep up with sludge composting demand alone, not even in good weather, not even working 12 to 14 hours a day.

By way of comparison, the new Brown Bear model selected, its 12-foot auger and hydrostatic no-slip traction, rarely had to work more than 6 hours a day to process all 2,000 cubic yards of sludge produced in its **first year** of operation.

Now 24,000 yards per year

Every year since, the big 300 hp 28,500 lb. tractor has efficiently handled

an average of 2,000 cubic yards of sludge and yard waste **per month**.

Its mixing, aerating and turning action results in 503-compliant compost that has been in great demand by local corn/soybean/wheat farmers, gardeners, home owners, and the city's parks and other departments.

Capability: 48,000 yards per year

Based on his observations and calculations, Bruce Bates, a Water Pollution Control Department employee for 38 years — the last 25 years as superintendent — estimates the city's auger tractor, by itself, will be able to effectively process an additional 2,000 cubic yards per month, should volumes continue to increase.

How effective is the end product as a soil enhancer?



The Brown Bear aerates all windrows 5 times in the first 15 days.

The Department answers this question by pointing to a berm constructed to hide the field treatment facility from passing motorists. Up until two years ago, nothing grew on the hard clay, not even dandelions. Some of the finished compost was then spread by a loader, and seed broadcast. Three weeks later, grass had grown high enough to need mowing. Slow release of the nitrogen and other nutrient contents is expected to act like fertilizer for another three to five years. Watering has not been needed. The compost retains enough moisture for continued natural germination and growth.

Program started 20 years ago

Composting here went through a long process of trial and error. The program started in 1979 when construction on the city's then-new 3 mgd primary-secondary sewage treatment plant was nearing completion. "Do you know you have nothing in your design covering the disposition of sludge?" a visiting EPA inspector asked. No answer. The oversight just happened.

Rather than tear up structures already completed, the city experimented with open-air composting.

Started in December, men and machines worked all winter. So long as ambient temperatures stayed above

10° F and windrows previously worked to sufficient depth to hold inner compost temperatures of over 100°, digestion and sludge reduction occurred. About six weeks of final processing as weather warmed in spring accomplished the desired chemical change to produce a product acceptable for soil enhancement.

These good results led the city to shelve alternate plans for dewatering sludge mechanically.

The program adopted called for a continuation of composting, with the addition of a bulking agent and a plan for material handling. Mixing the sludge with amendment materials would be the job of a feedlot-type spreader, modified with different flighting and discharge chutes. A ratio of 3-to-1 sawdust and wood chips to sludge was recommended by state authorities. Volumes were determined by a scale on the truck bed; incorporation took place on the composting site.

Low equipment power, low traction and frequent jamming created problems — yet, Bates recalls, "We made do with this system for 12 years." Then volume outpaced production.

Major improvements 8 years ago

To match the new demands, composting was moved from a site near the city's in-town treatment plant to a larger plot at the city's sanitary landfill. No

longer would high water from the Blue River stop composting for weeks every spring. Preparation of the new site included stripping of topsoil, leveling the natural clay base, and excavating a pond to keep runoff from entering the ground water table. The pond also provided moisture for enhancing the composting process during dry periods.

Demonstrations of various equipment followed. A new Brown Bear model came in from the corporation's factory in Corning, Iowa. It had no trouble mixing and aerating all materials. Even old grass clippings which, set up like adobe, had slowed and sometimes stopped Beatrice's feedlot spreader proved no problem. Moreover, the Brown Bear was the only machine tried that had the traction and flotation necessary to work in soft footing — an ability which saved the city an estimated \$500,000 otherwise required for hard-surfacing the composting area. And operations needed only the 12 foot width of the unit's auger — not the 30 feet between windrows and 50 feet of turning space required by straddle-type aerators.

Assisted by the state's 50-50 cost-sharing recycle equipment procurement plan then in effect, Beatrice selected and ordered their Brown Bear. Model 500, Serial No. 1, came to work shortly thereafter.



The Brown Bear's paddle style rotor mixes, aerates and turns the windrows.

Capacity tripled, costs halved

Men on the job report that its power and mobility have enabled them since its start to effectively handle "at least three times as much material in the same area as could other machines."

Compost-site labor costs have been cut in half. A second employee, formerly needed to feed and otherwise service the spreader, has been transferred to more productive work.

Sludge continues to be delivered every hour or so by dump truck. Yard wastes come in throughout the day via a variety of vehicles. Whatever amendment materials are still required are brought in by a contract hauler. Loads of incoming grass, leaves, chips and brush are inspected at landfill entry gate to make sure such non-biodegradables as plastics, tires and cans are kept out of the compost mix. These materials are directed to the next-door landfill. During off-hours, the gate is locked.

