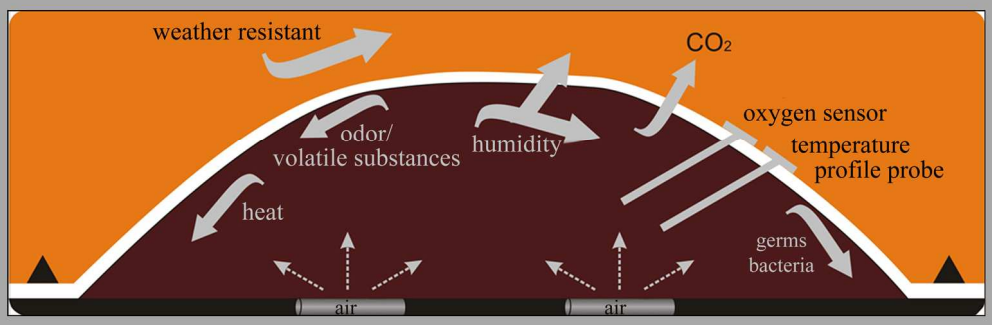
Processing of organic waste, manufacture and sale of machines and equipment necessary for compost preparation

placing the measuring sounds

perforated HDPE aerating pipes

software

aerating station



Composting happens under so called “controlled circumstances”; the main parameters controlled to achieve optimum composting are as follows: pH, moisture content, presence of air, balance of nutrients (C/N, C/P,..).

COMPOSTING with Compostal® technology

Composting is not only the best method to decompose the organic waste of various origin, but also a proper method to create high quality organic nutrients which are able to replace the manure in the extensive plant growing and partially the peat in the intensive production.

A plant producing high quality compost does not simply process the waste, but also recycles the organic content of the waste by a natural biological procedure for the purposes of agricultural utilization; we guarantee that this is best method whose comprehensive objective is to preserve the natural resources.

The waste's composting creates hygienic, non-infective product of high agricultural value which is easy to handle (storage, transport, spreading).

This procedure reduces the ecological and health risk posed by the waste's biologically decomposing fractions (typically found in fresh materials) and the energy can be preserved better as opposed to other waste decomposing and recycling procedures.

Composting differs greatly from other quicker chemical or physical methods which may create such unstable products that it is required to follow special instructions when they are used (such as temporary pauses, odour control with drying and disinfection).

However, if the organic substance given to the soil is not wet enough it worsens the soil's micro flora due to the metabolic products inconsistent with the plants' growing (such as volatile acids, NH3, H2S etc.).

With the aerobic treatment of the waste we can prevent that factors which are toxic for the plants appear, and we can devitalize the infected grass seeds that have passed through the animals' digestive system. Therefore the material is completely hygienic and there is no disturbing smell.

The nutrient received with this procedure has got clearly definable smell, texture, and moisture characteristics, as well as physiological features which are compatible with the plants.

1. THE OPTIMAL CIRCUMSTANCES OF COMPOSTING

Composting happens under so called “controlled circumstances”; the main parameters controlled to achieve optimum composting are as follows: pH, moisture content, presence of air, balance of nutrients (C/N, C/P,..).

1.1. Ph value

The pH value optimal for the growth of the bacteria is between pH 6.5 and 7.5.

At the initial phase of composting CO2 as well as organic acids are generated which shift the pH value in acidic direction (pH 5-6) owing to the presence of air which removes the CO2 and prevents the decomposition of the proteins.

By the end of the process, when pH balance is achieved, the value is close to neutral if the proper technological discipline is maintained.

1.2. Moisture content

Composting is a biological process that is why it requires a moisture content which provides proper living conditions for the microorganisms. The high moisture content (over 70%) is unfavourable for the process and anaerobic circumstances are created, while under the too low moisture content (under 20%) the biological activity is stopped.

As a result, the proper moisture content depends on the porosity and the structural characteristics of the mixture to be composed, which is achieved with optimal mixing proportions and by setting the visual moisture content.

The optimal moisture value required for the technology is between 40% and 50% which can be set easily with the help of the palm probe known in composting.

