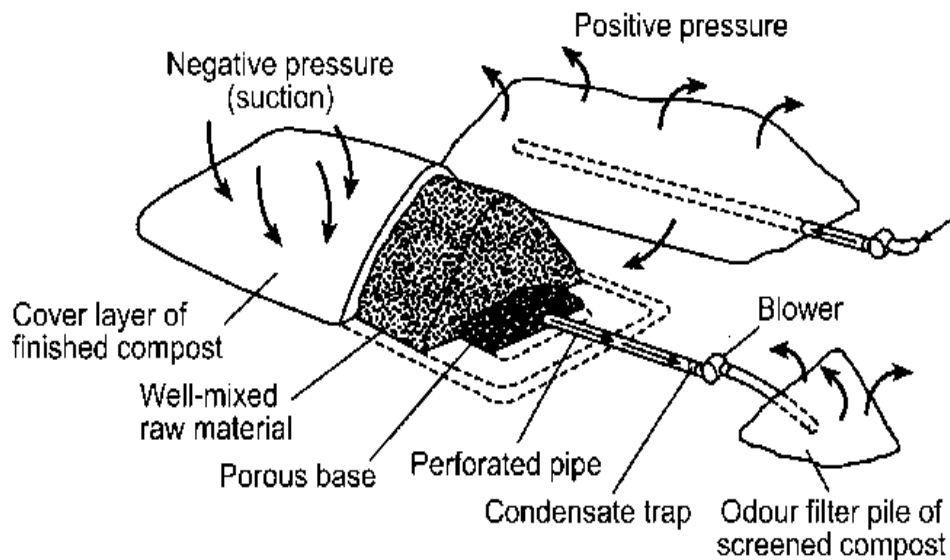


Aerated Static Pile (composting)

Defining characteristics	Narrative
<i>General</i>	Composting is a waste management practice in which organic waste, placed in natural or engineered environments, is transformed by micro-organisms after a period ranging from weeks to months into friable biosolids and carbon dioxide (CO ₂) and possibly leachates. Various researchers including Levis and Barlaz (2011) and Renkow and Rubin (1998) recognise composting alternatives of varying technological sophistication, based on anaerobic and aerobic principles (Jakobsen, 1994). For large-scale composting operations, ⁸⁷ the most prominent amongst the latter group include windrows and aerated static pile (ASP) systems. ASP is different from windrow composting with respect to physical manipulation of the blended mixture of organic waste materials during composting. ASP composting systems work well with wet materials and large volumes of treatable organic waste. The safety of compost is assessed by several methods emphasising the stability of organic matter content and absence of pathogens (Bernal et al., 1998; Jackson and White, 1997; Zucconi et al., 1981).
<i>Siting and land use</i>	Key factors in siting of composting facilities include the volume of raw materials anticipated and kind of machinery and equipment to be used for various activities in the composting process (Wei et al., 2001). Other factors to consider include road accessibility, susceptibility to flooding, and alternative land uses. Proximity of potential sites to major sources of feedstock/raw materials and low ground and surface water contamination risks may constitute significant advantages. Other environmental and social impact criteria may come into play as part of mandatory permitting processes. From an operational standpoint, a facility implanted in a rectangular- or square-shaped area is preferred over one that is located in an irregularly shaped area. ASP facilities can be under roof or outdoors.
<i>Design (components) and Operation</i>	Aerated static piles are elongated mounds of well-mixed, uniform compost materials, formed using a front-end loader. Typically, piles are 1 to 2 metres high, 2 to 3.5 metres wide at the base, and tens of metres in length, organised as parallel structures separated by alleyways at least 1.5 metre wide. Compost materials are usually piled on top of a 6-inch base of porous material such as wood chips, chopped straw, under which a network of pipes serve to force air into the pile to ensure adequate aeration within compost mass. In some variants, pipe networks are installed on top of a floor prior to the build-up of compost piles, or buried within the pile during its buildup (Renkow and Rubin, 1998). It is customary to pave surfaces on which wet compost material is placed, and considered good practice to build berms around the perimeter to control diffuse runoff headed towards or moving away from the site. The aeration system which gives the system its name uses a centrifugal blower or axial flow fan to push and/or pull air through the composting mass at fixed rate or variable rates. In large-scale systems, forced aeration system is coupled to a computerised monitoring system that controls aeration rates of the composting mass (Leton and Stentiford, 1990). An adequate oxygen supply is essential for achieving good composting results and controlling the formation of odours from decomposing material (Rasapoor et al., 2009; Sesay et al., 1998; Fernandes and Sartaj, 1997). To prevent the compost from drying out, the initial moisture content of compost piles is adjusted by mixing with high moisture materials and optimised to stay within the preferred range of 50 to 60% to support microbial activity during decomposition (Luo et al., 2008). Some piles equally feature an insulating layer of compost or bulking agent reduce moisture loss, retain heat, curtail the proliferation of egg-laying flies, and act as a biofilter for odours.
<i>Costs</i>	The literature on ASP systems contains sparse information on development and

