

TEXAS MAKES INROADS WITH HIGHWAY USE OF COMPOST

LOCATED 60 miles southwest of the Dallas-Ft. Worth metroplex is the bustling town of Stephenville, Texas, population 14,600 and 67,622 dairy cows. Every dairy cow in Stephenville produces approximately 100 pounds/day of manure, 365 days/year — or 18.25 tons/year/ cow. Multiply that by the total number of dairy cows in the area and you get 1,234,101 tons/year of manure — way more than what the land in the Stephenville area can ever handle in the way of direct land application.

Faced with this manure management challenge, the Texas Natural Resource Conservation Commission (TNRCC) began exploring cost-effective options for handling manure outside of the area where it is generated. One promising solution was to compost the manure and then tap end uses in a broader geographic area. And a promising end use selected is application of the compost to Texas roadways to establish vegetation. The TNRCC approached the Texas Department of Transportation (TxDOT) with a proposal to work jointly to demonstrate the application of compost along roadsides to the public, potential contractors, and other interested parties.

TxDOT responded positively to the idea, especially as the agency was becoming increasingly concerned about depleted soils that had little or no organic material to sustain plant growth, leading to severe erosion on many projects. If erosion occurs while the project is still under contract, the contractor must reapply topsoil, seed, fertilizer, and mulch/and or erosion control blankets and cannot leave the project until sufficient grass growth occurs. If erosion results on existing highway sections, TxDOT maintenance is left to deal with the resulting problem, which is an added expense.

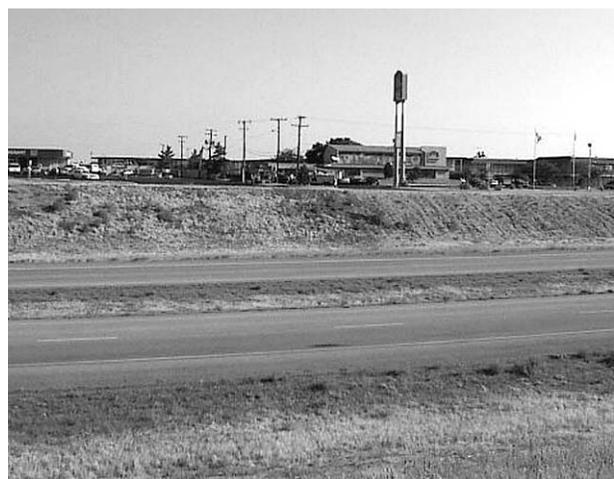
VEGETATING THE FIRST SLOPE

In May, 1999, the two agencies held a demonstration in the West Texas town of Big Spring. TxDOT had tried five times — unsuccessfully — to establish vegetation on a steep, severely eroded overpass. The site was constructed in 1968 in a low rainfall area and had been barren except for the occasional tumbleweed for nearly 30 years. There were six-inch gullies running the entire length of the slope. Compost made from

Success vegetating a slope that hadn't seen green since the highway was built in 1968 has led to broader use of compost by TxDOT — and a potential solution to how to handle the millions of tons of manure generated annually in the state.

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The Big Spring site had been unsuccessfully revegetated with conventional treatment, and had six-inch gullies running the entire length of the slope (top). A blend of compost and wood chips was applied at a depth of three inches (middle). Within a month, thick grass was growing in the treated area (left side of bottom photo) versus the untreated area (right side of bottom photo).



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feedlot manure, cotton burrs and yard trimming wood chips was applied with a Rexius blower truck at a depth of three inches, and was used to fill the gullies. Grass seed was mixed in with the compost prior to application. Because wind erosion was considered a problem at this site, wood chips — generally less than three inches in size — were blended with the compost (at a 3:1 ratio of compost to chips) to keep the lighter compost from blowing away. The wood chip blend held the compost in place.

By mid-June, thick grass was growing on soil that had laid barren since the highway was constructed over 30 years before. Compost was the only application that provided a successful growing media over that time. A filter strip made out of the compost mix was built at the top of the slope for demonstration purposes only. It was about 100 feet in length (it would have been longer, but the supply of compost ran out). The filter berm worked well as it rained within a week of the compost blend application and the water was diverted as designed.

WIDESPREAD DEMONSTRATIONS

After the successful Big Spring project, the TNRCC and TxDOT initiated two more demonstrations using a topsoil manufactured from manure compost. The manure was generated by dairy operations located within the North Bosque watershed around Stephenville and Dublin.

Overall, the use of compost along roadways in Texas has been demonstrated in 14 of the 25 TxDOT districts, often with remarkable results. The latest one is in the Brownwood District, where one side of the highway was done without compost and the other had compost applied. The demonstration led this district office to specify compost for ten miles of roadway.