1.3. The presence of air

The air content is an extraordinarily important parameter during the procedure of conversion. The presence of the oxygen (air) is essential so that the basic biological processes of composting based on oxidation can take place. **It is crucial that the raw material of the mixture has enough “free air” content.**

This quantity of air is supplied by an aeration system in the Compostal technology controlled by a computer based on the measured parameters. Composting is an oxidative process to stabilize the initial substance under controlled circumstances.

1.4. The balance of nutrients

The heterotrophic microorganisms need carbon (source of energy) and nitrogen (for the protein synthesis).

With their enzymes they decompose the substrate’s proteins into peptides and free amino acids which can then be used directly or decomposed further while ammonia is generated; the ammonia may be used by the microorganisms (they become part of the organic compost) or it evaporates.

The excessive carbon hinders the microbiological activity, while the excessive nitrogen speeds up the decomposition and causes great loss of nitrogen with evaporation therefore it is important to create a proper homogenous mixture.

The optimal initiate C/N proportion is between 1/20 and 1/25 which gradually reduces to 1/10 by the end of the process, which is the value of the stabilized compost soil.

1.5. Pathogen agents:

Significant international literature supports that a properly performed composting method creates completely hygienic compost from entirely different basic substances.

The temperatures achieved during this process are able to destroy the pathogens found in the compost partly or completely.

In order to guarantee sterilization it is required that the temperature is at least 55°C for a few days. The cover system which forms part of the technology operates as a heat shield in the wintertime to ensure the heat treatment in the complete volume.

This temperature is easy to achieve and maintain for a long time with the Controlled Aerobic Composting with the purpose of ensuring the anaerobic conditions within the biomass.

The compost must be a ripe and high quality compost to be able to control the plant pathogens living in the soil.

1.6. Bio oxidation

The process of composting is started when the bio mass is loaded into the compost prism in the proper quantity which enables the accumulation of heat; the heat is indispensable for the stabilization.

The controlled aeration makes sure that the proper quantity of oxygen, necessary for the conversion, is added. During the bio-oxidation the most easily degrading organic fraction is decomposed (fraction of simple molecules such as the sugar, organic acids, amino acids etc.) which is accompanied by quick and intensive microbiological activity causing oxygen consumption and CO2 release.

When the supply of oxygen is reduced, also the aerobic decomposition slows down or stops completely in the given case if it does not get oxygen again. Therefore to continue the microbiological activity it is essential that the substrate is supplied with air.

By resolving the chemical bonds the microorganisms receive energy for their development and synthesis. Part of the chemical process' energy is transformed into heat which determines the substrate's increase in temperature then it gets lost in the atmosphere.

The increase in temperature caused by the microbial activity is significant especially in the 12 to 48 hours after the mass's loading.

The temperature of the materials to be composed usually shows a quick increase up to 55 to 60°C. If the temperature is not distributed properly, it may occur that the temperature of

certain organic matrixes exceeds 65 to 70°C during the bio-oxidation and kills the majority of the microorganisms.

1.7. Wetting and ripening

When the mostly decomposing fraction dissipates the majority of the microbe population dies and the decomposition is continued slower which is not really favourable for the more complex molecules and microbe residues. The “breathing” activity such as the microbial synthesis is reduced.

The temperature drops slowly and gradually. Owing to the cooling the bacteria and the fungi populations settle on the mass again starting from the outside, however, as the oxygen and moisture content are relatively low they do not develop as quickly as at the beginning of the process of composting.

During the composting the volume of the biomass is reduced to ¼ to ½ of the initial volume depending on the characteristics of the raw materials.

The main reason is that the water evaporates and the loss of CO2 from certain organic fractions as minerals are generated, moreover, the rough matrix is formed into a matrix of finer particles.

Mainly the water leaving the mass in vapour form is responsible for the weight loss of the composted substances which may achieve 40% to 60%.