⁸⁷ Industrial/Municipal

	operational costs. Most authors deliberately sideline the question of cost because costs are closely tied to the specificities of each site. Renkow and Rubin (1998) found composting costs of around USD50/metric ton from a sample of 19 sites in the US, simultaneously pointing out that very few facilities receive any revenues from the sale of compost to offset operating costs. According to Wei et al (2001), the costs of building and operating ASP vary considerably between locations from USD1.5 million to USD15 million. In most of the cases reported, capital costs significantly outweigh operating costs. Costs taking account of processing capacity range from USD55 to USD187 per metric ton of dry matter depending on the type of system and waste characteristics.
<i>Supporting infrastructure</i>	Apart from a fence to control access to the site, auxiliary infrastructure as follows might be required on site: - Retainer walls for storage piles - Office and lab - Storage and tool building, - Maintenance shed Other machinery used in composting facilities includes conveyance devices, loaders, screening equipment, and baggers.
<i>Advantages</i>	ASP systems combine the advantages of composting methods notably recovery and transformation of organic wastes into valuable resources, avoiding in the process unnecessary landfilling of biodegradable wastes and emission of greenhouse gases (GHGs) and volatile organic compounds (VOCs). In addition, the ASP method is very versatile. It can be operated with mobile and light power supply solutions (including solar) at multiple scales of operation. Compared with windrows, ASP optimises the use of land area and significantly improves the cost-effectiveness of composting operations (Oonk and boom, 1995). Parasites, pathogens and weed seeds are eliminated within 3 days, mature compost ready within 3 to 5 week.
<i>Disadvantages /Challenges</i>	ASP composting requires strict waste segregation. This could be a handicap in places where logistics problems hinder the separation of waste streams at source. Compared to in-vessel composting and anaerobic digestion, ASP operations also require a much larger land area.
<i>Abatement potential</i>	Lou and Nair (2009) point out that GHG emissions from the composting process is highly dependent on characteristics of feedstock that vary widely from “green” to “brown” wastes with various mixtures in-between. In general, feedstock with a higher dissolved organic carbon (DOC) will produce higher GHG emissions. In this regard, Andersen et al. (2009) report finding emissions ranging from 0.081 to 0.141 ton CO ₂ -eq from composting operations using garden wastes. By comparison, Lou and Nair (2009) cite studies in which theoretical estimates of GHG emissions range from 0.284 to 0.323 ton CO ₂ -eq per ton of mixed waste were reported. Little is known regarding N ₂ O emissions produced by either incomplete ammonium oxidation or via incomplete denitrification of compost mass (IPCC, 2006).
<i>Level of penetration</i>	ASPs are a completely new technology



Source:

<https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjVibOkyfjPAhVBPxoKHd5IBZ8QjRwIBw&url=http%3A%2F%2Fwww.fao.org%2Fdocrep%2F007%2Fy5104e%2Fy5104e07.htm&psig=AFQjCNHrpAc02W0UwO2l7KtlMISfKyYjAQ&ust=1477574614416515>

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