In another demonstration near Dallas, compost was used side by side with conventional vegetative establishment techniques (application of soil to the slope and a synthetic fiber blanket for erosion control). The application was done during a period of drought in north Texas. The areas established using compost had maintained over 90 percent cover while the areas treated with conventional methods had 25 to 30 percent cover. In addition, the compost areas were green and thriving while in the non-treated areas, the grass had withered and died. TxDOT requires 70 percent coverage of vegetation before a job is considered complete (five percent of the payment for highway projects is withheld until 70 percent is achieved); the composted areas far exceeded these requirements.

The demonstrations also have provided an opportunity to test the three different compost classifications developed for TxDOT's specifications (see below). In addition

to manure compost, biosolids and yard trimmings composts have been used. All the applications include a blend of compost and wood chips. Filter berms were used in most of the demonstrations, and with the newly approved filter berm specification, they will be demonstrated in all future programs. Several types of equipment have been used for these applications, including blowers, manure spreaders, side slingers, front-end loaders and graders.

Compost has been applied to the soil surface as a top dressing as well as applied and tilled into the soil. Applications range from one-half inch to two inches deep. We have found that the maximum benefit of compost is limited to one inch in depth, with additional depth adding cost without increasing benefits. Tilling in the compost increases the soil microbe activity with positive benefits to soil tilth.

The demonstration projects also have helped to stimulate an increase in compost production. For example, while composting



had been discussed as an alternative to land application of manure in the North Bosque watershed, potential composters who had the capability to build processing capacity were reluctant due to their apprehension about the compost markets. Several compost operations had come and gone in the area, failing because of the lack of reasonably close markets. The large volume markets were 60 miles away in the Dallas/Ft. Worth Metroplex. Dairymen also were reluctant to sign up with a composter because of this market situation. TxDOT's intentions to use compost (and then actual purchases) helped to address the situation, providing a sustainable market for large volumes of compost. The TNRCC has now assisted in the development of seven composting operations within the Bosque/Leon watersheds.

COST COMPARISONS

The demonstration projects have proven that, in addition to conserving water, using

composted topsoil alongside highways has an economic benefit. "The Big Spring project showed us that using compost for normal roadside maintenance, erosion control, or repairs saves about 20 percent of the cost of a traditional seed-soil-erosion blanket," says TNRCC Commissioner John Baker. "For new construction, the savings jump to about 60 percent." The amount of savings depends on the location of the project, the costs of transporting compost to that site and the type of application.

While no actual cost comparisons have been done at this time, some general cost discussions between TxDOT and TNRCC, contractors and applicators provide some insights, as follows: Application of erosion control compost — \$.75 to \$2/sq.yd. (depending on depth); Application of erosion control blanket — \$1.25 to \$3.50/sq. yd. (depending on slope). Furthermore, in the case of our demonstrations, there has been no additional cost due to the need for maintenance follow-up.



In a demonstration near Dallas, the part of the site treated with compost maintained over 90 percent of its cover (left and above), while an adjacent site treated conventionally had 25 to 30 percent cover.

At the demonstration in the Brownwood District in January, the maintenance engineer expressed a willingness to pay more for the application of compost if it would increase germination rates and reduce the need for revegetation. This would reduce the number of failures that his maintenance staff has to contend with after construction is complete.

Application of mulch/compost material as a filter berm costs in the range of \$.80 to \$2/linear foot. There are no additional costs for removal and disposal and the compost berm provides more organics to the soil. Application of standard silt fence is \$1 to \$3.50/linear foot, which does not include the additional cost of maintenance and the removal and disposal of used materials

(roughly \$1 to \$2/linear foot). In the Brownwood District, the same maintenance engineer indicated that he might be interested in using the compost/mulch filter berm to reduce maintenance and removal costs, even if the initial cost is higher.

COMPOST SPECIFICATIONS

Before any demonstration projects were conducted, TxDOT asked TNRCC if it could assist in developing a specification for compost use. The project took almost a year to complete. Information was gathered from all states that had a specification available. A committee was formed with TxDOT and TNRCC staff, and composters from various communities. TxDOT Special Specification Item 1027, "Furnishing and Placing Compost," was developed and submitted to TxDOT's specification committee for approval, which was given in January, 1998. It identifies three grades or classes — compost for manufactured topsoil, erosion control compost, and general use compost. Erosion control compost and general use compost are required to have 40 to 60 percent organic matter; compost for manufactured topsoil has 30 percent organic matter. Particle sizes for the erosion control compost are two to three times that of the other two compost classes. The TxDOT specifications also require that the compost be tested for maturity using the Solvita test. This provides an added layer of product quality control and confirms the results of laboratory analyses that have to be submitted to TxDOT within six months of compost use.

