

B BROWN BEAR

ROSWELL WASTEWATER PLANT PRODUCES CLASS A COMPOST FOR AGRONOMIC APPLICATIONS

Important Advantages Achieved By Long-Term Sludge Processor

By upgrading their sludge handling system from sand to hard-surfaced drying beds — and assigning aerating and mixing to a highly efficient auger tractor — the City of Roswell, New Mexico, has greatly reduced land requirements, workhours and costs.

Total savings since the system was inaugurated and the Brown Bear tractor purchased in 1985 was computed under EPA Project No. C-35-1052-01 to total \$409,575 in pro-rated capital investment and yearly operating expenses.

The study team, as composed for representatives from the City of Roswell, the federal Environmental Protection Agency, State of New Mexico, New Mexico State University, Wilson & Company Engineers & Architects (Albuquerque) and CH₂M Hill Inc. (Albuquerque), further noted a substantial reduction in odor and insect problems, elimination of bulking agent and sand purchases, and the assignment of eight laborers to more productive work.

Daily records show that the system has always met all state and federal government regulations for sludge composting, including the new 503 specs, and that the end-product produced here has been readily



Biosolids are aerated in windrows.

disposed of as a beneficial soil additive for field crops, home gardens and lawns.

In 1996, the program won the Rocky Mountain Environment Association's Merit Award "for accomplishing out-standing results in biosolids management" and the New Mexico Water & Wastewater Association's Outstanding Achievement Award "for exceptional performance in sludge composting".

Its success has inspired at least eight other New Mexico communities to duplicate the system and its key material handling Brown Bear machine.

Roswell's Brown Bear has worked 12 months a year, every year, since its arrival on site in 1985, and is still a highly-available highly-effective tool. Its front-mounted 10-foot-wide hydrostatically-controlled 0-140 rpm paddle-type auger does all the sludge mixing, aerating and turning; its 2.16-yard bucket and 12'1" lift does all truck loading and stock-piling. The machine's operator and a helper exchange the two attachments in under 30 minutes. Extendable booms, v-plows, snowblowers, powerbrooms, forklifts, dozer and angle blades are also available for the 174 hp, 22,000-lb. machine.



Biosolids ready to be removed from drying beds.

Despite the highly corrosive environment established naturally by contents of the sludge, the unit has lost very little work assigned work time in its many years of operation. What few spare parts have been needed have been shipped within 24 hours by the Brown Bear factory in Corning, Iowa, or by the company's local distributor, according to a spokesman for the City of Roswell.

Capital savings

When Roswell's biosolid production program started in 1985, the city's new primary-secondary-trickling filter waste-water treatment plant had a design capacity of 6.5 mgd. At the time, the city's population stood at 39,000; it is now 47,000; the facility will handle 65,000. Current inflows average 4.5 mgd; current sludge production, approximately 600 metric tons per year.

Its paved sludge drying beds were based on a textbook-recommended 0.77 square feet per person. The design 65,000 P. E. required 50,050 square feet of lined beds (5 beds). By comparison, sand-based beds would have required 3.0 square feet per

person, 195,000 total square feet (16 beds). Construction costs for the Roswell paved beds — including grading, excavation, backfilling, concrete retaining walls, 4 inches of asphalt surfacing, and underdrains — totalled \$340,000. Two acres were required at \$3,000 per acre. Sand beds, per the Means Construction Cost Manual, would have totalled about \$786,600 to construct; the required six acres, if available, were valued locally at \$18,000.

Thus, the city's capital investment, including land, bed construction and operating equipment added up to \$526,000. Had sand beds been chosen, capital costs were conservatively estimated at \$896,600.

Simple process

Under these parameters, dewatering starts with drawing of sludge slurry from the plant's secondary digesters. Approximately 72,400 gallons can be directed to each of five lined drying beds. When pump-in attains what has been found to be optimal working depth, 9 inches, feed to that bed is stopped and its contents left undisturbed. Within 3 to 7 days,

free liquid has separated from the solids, been decanted and returned to the plant's influent flow stream. Typically, drainage at this stage ranges from 17,000 to 28,000 gallons.

Once this free water has been drawn off, the remaining sludge solids are mechanically turned and mixed by the Brown Bear. Solids content at this point averages 4 to 7% by dry weight. The machine's augering action breaks up the crusts which form on the sludge surfaces. Repeated turning exposes different portions of the sludge blanket. Water escapes into the atmosphere at a much higher rate than if the material was not rotated.