All accepted yardage goes from truck and hand-unloaded stockpiles into windrows, maintained by the Brown Bear at approximately 12 feet wide, 3 to 6 feet high and 100 feet long. To attain 503 standards, everything is turned at least 5 times in the first 15 days. It is then left in place for another 30 days; then stacked in a cure pile which eventually builds up to 50

feet wide, 15 feet high and 300 feet long.

Leaving the mixed mass here for one year assures the full cure specified by Class A regulations, Bates states.

"We note a better mix than before," he says. "The Brown Bear's auger action eliminates virtually all lumps, effectively homogenates all ingredients, and provides a higher quality compost.

"Independent laboratory tests show coliform bacteria, fecal salmonella and other pathogens to be reduced to levels which are well within federal, state and local tolerances," Bates continues. "Against a required fecal maximum of 200 colonies per milliliter, we have not had more than 17 colonies per milliliter at any time since the Brown Bear came to work here. Most of the time, we attain our own goal of 0 colonies."

When cured, the annual processed volume of approximately 24,000 cubic yards looks like potting soil. Its use is unrestricted. "Acceptance has been so universal, we can't make enough to fill demands," Bates says. Available to anyone who comes to the site, the finished compost is taken by several thousand people each year. Other Beatrice city departments and many of its residents haul leaves and grass to the site, and take compost back for their lawns and gardens. Farmers apply the material to their field crops. Builders utilize

it for property landscaping. Most handle loading themselves. Some request and receive help from the Department's front-end loader.

The same procedure currently continues at a third site, established in October 1995. Located at the opposite end of the landfill from Site No. 2, the new location doubles the composting space available, to 5 acres. No longer need delivery vehicles drive through the landfill. Operations take place just off the fill's main access road. Conventional dirtmoving equipment was hired to remove a mid-site hill 20 feet high. Men and machines also leveled, graded and compacted the area, built a driveway and turnaround space, and excavated another retention pond which, with 5 to 6 acre feet of available volume, holds three times as much water as the previous pond. Tight compaction of the native clay base and sides minimized seepage; aeration of the basin keeps the water from turning septic.

Brown Bear = major benefits

Now that they've utilized the Brown Bear as their sole material turning tool for over eight years, Water Pollution Control Department superintendent Bates and machine operator Jerry Carmichael point to a number of major benefits.

1. The unit's augering action "fluffs



Compost cures for a full year to assure it meets Class A regulations.



Superintendent Bruce Bates (foreground) and operator Jerry Carmichael.

material so it gets supplied with air continually and thus decomposes better and faster than the beating and flattening common to other mixing machines".

2. It operates effectively when the site is muddy. "In summer, we have around 20 windrows of compostables on the ground, each 100 to 125 feet long," the two men state. "Our Brown Bear turns all of them in half a day." By way of comparison, the landfill's 5-yard rubber-tired loader in a test required two full days to do the same job. "And the mixing was not nearly as complete," they note. Soon, wet weather efficiency will be improved still further. The Department has invested \$50,000 in surfacing a 140 x 140 foot pad with 6 inches of PC concrete. The solid surface will speed vehicle deliveries in bad weather and keep various vehicles from tearing up the ground.

3. The Brown Bear's user-friendly cab design keeps its operator in a heated, air-conditioned environment, out of the

steam produced by the necessary disturbance of wet materials and, more important, out of the same sort of airborne spores which have been known to cause black lung disease in coal miners. Everything is contained on site. Nothing threatens water supplies, nor homeowners, nor farmers, nor a nearby ranch which raises zebra, elk and other exotic animals.

4. Not only does the Brown Bear cut composting manpower and therefore composting labor cost in half, but its fast work enables operator Carmichael to do more than his main assignment. Once composting has been completed each day, he goes on during his normal shift to handle all machine maintenance on both the Brown Bear and the loader, operate the site's moving equipment, control weeds, take windrow temperatures, and reset the site's windrow irrigation system to sprinkle water when needed. Carmichael also found the time to build a

combination compost-area office and garage, including carpentry, site preparation, pouring and finishing its concrete pad.

5. The machine's power and versatility enable Beatrice to continue composting operations year-around. To retain heat for wintertime digestion, a base is built of leaves — 20 feet wide, 3 feet deep and about 100 feet long to start. As sludge deliveries continue, depth and other dimensions are increased to match. Sludge goes atop the leaves; wood chips go atop the sludge. Currently, about 50 cubic yards of sludge is added per week. Augering proceeds in all but the coldest weather. Full processing resumes each spring. All work begins with the Brown Bear breaking down the truck-dumped stockpiles, distributing the materials into conventional windrows, and mixing the mass regularly so everything stays aerobic and within the desired curing parameters.

Three Brown stripes . . . the sign of quality