The success of the Texas demonstration projects led to the development of an additional statewide TxDOT specification. The "Mulch/Compost Filter Berm for Erosion and Sedimentation Control" (Item 1034) was approved for statewide use in September, 2000. Item 1034 increases the particle size of the material to allow for water to filtrate through the berm structure. It allows for the use of a variety of materials to be composted and sets minimum requirements for the quality of material and construction methods.

The mulch filter berm is used when an area is not to be reseeded, so shredded brush meeting the specification would be used. When the filter berm is to be reseeded, the compost filter berm would be used. An example would be if a contractor wanted to put a temporary filter berm around a stockpile of topsoil at the site. A mulch filter berm would be utilized because the berm is temporary and seeding is not necessary. If a berm were being used along the top of a slope to reduce erosion, than a compost filter berm would be put in place that could be seeded and left on site after construction.

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COMPOST USE AND WATERSHED PROTECTION

A UNIQUE partnership between the Texas Department of Transportation (TxDOT), Texas Natural Resources Conservation Commission (TNRCC), and the Texas State Soil and Water Conservation Board (TSSWCB) will result in more compost being used on roadsides and in other applications across Texas. The U.S. Environmental Protection Agency's Region 6 office, along with the TNRCC and TSSWCB, have completed a grant in the amount of \$5.1 million to assist in further encouraging the use of composted dairy manure through funding of a Clean Water Act Section 319 grant. These are incremental funds to be used by states in areas with threatened waterways.

TxDOT projects using compost made from dairy manure from the Bosque and Leon watersheds will receive \$5/cubic yard of compost, which will be applied to

the transportation of finished compost for TxDOT construction and maintenance projects within a 150-mile radius of the watersheds. Because transportation is a large factor in the price of compost, eligibility in this program was limited to those districts within a 150 mile radius of the watersheds. Of the 25 TxDOT districts, seven fall within this region and are eligible for this incentive. The grant also will provide an incentive for the transportation of manure from the dairy operations to area composters.

Cities, counties and universities, also can receive the \$5/cubic yard transportation refund if they want to utilize compost for construction, grounds work or revegetation projects. A series of workshops have begun to assist these other potential markets/users in the utilization of compost for their particular needs.

Using materials that once were considered a waste also supports TxDOT's emphasis on the use of recycled products. All compost feedstocks used on TxDOT projects must meet the same strict EPA standards for Class A biosolids.

REALIZING THE POTENTIAL

The successes with the use of compost in vegetation establishment along Texas roadways have shown the utility of the product for erosion control and moisture retention as expected. The Texas demonstrations have also shown the benefit of compost for vegetation establishment in the harshest of climatic and soil conditions. Probably it is the latter benefit of compost that makes it most attractive to Texas contractors who need to comply with the requirement of achieving 70 percent revegetation of the disturbed area in order to receive full payment.

The economic impact of using compost-enhanced topsoil becomes clearer when considering that Texas has an estimated 1.3 million acres of highway right-of-way. TxDOT's use of the highway soil enrichment process is a huge market for compost, which in turn has the potential to ignite the composting industry and its ability to remove large volumes of organic material from high-impact watersheds. The TNRCC, working closely with many of TxDOT's district offices as well as public and private stakeholders around the state, has moved beyond the demonstration stage to promoting widespread use of compost in highway revegetation.

While it is difficult to calculate the actual amount of compost being used in TxDOT projects, these examples give some sense of the volume. Over the next three years, TxDOT districts included in a U.S. EPA-fund-

ed project (seven districts out of the 25 TxDOT districts) have committed to utilize 200,000 cubic yards of compost (see sidebar). However, one engineer in another district not involved in the EPA project has told us she will utilize 300,000 cubic yards on just one of her projects. The San Antonio district just released its bid for three jobs, which included 10,000 cubic yards in this one letting. At TNRCC, we can only give an educated guess that we will need to find other sources of compost in the state to fill just the needs of TxDOT.

Still, compost use for DOT projects is a very new concept in Texas. Lots of education needs to be done. Contractors who work on DOT projects have been invited to attend workshops with TxDOT staff, which has proved very helpful in lessening apprehension about trying something new. TNRCC and TxDOT staffed a booth at the recent Texas Associated General Contractors annual conference in Austin. Attendees included highway contractors and TxDOT engineers from all over the state. Another booth was staffed by compost suppliers and applicators so that contractors could ask questions about compost. We also electronically distribute a "Navigating the TxDOT Website" fact sheet, which tells composters how to learn more about the TxDOT compost specification, find out what upcoming projects specify compost, and make contact with the low bidder. ■

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