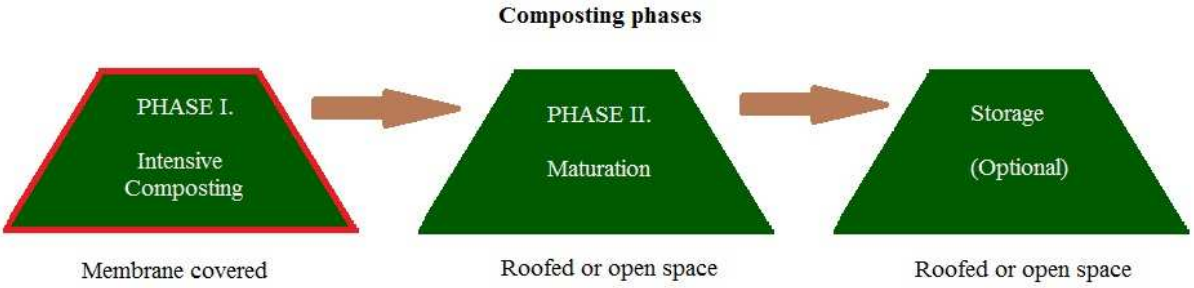
While there is a slight loss of nitrogen as ammonia the majority of the nutrients are preserved, they are found in the stable organic compost.

The biomass types that can be treated with the COMPOSTAL controlled aerobic composting system:

- dung waste from animal husbandry (poultry, cattle, sheep, rabbit, pig farming);
- waste from the slaughterhouses after performing the treatments ordered by the laws;
- sludge from the agriculture and food industry, industrial and communal sludge if it does not contain any heavy metals over the level specified by the laws, they are not stable and do not contain any toxic and harmful substances, antibiotics, medicine residues which may hinder the aerobic process of fermentation.
- selectively collected garden waste;
- raw kitchen waste, residues of vegetable, kitchen and canteen waste etc.;
- organic waste from selective collection.

2. GENERAL DESCRIPTION OF THE TECHNOLOGY

The Compostal® procedure with cover material and controlled aeration system is an EU-conform technology even if we consider the technical and ecological aspects. It is characterized by simple and flexible handling, short composting time (30 days), great operational safety and low costs of operation.



2.1. Pre-treatment

The organic waste transported to site are loaded into the pre-storage equipped with solid paving. When communal sewage sludge is composted it is necessary to add certain structure-improving structure materials to the sludge to create the proper moisture content and texture and to ensure the aerobic conditions (green waste, straw, wood chips, agricultural secondary products, park keeping waste etc.). In the case of materials with weaker texture (including, without limitation, the straw) we need to expect that structure materials with at least twice of the volume, or at least one and the half of the volume will have to be added if the substances are materials of wooden structure. During the mixing and the thorough homogenization some decrease in the raw materials' volume is expected.

During the pre-treatment the green waste is prepared with a chipping machine (dung waste does not require any cutting), then with the help of a front loader or a special cutting-mixing-homogenizing equipment it is mixed with the sewage sludge. During the homogenization the optimum moisture content is set, then the raw materials are loaded into the prisms with the front loader.

2.2. Aeration

Aeration has major importance for the quick and odourless decomposition and recycling of organic waste. We are using forced ventilation which sucks in the environmental air and blows it into the ripening material through the aerating (on-floor) perforated pipes placed under the ripening material. The HDPE pipes are resistant to the environmental effects, their hole profiles and perforation has been designed individually. The air is blown in through the cone-shaped holes.

2.3. Building the prisms

The prisms of raw materials are built with a front loader. The materials to be treated are loaded onto the aerating pipes laid on the composting area. In order to prevent that the pipes may get blocked and to ensure that the substance is aerated immediately, the aerating system is always switched on during loading.

2.4. Placing the measuring sounds

After the prisms of raw materials are built we are placing the temperature and oxygen content measuring sounds necessary to control the aeration. The temperature measuring sound is placed squarely, and the oxygen measuring sound in ~45° angle into the substance so that the forming of condensate drops does not influence the data measured with the oxygen sound. The data transmission is led directly on the prism's surface and connected to the outdoor control technical box.

