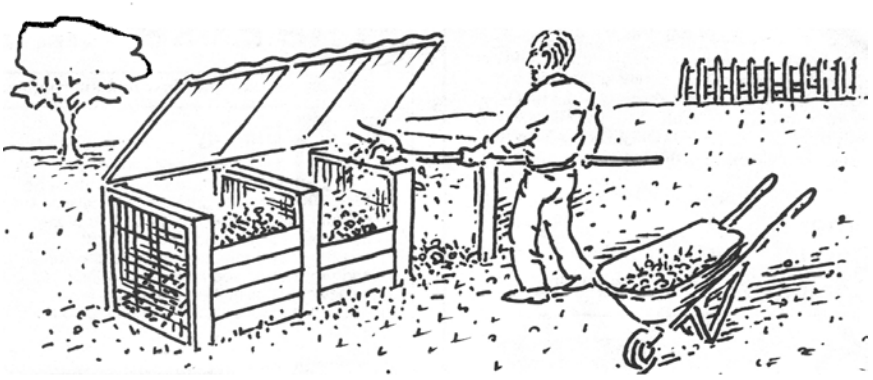
Composting Systems: Turning Systems

Turning systems are characterised by the active turning of the materials you are composting. This helps to mix and aerate them which, in turn, promotes optimal conditions and speeds up the composting process, producing compost in 2-3 months. There are three main types of turning systems:



- Multi-bin systems
- Tumblers
- Spheres

Multi-bin systems (as shown above) require materials to be turned from one bin into the next. Multi-bin systems can consist of 2-6 individual bins in a row. **Tumblers** consist of some sort of barrel that is mounted on a frame. Materials are added to the barrel and "turned" by rotating the barrel. **Spheres** are a new system consisting of a large plastic ball which is filled with materials and rolled on the ground to mix materials within it.

Examples of tumbler and sphere systems are shown below (from left to right: Jora 270 "Big Pig," Tumbleweed Composter and Eco-Orb).

How does a turning system work?

This is an active, hot and fast method of composting. Garden and food materials are gathered over a week or two until there are enough materials to make a "batch" of compost. It's more like baking a cake.... To get materials within the bin to heat up and compost quickly, you must have the right balance of ingredients by mixing "green" materials with "brown" materials together and get everything wet enough to kick-start the composting process.

Given the proper mix of materials and sufficient water, the microbes get started and produce heat as materials break down. This heat, which can reach temperatures of 50-70°C, can kill diseases as well as destroy weed seeds. After a week or more, temperatures can decrease as the level of oxygen to keep the microbes fully active decreases. This is where turning comes in – by turning, agitating or mixing the materials, air is re-introduced into the composting mass and the microbes accelerate their activity again. Eventually, they run out of food and you are left with a high-quality compost product.

What materials can and should not be composted in turning units?

As always, it is important to remember the mixture of green and brown materials in your composter.

Good for the compost pile/bin	Not recommended for the compost pile/bin
Non-woody garden and landscape materials including grass cuttings, weeds, leaves, old flowers, plants, small twigs and bush trimmings	Meat, fish, bones, skins, guts or other high protein items (dairy products, eggs, cheese, grease, etc.);
Vegetative food scraps – see the following sections	Weed seed heads and roots of invasive weeds such as ivy, buttercup, morning glory and bramble;
	Insect-infested or diseased plants;
	Cat and dog poop and ashes.

What are the good and bad points of these systems?

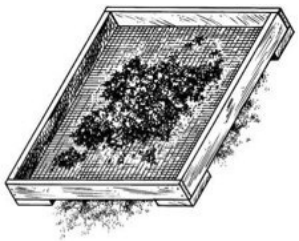
Good Points – main benefits	Bad points – main drawbacks
Makes high-quality compost quickly: 8-12 weeks.	More expensive to build or purchase (unless the system is made from recovered or scrap materials such as pallets).
Multi-bin systems handle larger volumes of materials and therefore are ideal for larger properties.	Multi-bin system can take up more space.
High temperatures in these systems are better at killing diseases as well as destroying weed seeds than piles or holding bins.	Requires more time to manage and turn materials.
The heat from the composting process can drive off excess moisture in the form of steam.	Open bins or bunkers in multi-bin systems can easily become too wet if uncovered during wetter winter months.
Vegetative food scraps can be added to the mix of materials when a batch is formed or first turned.	High temperatures can drive off moisture and dry the pile out too much so piles may need to be moistened when turned.
Tumblers and spheres are good at excluding pests and keeping in moisture for efficient composting.	
Multi-bin systems with a lid or covers prevent rain from soaking the pile.	

How do I get started?

