

Cologne, 24 October 2006

Organic waste treatment with GORE™ Cover Systems is successful in Europe – despite very different environmental regulations

GORE™ Cover Systems, the technology for aerobic waste treatment using special laminates from the membrane specialist Gore, have not only been proven to provide the best performance worldwide but have also been designed to fulfil their purpose even under strict national environmental regulations. The system is now being utilised in over 130 composting and mechanical biological waste treatment plants in Europe alone, with a total throughput of the plants in operation amounting to more than 2 million t/a.

The principle of waste treatment with GORE™ Cover Systems

The central component of the system is the GORE™ Cover laminate. The heap cover is made of a specially developed, microporous GORE membrane based on PTFE (Polytetrafluoroethylene) laminated between two ultraviolet resistant, highly robust support fabrics. Because of the special pore structure of the membrane, GORE™ Covers possess unique semi-permeable properties that produce a constant microclimate in the heap. Being waterproof and windproof, it protects the composting material from the elements and therefore also from unwelcome decaying processes. Being permeable to water vapour and air, it regulates the extraction of moisture during composting and allows gases produced during the composting process to escape. An insulating layer of air builds up and guarantees an even distribution of temperature in the body and edges of the heap thus ensuring a homogeneous hygienisation of the composting material. Pathogenic microbes are reliably destroyed throughout the entire heap. For this reason the GORE™ Cover system has been approved as a certified composting process as defined by design category 7.2/encapsulated heap covers in accordance with the German Hygiene-Baumusterprüfsystem (HBPS) (hygienic validation system).

At the same time the cover works as a physical barrier against odours and other gaseous substances escaping from the decomposing pile. During the composting procedure a fine film of condensation develops on the inside of the cover in which the odours and other gaseous substances dissolve and drop back into the composting material where they continue to be broken down by bacteria. Compared with composting in open windrows without forced aeration, the use of a GORE™ Cover Systems can achieve a reduction of up to 97% in odour concentrations – without additional filtering installations. With a pore size of approximately 0.2 µm it is also an effective barrier against spores and microbes. Tests have proven that the GORE™ Cover System exhibits a microbe retention rate of > 99% thus guaranteeing that plant workers and nearby residents are well protected.

With its oxygen controlled aeration system the GORE™ Cover System creates ideal composting conditions. The shorter composting process results in a higher throughput per unit area of composting material – at a relatively low cost and with relatively little human involvement. Special measuring

probes inserted into the body of the pile monitor the oxygen levels and temperature parameters in the pile and regulate both through periods of aeration. At the same time the operating data is documented by the computer and is being used later as documentary evidence, particularly with respect to hygiene. Radio-remote monitoring of the controlled composting process is also possible.

Complies with the numerous legal requirements in Europe

GORE™ Cover laminates are predominantly utilised for the treatment of organic waste, green waste, sewage sludge and municipal solid waste. In combination with a controlled pressurised aeration system, they are used to enclose composting heaps and concrete bayxs, and also for the gates and roofs of composting boxes (BIODEGMA® System). The fact that such a versatile system can also provide an elegant solution to the many different European and national regulations within the EU is illustrated in the following using three waste treatment plants as examples. These cover the three major areas affected by regulation, namely "emission control", "hygiene" and "reduction of waste to landfill".

Emission control

During the composting process disagreeable smells, dust and germ carrying organic aerosols can be released. In order to protect the general public and nearby residents from these health risks, composting plants have to comply with the requirements of an extensive array of air pollution laws. Within the EU the German Federal Emissions Protection Act (Bundesimmissionschutzgesetz = BImSchG) and TA Luft (Technical instructions concerning air purity) impose the most stringent regulations on air purity.

In TA Luft 2002, nos. 5.4.8.5 list the requirements for the construction and operation of composting plants which have to be imposed by the appropriate authorities when they give their approval for new composting plants or for the modernisation of old ones (transitional period until 30.10.2007). Among other things, the emissions of odorous substance in the waste gas of plants with a throughput of ≥ 10.000 t/a may not exceed an odorous substance concentration of 500 OU/m^3 . In addition to this, in order to reduce emissions, for plants of this size an encapsulated construction (bunker, main rot) is recommended. An encapsulation is however not necessary for an intensive rot with the GORE™ Cover System is used instead. The fact that it delivers the same level of performance as conventional, cost-intensive encapsulated systems has to be proven in the permitting process.