As the solids percentage thus increases, the Brown Bear works in a pattern which forms the ever-drying sludge into three or four windrows, each about 3 feet wide by 1 1/2 feet high, each extending from one end of the bed to the other. The machine augers through the material two or three times a week for two to eight weeks.

(Roswell's old sand drying beds used to be filled in the same way. In this process, the free water was not drained off. Instead, it percolated



Initial drying in sludge beds.

through the sand to underdrains from where it was piped back to the plant influent stream. The sludge deposit took up to 24 weeks to dry. Though it provided efficient drainage, the silica sand base afforded such poor footing that mechanical removal methods could not be used. Instead, a crew of laborers, generally eight men and a foreman, utilizing shovels, forks, wheelbarrows and hard manual labor brought the material out of the beds to locations where solid natural soils allowed tractor shovel loading.)

With the Brown Bear/paved drying bed operation, the desired drying content is attained in an average of 4 to 6 weeks, 12 to 18 cycles.

Sanitary engineers feel that more frequent cycles could speed drying "a little", but not enough, under current loadings, Art Torrez, Roswell plant superintendent notes, to effect much of a saving. "Besides," Torrez adds, "off-time allows the machine operator to do all routine maintenance on his rig plus handle other operational assignments around the plant."

Once solids measure 50% by dry weight, the material is stripped out by the Brown Bear and its inter-

changeable 2.16-yard loader bucket, and placed into a 5-yard dump truck. Haul is to an unpaved composting area 500 feet away. Clearing of each drying bed takes about 2 hours.

Operational savings

The EPA Roswell study shows that the paved beds and Brown Bear material handling require 204.54 manhours per year. The sand beds with their manual stripping, would have required 469.98 manhours annually. At an average wage rate of \$11.75 per hour (including fringe benefits), annual labor costs for the paved bed/Brown Bear operation uses total \$2,403; for the sand beds/manual operation, \$5,522.

At \$1.00 per gallon, feed fuel comes to \$1,746 for both types.

Maintenance adds \$2,725 per year for the Brown Bear; \$1,190 per year for the smaller skid loader required to service the sand bed operation.

Virtually no repairs have been needed with the paving; the sand beds require replacing the amount lost when stripping, about 1 inch per year. Adding of 1,520 tons of sand at \$80 per ton equates to \$24,320 per year.

Overall, the paved bed/Brown Bear operation saves Roswell \$27,305 in operating expenses per year, or 24.4%.

Superintendent Torrez likes to describe his city's system as "forgiving". The hard surface, he explains, allows the plant to add, move or remove sludge whenever desired. Weather has no effect on the footing. Nor is there any direct contamination, plugging or rework.

Better finished product

The same advantages continue at the composting area.

Continual consolidation here by the Brown Bear keeps the material stockpile at the desired 12-foot height, a 50% saving in storage space over the 6-foot lift possible with the skid loader. The doubling of height also makes it easier to get the desired natural increase in biosolids temperature to 55°C, summer and winter. Further decomposition, drying and hauling go on, 12 months a year.

Generally, the Brown Bear backdozes, moves and restacks the entire pile once a week for about five weeks. The mixing and aerating release



Finished compost is granular, dry, and odor free.

ammonia and keep the material from going septic. It also minimizes odors, flies and gnats.

"We used to get frequent complaints from resident whose homes were 400 to 500 yards away," Torrez recalls. "Now we get none!"

In-pile remixing also breaks down larger pieces of dried sludge. "Our final product is finer and more homogenous," Torrez states.

Fecal coliform, measured continually, averages only 7 fcc/gram. Tests often show levels of 3 fcc/gram.

Federal 40CFR503 requires no more than 1,000 fcc/gram, Torrez explains.

Finished material is given away to anyone who wants it. Alfalfa, corn and wheat farmers like the rich smelling, rich acting, high-nitrogen material to enhance the production of their lands. Lightweight, 1,500 pounds per cubic yard, makes the material easy to handle. Unlike dewatered dairy wastes, a byproduct of one of Roswell's major agricultural industries, the dewatered sewage sludge contains no weed seeds. Gardeners

and home owners like it because its phosphorus, potash, 3% nitrogen and trace mineral contents increase flower, vegetable and lawn greenness and growth. As a soil conditioner, the material adds organics to improve water retention.

And the entire sludge drying and removal process has been handled to high equal or exceed all state and federal specs — most recently to rigid 40 CFR 503 standards — by one man and one machine, every week and every year since 1985.

Three Brown stripes . . . the sign of quality

NEW ARFA CODE 641