There are 6 main steps involved in using turning systems to compost your garden materials and vegetative food scraps. Be sure to read the "How to Compost" brochure to understand the biology and essentials of composting. This can be found at **STOPFoodWaste.ie**

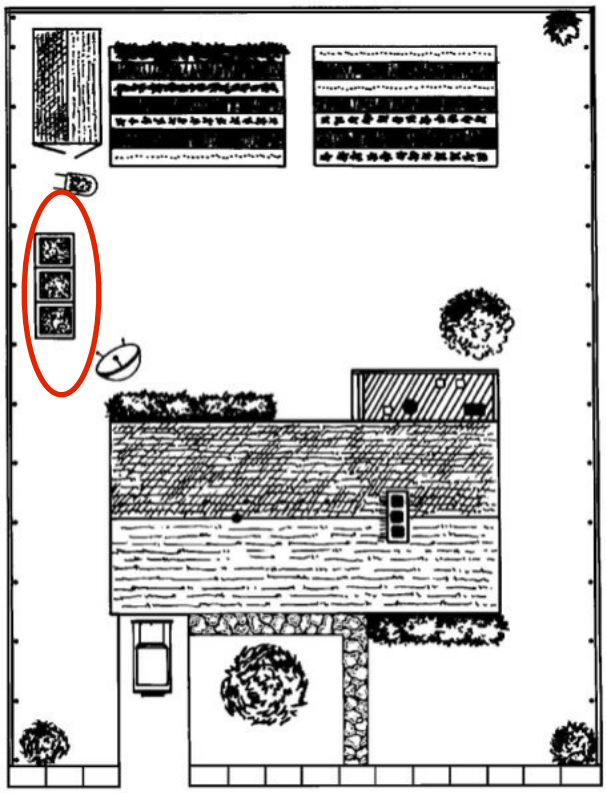
First of all, the following are the basic tools needed for maintaining your system:

- Shredder, mower and/or spade for chopping materials up
- Pitch or spading fork to mix and turn materials
- Hose with spray nozzle or other watering device
- Homemade screen with 10-20mm openings (may not be necessary if compost is dug into garden or used as a mulch)



1. Set up your system

Ideally, the spot you choose for your turning system should be in a shady or partially sunny spot on bare soil. This keeps materials from drying out in the hot sun, allows beneficial organisms, insects and worms to gain access to the rotting material, and promotes better aeration and drainage.



Also, make sure that there is sufficient space in front of the system so you can aggregate, mix and water materials before they are placed into the system. This is also important for turning the materials as well as harvesting and screening the finished compost. For multi-bin systems, you can facilitate better aeration by placing a pallet or timber platform at the bottom of the first and second bins. If the multi-bin system is open to the elements, you should cover the piles with a plastic sheet, tarpaulin, old carpet or pieces of plywood to keep rain from soaking the pile. This also encourages the larger composting organisms (insects and worms) into the composting process, as they like dark and damp conditions.

2. Aggregate enough materials to make a batch

As you garden, gather materials in front of your composting bins until you have enough to fill the first bin of a multi-bin system or to fill a tumbler or sphere. Turning systems work on the principle of getting enough fresh materials together to reach critical mass. For multi-bin systems, this is about one cubic meter of material. For tumblers or spheres, it's enough to fill up the barrel or sphere. Be sure to chop or shred materials so that they can be easily mixed together and turned. Chopping materials also ensures faster composting as there is more surface area for the microbes to work on.

3. Mix "green" and "brown" materials together and add water

It's important to pay attention to the essentials of composting and get the mix right from the start. If you want to compost grass cuttings and food scraps ("greens"), you must balance them out with both "brown" materials such as leaves as well as brushy materials that create air pockets within the pile. Remember that variety is the spice of a compost pile's life; a pile made with grass cuttings, vegetative food scraps, weeds, leaves, and bush trimmings is ideal. If you are gardening in dry weather, you might need to water materials as they are being mixed together. Materials should glisten with moisture and feel wet to touch. The beauty of mixing and watering materials outside of the system is that any excess moisture will simply drain off the materials and soak into the ground before they are put into the bin.

4. Place materials into the first bin or tumbler/sphere

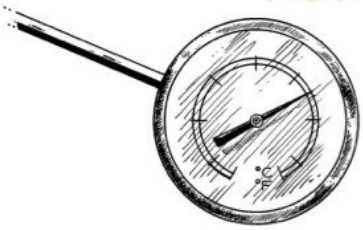
For all turning systems, it's best to mix and water materials before they are placed into the system. Once you are happy with the blend of ingredients and the moisture level, you can fork materials into the system. Alternatively, in a multi bin system you can layer materials as you add them, but be sure to mix them together as you build the pile upward. Bacteria need a good mix of materials when composting and layers don't really provide this.

Food scraps can be easily included in to the mix of materials added to a tumbler or sphere without worrying about pests as the materials are enclosed within the system. For multi-bin systems, incorporate food in to the lower or middle levels of the pile.

Begin by mixing garden materials together in front of the bin. When the first bin is half to three quarters full, add the vegetative food scraps to the top of the pile and mix with the garden materials already in bin. Then cover the blend of food scraps and garden materials with a layer of mixed garden materials to top off the pile. This keeps the food scraps buried inside the pile and will not attract pests, such as rodents, birds or insects. Food scraps can also be added to a turning system within a week or two of adding a batch to the system.