2.5. Covering the prisms

First 5m wide slide-contributing foil will be placed on the backbone of the stacks. Then the stack can be covered with the Compostal® semi-permeable covering material. The cover is positioned manually or with the winding machine mounted on the wall. The laminate is fixed with the fastening bags filled with sand which form part of the system. After the cover has been placed, the aerating system is started with the feedback of the data received from the temperature and oxygen content measuring sounds.

2.6. Operation

During the four-week ripening time the aeration is operated based on the temperature limit and oxygen content limit. It is not necessary to control the prisms' moisture content and to turn the material over during the time of composting. Owing to the loss in the volume experienced during the ripening the membrane cover no. 2 needs to be re-stretched and the measuring sounds must be pricked deeper into the prisms.

2.7. Demolition of prisms

The prisms are demolished after the four-week ripening period. The first step is to remove the cover from the prism, then to remove the sounds and the pipes. The flexible goose neck is released from the fan's side of the aerating pipes, then the pull cable is attached to the drawbar eyes at the pipes' ends and they are pulled from below the prism. Now we start demolishing the prism.

2.8. Post-ripening

Following the intensive ripening the compost usually achieves the ripeness grade 2 to 3 therefore a few weeks of post-ripening is recommended. During the post-ripening the conversion processes are finished, the material is stabilized. Then the compost can be sieved, and bagged or packed in bulk form, depending on the future use.

2.9. Post-treatment

After the post-ripening has been completed the compost which is expecting to have ripeness grade 4 is fractioned at the post-treatment area. If the compost's moisture content is acceptable, the sieving can be started which loosens the compost and the rough and fine fractions can be separated.

The sieving residue is returned to the pre-treatment hall and it can be used in the next composting cycle as an inoculating agent. Then the fine fraction is stored or packaged (bags or bulk) depending on the rate of usage then it is transported.

3. PARTS OF THE Compostal- COMPOSTING SYSTEM:

3.1. Compostal covering material

- It is a semi-permeable laminated material which will retain the moisture and reduce the odours given out (more than 90%). In addition, it will protect against the external weather conditions.
- Owing to the special fixation, it will remain stable even in the event of wind impulse of 120 km/h.

3.2. Aerating system (on-floor system)

- aerating station, specially dimensioned stainless fan
- on-floor, perforated HDPE aerating pipes

3.3. Control engineering system

- hardware (industrial computer, monitor, keyboard, mouse, communication unit);
- software in Hungarian to control the composting process and to store the data, it manages 20 prisms simultaneously, if necessary;
- oxygen content measuring sound;
- temperature measuring sound;
- control engineering box: (modular extension from 1 to 20 pieces);
- combined power supply;
- measuring and control unit;
- engine starting relay;
- engine protecting unit;
- fan power supply connection (5-pole 3x16Ah);
- radio-controlled data transmission.

The on-site control module of the COMPOSTAL system and the aeration technique has CE qualification.

CERTIFICATE
of Conformity

TÜV

Registration No.: AK 60002180 0001

Report No.: 02292048 001

Holder: COMPOSTAL Kft.
Templom u. 1.
H-2045 Törökbálint

Product: Schaltschrank
Control cabinet and fan

Identification:

Type:	Compostal
Fan unit:	MD-45/2-C
Nominal Voltage:	400 V, 3~
Nominal current:	4 A
Motor rating:	400 V, 3~, 1.5 kW

Tested acc. to: EN 60204-1:1997

The certificate of conformity refers to the above mentioned product. This is to certify that the specimen specime is in conformity with the assessment requirement mentioned above. This certificate does not imply assessment of the production of the product and does not permit the use of a TÜV Rheinland mark of conformity.

Certification Body

Cologne, 29.03.2002

TÜV Rheinland Product Safety GmbH
TÜV Rheinland
Zertifizierungsstelle

G. Bereczky

TÜV Rheinland Product Safety GmbH - Am Grauen Stein - D-51105 Köln

The technology's domestic service is provided by COMPOSTAL KFT.

Composting plant 25.000 t/year