First of Two Parts

There is No Need to Turn the Compost Pile When Using the Aerated Static Pile Method

ASP Composting was first developed to process wastewater treatment sludge in the mid-1970s and it is commonly used today throughout the world to process all varieties of organic "waste" materials. Despite its common use, it seems to be the "best kept secret" for many private and public sector compost facilities.

By Peter Moon

Conventional wisdom in the composting industry states that compost piles need to be turned periodically to infuse oxygen into the core of the pile. This does work; however, the microorganisms that are degrading the feedstock materials very quickly consume the oxygen that is reintroduced into the compost mix. In a fresh compost pile, the oxygen level drops from (let's say) 18 percent to less than 2 percent in 30 to 40 minutes. This is easily demonstrated using an oxygen meter.

Problem No. 1: *When the oxygen levels inside a compost pile drop much below 10 percent, the pile is said to be anaerobic. The gaseous by-products of an anaerobic system tend to be offensive (i.e., they stink). People experience gases such as hydrogen sulfide (rotten egg), methyl amine (spoiled fish), putresine and cadaverine (dead animals) as highly objectionable, and an assault on their quality of life.*

Problem No. 2: *When an anaerobic pile is turned, these gases are released and neighbors downwind are known to protest loudly. This is problematic if it happens every now and again, but it can evolve into lawsuits or site closure if it persists. In fact, most compost facilities that fail are closed down due to odor management challenges.*

Problem No. 3: *When a compost pile is turned, a great deal of steam is also released, and this moisture loss slows down the composting process and further heightens odor impacts. In fact, if the moisture content of the compost mix drops much below 50 percent, the biology of the system simply goes dormant. The only option at that point is to breakdown the pile, rewet and remix the materials, reconstruct the pile and hope that it reheats.*

Problem No. 4: *Turning a compost pile requires the use of a front-end loader, an excavator or a specialized windrow turner. Using a piece of equipment to turn windrows requires fuel, labor and maintenance—all of which cost money.*

Despite these problems, there are several benefits associated with turned windrow composting. First, turning windrows provides an opportunity to remix (and "fluff") the pile and second, remixing provides an opportunity for the operator to add water to adjust the moisture content of the mix. Third, turning the pile tends to reduce the size of the larger pieces, which can be a mixed blessing when also dealing with plastics and other non-compostable materials.

Overall, however, turning compost windrows is not as effective as most people think and can lead to serious operational problems and unnecessary expense, as previously described.

The Anatomy of an Aerated Static Pile

There are three basic components with an aerated static pile, including:

1. The aeration system
2. The initial compost mix
3. The biofilter cover layer

The aeration system can consist of either a simple network of pipes placed directly on the ground or aeration channels that are constructed into the compost pad. Using pipes "on-grade" for this discussion, the lengths of pipe that underlie the core of the pile are perforated (drilled holes), and the diameter and spacing of the holes allows for even air distribution of airflow along the length of the compost pile.

On top of the perforated pipe sections, a layer of course material is used to further distribute airflow evenly across the length and width of the pile. This "Plenum Layer" may be comprised of wood chips or "screen overs". The Plenum Layer also serves as a drain and to absorb excesses moisture that may drain from the compost mix.

The Initial Compost Mix

There are three key parameters that need to be met when preparing the initial compost mix (this is true for turned windrow composting as well):

1. Nutrient balance (carbon to nitrogen ratio of 30:1)
2. Bulk density (550 to 950 pounds per cubic yard)
3. Moisture content (60 percent to 65 percent)

When these parameters are met, the compost pile can be constructed to a height of 8 to 10 feet, sometimes higher with a highly porous mix.

The Biofilter Cover Layer

The biofilter cover layer consists of finished, unscreened compost that has previously reached temperatures that effectively destroy pathogens, parasites and weed seeds (i.e., 131ºF for three days). This compost cover is an essential component of the ASP Method as it serves six important functions:

1. *Insulating Layer:* By covering the raw mix of materials with an insulating layer, all of the raw materials can come up to temperature to meet time/temperature conditions for pathogen destruction (referred to as a Process to Further Reduce Pathogens[PFRP]). With ASP Composting, this criteria is 55ºC (131ºF) for a minimum of three days. *Note: With turned windrow composting, PFRP conditions are met when the windrow reaches 55°C for 15 days, and the windrow is turned at least five times during this period.*

2. *Biofiltration Layer:* The compost cover has been demonstrated to be very effective at reducing odors. In a 2012 grant funded study in Tulare, CA, volatile organic compound (VOC), ammonia and greenhouse gas (GHG) emissions were shown to be significantly reduced when compared side by side with a turned windrow system.

3. *Nutrient Retention:* Ammonia is a nitrogen compound, and by retaining ammonia in the outer layer, the product quality is improved. This is also true of other macro- and micro-nutrients.

4. *Vector Barrier:* The compost cover is generally 1-foot or more in thickness. If a vector (rodents, birds, large wildlife) tries to dig in the pile to access raw "food", they will quickly learn that it is too hot to proceed much past a depth of 6 inches. In addition, flies are not attracted to the stable compost layer, and any fly larvae in the mix are soon destroyed by the high temperatures.

5. *Moisture Retention:* To perform properly as an insulating layer and a biofilter, the compost cover needs to be kept wet. This is generally accomplished through top irrigation with common garden sprinklers. It has been shown that top irrigation also helps to conserve water in the core of the compost pile reducing the overall use of water bay as much as 70 percent (based on an informal study conducted by the City of Bakersfield, CA).

6. *Improve Aesthetics:* There is a saying in the compost industry, "People Smell with Their Eyes". When a compost pile is covered with a cover layer, it appears well managed and a casual observer will relate that to the overall management of the compost facility.

There is No Need to Turn the Compost Pile

With an aerated static pile (ASP) system, ambient air is delivered into the core of the compost pile using a high pressure/high volume blower. By periodically inducing airflow into the pile, the operator can maintain aerobic conditions throughout the pile, mitigate offsite impacts from objectionable odors and greatly expedite the rate of composting. All of this is accomplished without turning the compost pile, thereby saving a considerable amount of time and money.

By controlling the amount of air that is delivered into the pile, the operator can also manage pile temperatures. With a small amount of airflow, the pile temperature goes up and with an increase of airflow, the pile temperatures come down because the heat in the core of the pile is displaced with ambient air. The amount of airflow required to manage pile temperatures is determined by a wide range of factors:

- The amount of energy in the initial compost mix
- Age of the pile
- Pile geometry (length, width and height)
- Aeration pipe network
- Size and capacity of the blower
- Ambient air temperatures and seasonal climate changes, etc.

ASP Composting is not new technology. It was first developed to process wastewater treatment sludge (biosolids) in the mid-1970s under a USDA Grant and it is commonly used today throughout the world to process all varieties of organic "waste" materials. Despite its common use, it seems to be the "best kept secret" for many private and public sector compost facilities.

There are numerous benefits derived from using the ASP Composting Method, many of which will be discussed in a companion article, to appear in *Waste Advantage Magazine*'s January issue. | WA

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