For tumblers or spheres, just open up the unit, add the food scraps and rotate or roll the system to mix the food scraps inside.

5. Monitor the temperature of the pile and turn as needed



Every 2-3 days, monitor the temperature and moisture level of the pile. You can do this by digging into the pile with a pitch fork and touching the materials at the bottom. If you break into the pile and steam comes out, then be careful as the pile can be as hot as the water coming out of your hot water tap (50-70°C). Compost thermometers are also available for about €20

If you see or feel the temperature significantly cooling off from the time before, then it is time to turn the pile from the first bin into the second bin. Piles in a multi-bin system can be turned every 1-2 weeks. For tumblers and spheres, turning can take place every few days. After turning, you should see the temperature increase again. After the second or third turn, the materials may not heat up as much as in the beginning of the process. This is due to the fact that the food within the composting pile (your greens and browns) has been consumed by the microbes and the compost is almost finished.

Remember, if you see and feel that the pile has dried out, be sure to moisten the materials as they are being turned. Again, the rule of thumb here is to make sure that the materials are wet to touch, not soaking - if you squeeze the materials in your hand and a stream of water comes out, the pile is too wet. Then you will need to add in dry materials such as sawdust, shredded paper, leaves or straw to soak up excess moisture when the pile is turned. Sometimes, just turning a hot pile will release moisture so if the pile is wet but not soaked, then this might be sufficient to dry things out a bit.

Lastly, when turning a pile in a multi-bin system, try to move materials that were in the middle to the outside and materials from the outside into the middle as shown below. This helps to expose all materials to the heat in the middle or core of the pile which kills diseases as well as destroys weed seeds. Also, shake materials off of your pitch fork to break up clumps, mix materials together and fluff up the pile to create more air spaces within it.

6. Reap the benefits: Harvesting your compost

The beauty of a turning system is that compost is produced in batches. So when materials have been turned through a multi-bin system or with the use of a tumbler or sphere, they are all ready at the same time. Depending on the mix of materials used, the moisture level and the frequency of turning, compost can be ready in as little as 8 weeks. So how do you know if the compost is ready?

- When the materials do not heat up again after turning
- When you don't recognise the original materials and everything is a dark brown or black colour
- When the compost does not smell strong and has an earthy, soil like smell
- When the compost feels friable and crumbly.

When in doubt just use your senses....If the materials have a strong smell or are still warm to hot, then just allow the materials to sit for 2-4 more weeks to mature.

Once you have removed the compost from the last bin of a multi-bin system or from a tumbler or sphere, you can use the compost as a mulch or soil amendment. If there are a lot of woody materials in the compost or if you would like to make a potting mix, you can screen the compost using a homemade screen. This can be made by simply sandwiching some mesh or hardware cloth between two squares made of 2" x 1s" or making a frame and attaching some mesh.

What are the common problems??

The following chart helps to troubleshoot common problems associated with Turning Systems

Symptoms	Cause	Solutions
Pile has foul odour	• Not enough air • Pile too wet • Meat and fish added to pile	• Turn it, add course dry stalks, hay, leaves or bush trimmings • Limit food scraps to vegetative ones
Clumps of slimy grass, sharp ammonia smell	• Too much fresh grass	• Leave cuttings on lawn or allow them to dry for 1-2 days before collecting them for composting. • Mix in brown leaves, hay, bush trimming, stems, stalks, or wood shavings. Remember the 50/50 rule of mixing green and brown materials.
Pile is dry throughout	• Not enough water • • Too much woody material • Pile is in sunny location • Pile may be too small	• Turn it and moisten materials • Cover pile • Add fresh green materials • Move bin to a more shady location • Add materials or combine with another pile.
Pile is damp, but woody and not composting	• Materials are too big • Lack of green materials	• Chop or shred materials • Turn and add green materials such as grass cuttings or animal manure
A swarm of flies greets you when you open the lid	• Pile is too wet • Food scraps are placed on top	• Mix in dry materials or add some on top • Bury food scraps within the pile • Cover pile with wet newspaper or a plastic sheet
Rats live in the pile	• High protein food waste in pile • Food waste on top • Warm and dry	• Stop adding animal products to bin, e.g., meat and dairy products • Bury food scraps into pile • Turn pile frequently to disturb nesting • If necessary, set traps around pile
Pile does not heat up	• Not enough material • Too dry • Not enough fresh green materials • Particles too big • Compacted or too dense- no air spaces in pile	• Make bigger batches • Add moisture when pile is turned • Add fresh green materials when turned • Chop or shred materials • Turn to introduce air and loosen up the pile
Pile has shrunk, but looks undecomposed	• Outside of pile is dry, inside probably composted	• Check in pile for finished compost. • If compost is not ready, turn pile, add water if necessary and allow it to finish • If compost is ready, harvest compost and use undecomposed material to start a new batch.

For more information on food waste, and how to prevent it, as well as all aspects of home composting, visit our website:

STOPFoodwaste.ie

This programme is developed by the EPA as part of the National Waste Prevention Programme (NWPP)

epa Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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