Transform Compost Systems

turning waste into an opportunity

Development of the Foundation Aerated Floor System

In development of an aeration floor, there are five "Foundational" considerations:

1. Operate loaders on the floor without damaging piping
2. Construct and install the aeration system efficiently
3. Provide air consistently throughout the length of the pipe
4. Minimize the risk of hole blockage and simple to clean
5. Ease of shipping aeration system around the world

The development of the current Foundation Air System began in 2002. I had designed the aeration configuration (pipe sizes, hole sizes and spacing) for composting on a local farm. The farmer used existing PVC piping and fittings to create his aerated floor. Concrete was poured about ¼" on top of the spigot. Spigots were then found using a metal detector to find the screw placed in the top of each spigot. This worked well as long as the reinforcing steel was not too close to the surface.

Figure 1. Pouring concrete for an aerated floor in 2002. Finding the spigots after the pour was the greatest challenge!

In 2003, we constructed a similar type of floor, but used a 1" x 2" section of wood tied on top of the spigots. The advantage here was that the aeration holes were now recessed in a trench, which gave less risk of damage resulting of wear of the concrete floor by the loader. The challenge here was that the 1" x 2" section was not able to be fixed firmly enough on the piping, and was at risk of being knocked off by the force of the concrete pouring.

Figure 3. In 2003, we used a 1" x 2" section of wood on top of the spigots allows the aeration holes to be recessed and allows easier leveling of the concrete floor.

Figure 2. Concrete floor with 3/4" deep trench protects the aeration piping.

The result was a well formed trench with consistent holes at specified intervals. Other than the ease of construction, we had had met our objectives for an aerated floor!

We delayed further development of this system until December 2012.

We were involved with two other aerated floor systems, one of which we still provide today.

In 1998, we designed aerated bunkers for a goat farm. Here we made the aerated bunkers just wide enough for the loader, so that the tires of the loader would run along the footing beside the wall. It worked very well, but would become a challenge if the operator changed loader sizes!

In 2000, we were asked to design an aerated bunker system for composting slaughter waste at Olds College in Alberta. For this project, we designed tapered 3.5" x 3.5" concrete trenches in the floor, which would accommodate 2" PVC piping in the trenches. This would allow a skid steer or other loader to freely drive on the floor without damaging the pipes.

Figure 4. One of our first aerated floor designs that allowed the loader wheels to ride along the footings for the wall.

This design worked great. One of the benefits was that the 2" PVC pipes could be easily removed for cleanout. With the slaughter waste, some of the fats were solubilizing due to the high temperatures in the compost, oozing into the pipes and solidifying. Simple removal of the 2" PVC pipes allowed an easier pipe cleanout. Of course the best solution is to avoid this altogether!

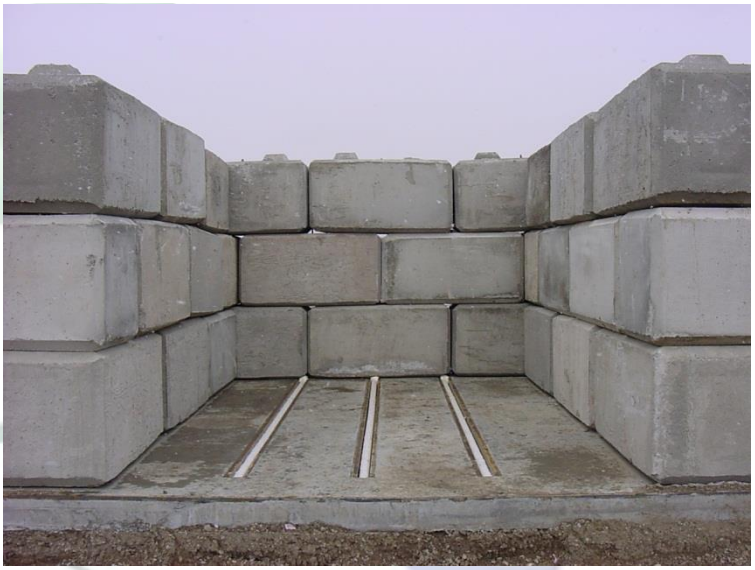

Figure 5. A 2" PVC pipe in a 3.5 x 3.5 inch trench in the concrete allows the loader to drive on the floor without damaging the piping.

Figure 6. High fat concentrations in slaughter waste can solublize during composting and flow into the aeration piping!

We have used this aerated floor design in a number of other projects, including Dickson Environmental (agitated bed with Rotoking turner in 2006), Sunshine Valley Good Earth (outdoor aerated bunkers for biosolids in 2009), and Spa Hills Farm (indoor aerated bunkers for slaughter waste and food waste in 2011).

The greatest limitation to this aeration system is that the length of the runs is limited to 60 ft maximum by the 2" diameter of the pipe. For longer aerated bunkers or windrows, we have to use larger diameter piping, which makes the trench and pipe design difficult.

We have also used HDPE piping in a trench design. This too works well, but we have to account for the unrestrained thermal expansion characteristics of the HDPE piping! We also found that the HDPE pipe is more pliable and subject to damage when it is very warm at composting temperatures.

Our first experience with HDPE pipe was in 2004, when we were asked to come up with an aeration system design for a large covered aerated windrow system. We had worked with a friend to develop a PVC extrusion that would fit onto a larger diameter PVC pipe, but the client was concerned about the lower temperature tolerance of the PVC pipe.

Figure 7. A trench design with 4" HDPE piping under a windrow in 2010.

Figure 8. Installing the PVC extrusion onto the HDPE pipe to be completely embedded in the concrete floor.

We did a comparison. We provided enough piping for two windrows with the PVC extrusion on HDPE piping and two windrows with the PVC extrusion on PVC piping. This was installed in 2004 for S&W Rock Products in Lynden, WA. Because of the weight loading on the floor, and the thermal expansion characteristics of the pipe, we engineered the concrete floor to completely encase the piping system. This was the first successful implantation of this style of aeration floor in an active composting process! We are thankful and proud to say that this floor is still in use today and is in excellent condition!

This aerated floor served as a model and proof of concept for several other projects that we have been involved with. We provided the complete aeration system design and piping for Central Valley in Salt Lake City, Utah, and for Phase I at Foundation Organics in Victoria, BC.

Figure 9. Aerated floor for an aerated windrow composting project (S&W Rock Products)

One of the concerns at Foundation Organics was the wear on the concrete floor that is beginning to bring the plastic extrusion very near the surface.

We are looking forward to the first installation using the actual Foundation Air spigots that allow the spigots to be in a deeper trench. The concept is proven. We have met our five Foundational considerations outlined at the beginning of this document. We have an aerated floor for composters, designed by composters!