When the stricter TA Luft requirements came into effect a district town in North Rhine-Westphalia, Germany, as the operator of a composting plant with a throughput of 11.500 t/a organic and green waste, was forced to adjust its open pile composting system to the above-mentioned state-of-the-art technology. Since the GORE™ Cover System had proven how effective it was in retaining $\geq 90\%$ of disagreeable smells and organic aerosols in on site tests, the town decided in favour of the GORE™ Cover System. This system is also highly cost-effective in terms of the investment and the operating costs, and is approved as an encapsulated composting system as defined by the German Hygiene-Baumusterprüfsystem. As of spring 2007 the 4 week intensive rotting process will be conducted under a

GORE™ Cover laminate. At the same time the new technology will mean that the total throughput of the plant will increase from 11,500 t/a to 13,500 t/a. The decision was confirmed by an emissions study carried out by Barth & Bitter Gutachter der Arbeits- und Umweltschutz GmbH (2006), a firm of consultants working in the field of industrial health, safety and environmental protection. The study reveals that the GORE™ Cover System is at least as good as established composting systems (tunnels, containers, drums): based on many odour measurements and control tests conducted by order of the authorities, the study comes to the conclusion that even lower emissions can be achieved with the GORE™ Cover System than with established tunnel or container composting systems. The GORE™ Cover System is therefore state-of-the-art.

Hygiene

"Hygienic safety" is a critical criteria when evaluating the quality of compost. According to the requirements of EU law, particularly when animal waste is being treated, waste treatment processes must be able to prove that they are epidemically und phytohygienically safe and provide proof of their hygienic efficacy: for the composting process this means that the plant microbes, but also the pathogens that might well be present in the composting material, must be reliably destroyed by the heat generated during the treatment process. In addition to this, composting plants must be designed in such a way that a recontamination of the hygienised material is impossible. This is usually achieved by encapsulating the heap and ensuring that all leachate is reliably collected. The implementation of the European Animal By Product Directive (ABPR; 1774/2002/EC) in the UK sets the strictest standards in Europe as a reaction to BSE and foot-and-mouth disease.

The latest example of GORE™ Cover Systems being used in this area is the London Waste Composting Centre in London's Edmonton EcoPark which was approved in 2005. This is where 30,000 t/a of kitchen, green and organic waste (140 t/day) originating from seven London districts is treated in 16 BIODEGMA® composting modules. In order to comply with the strict ABPR requirements, these composting modules are always loaded from one side and emptied from the other, making sure that different front-end loaders are used for each of these tasks. This set-up accomplishes a "two-barrier-system", thus avoiding the danger of a recontamination of the hygienised material. In the composting module the oxygen supply of the composting material takes place by means of controlled pressurised aeration via aeration channels in the floor, the CO₂ and water vapour discharge on the other hand takes place via the semi-permeable GORE™ Cover box laminate that is integrated into the wing-like fold-back roof and the gates of the composting module. The function of the semi-permeable membrane ensures that the emissions from the composting boxes are minimised while at the same time creating and maintaining the perfect environment for organic waste treatment inside the composting boxes. This is where the biowaste is encapsulated for a period of 3 weeks to undergo the intensive rotting process. Afterwards it undergoes a 3 week post-rotting process which means that hygienisation requirements are doubly complied with. The wet compost then 'matures' for another 4-6 weeks in an un-aerated post-composting heap (with a side turner) before being sold as high-quality compost. This plant provides proof of the fact that apart from being able to process large quantities of waste in a small area



efficiently and with low emissions, the GORE™ Cover technology offers you a cost-efficient way of complying with the legal regulations of ABPR.

Reduction of waste to landfill

The aim of the European Landfill Directive, 1999/31/EG is to reduce the amount of organic material that ends up in landfills in order to reduce the environmental dangers that occur as a result of gaseous emissions and leachate from the landfill. That is why the Landfill Directive demands that all EU member states impose national measures and targets for waste disposal with the aim of gradually reducing the amount of organically degradable waste that ends up in landfills to 35% by 2016. In order to achieve these limits the directive also demands that organically degradable waste is treated before it is landfilled. This treatment can be mechanical biological, or thermal, i.e. by means of combustion.

In the mechanical biological treatment (MBT) plant at the landfill Discarica del Fossetto in Monsummano Terme, in Italy, since 2002, 25,000 t/a of the 60,000 t/a of household waste received is separated off by screening and the remaining 35,000 t/a of organic waste (< 60 mm) is treated in 7 concrete bays that have been encapsulated with GORE™ Cover laminates. During the 3-week, intensive rotting phase the organic portion of the waste is reduced and stabilised before being landfilled. Measurements taken on site have proven that the use of GORE™ Cover Systems can achieve a reduction of > 90% in odour concentrations, as well as reliable hygienisation and stabilisation. Moreover, the use of GORE™ Cover Systems helps the plant operator to comply with the criteria of the Italian Landfill Directive (issue 36/03 dated 13.1.03), and in particular the breathability index of $\leq 600 \text{ mg O}_2/\text{kg VS/h}$ (Indice Respirometrico Statico-Metodo IPLA) with respect to solid matter, with relatively low investment and operating costs.

In the final analysis

Thanks to its flexibility GORE™ Cover Systems offers plant operators in Europe exactly what they have always wanted: an efficient and cost-effective technology for organic waste treatment - that also complies with the many different legal requirements in Europe.

For further information
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In case of publication we would appreciate a copy.