BORD NA MÓNA
BORD NA MÓNA ENVIRONMENTAL LIMITED

Clean Air Solutions

Odour Abatement at a Snack Manufacturer

Site Assessment

Bord na Móna's technical experts met with managers at Kettle Foods to discuss a sampling regime and analytical methodology to identify sources of odorous compounds and their concentrations. In addition Bord na Móna built an odour dispersion model to define the reduction in odour concentration required to prevent nuisance odours at the site boundary. They rapidly determined that the only source of odour from the factory resulted from the batch cookers in the cook room.

Dynamic olfactometry, and a Flame Ionisation detector method were used to determine odour concentrations and establish any correlation between odour emissions and constituent Volatile Organic Compounds (VOCs). Olfactometric analysis was conducted in accordance with CEN Standard TC264 (1999) with a trained panel of assessors. Initial analysis of

Odour Dispersion Modeling

odour emissions and gas flow rates allowed Bord na Móna to identify potential improvements to the plant to optimise air flow from the batch cooking process area, maximising treatment efficiency. They examined a number of scenarios to establish the optimum configuration for discharge of air emissions from the factory. The model accounts for prevailing weather conditions to determine ground level odour concentrations at the site boundary and the nearest sensitive locations. The model also defined the performance criteria to assess potential abatement technologies.

Odour modelling and dispersion techniques together with a detailed understanding of the impact of different technologies has helped Kettle Foods to assess potential emissions of nuisance odours. Bord na Móna helped them assess incineration, carbon adsorption and biofiltration as treatment options with particular attention to their environmental impact. Analysis of the odourous compounds from the factory, optimisation of air emissions and odour dispersion modeling formed an important part of this assessment. As a result of the assessment Kettle Foods asked Bord na Móna to install a pilot plant biofilter to demonstrate its effectiveness at preventing nuisance odour emissions.

Odour dispersion modeling and olfametric testing enabled Kettle Foods to assess odour emission levels and model the odour reduction achieved by the enhanced biofilter pilot plant during a trial. The pilot plant biofilter, packed with advanced biofiltration media, was proven to be a successful method of reducing nuisance odours. Kettle Foods have also found enhanced biofiltration has low environmental impact and is significantly less expensive to install and operate than other technologies.

Treatment Technique	Enhanced Biofilter	Thermal Oxidiser	Activated Carbon (dispose of media)
Operation	Simple	Complicated	Simple
Daily Maintenance Costs	Low	High	Low
Periodic Maintenance Costs	Low	High	Medium
Day to Day Running Costs	Low	Very High	Low
Media Life	Long	Very Long	Short
Media Replacement Costs	Low	N/A	High
Performance Deterioration with time	Gradual	None	Immediate at Breakthrough
Environmental Friendliness	Good	Poor	Medium
Optimum Effectiveness	After 2 weeks	Immediate	Immediate
Capital Costs	++++	++++++	+++
Footprint	Large	Small	Medium
Response to Variations in Feed Concentration	Fair	Immediate	Immediate
Performance Change with relative humidity variations	None	Increase in Power Consumption	Decrease in Capacity

Technology

Bord na Móna assessed thermal oxidation, carbon adsorption and enhanced biofiltration as potential abatement technologies. They examined life time costs together with treatment efficiency and environmental impact. Thermal oxidizers are designed to operate at 750-900°C and can produce large volumes of carbon dioxide. The technology was rejected as Kettle Foods had no use for the excess heat that would be generated. Also the concentrations of odorous compounds in the air were not sufficient to support sustained combustion, adding significantly to running costs.

Activated carbon physically adsorbs organic molecules on the carbon surface by intermolecular attraction. It does need to be replaced or regenerated when it becomes saturated. Regeneration involves the use of steam or other hot gases and pressure changes across the activated carbon filter to break the weak interactive bonds between the carbon and organic molecules being adsorbed. High media replacement costs and certain technical issues precluded this technology from being chosen. Enhanced biofiltration offered the most cost effective option with low capital and running costs. A biological single stage system operating at ambient temperature was recommended. This demonstrated effective odour abatement at the low concentrations being emitted from the batch cookers together with the ability to adapt to any future increased loadings.

Pilot Plant

To demonstrate the effectiveness of enhanced biofiltration a pilot plant was commissioned. The plant treated the odours from two of the batch cookers at Kettle Foods. As a result of the dispersion modelling, modifications to the air abstraction system and the hoods over the cookers were made to optimize the airflow. These modifications improved the efficiency of the abstraction system, improved the working environment and achieved a 65% reduction in the air volume required.

An enhanced biofilter pilot plant unit, 1.5m wide and 3m high, was connected to temporary ductwork, taking air from the two batch cookers, and an irrigation system. The pilot plant containing MÓNASHELL media, was inoculated with bacteria and run for a week to establish optimum performance. The dispersion model showed that the enhanced biofilter would be required to reduce the odour concentration at the outlet stack to 1,700 ou/m^3 to ensure that ground level odour concentrations at the boundary were below 3 ou/m^3. A trial followed between November and mid February 2003 with air samples being abstracted for analysis.

MÓNASHELL Media

Following inoculation of the biofilter, Bord na Móna analysed the compounds entering and exiting the biofilter. The irrigation water was also analysed to confirm the biofilter media remained healthy. Tests were conducted in accordance with ASTM standard methodology. Odour concentrations were analysed using dynamic olfactometry and sorbent tube sampling.

The pilot plant successfully treated odours in the air from the batch cookers reaching a removal efficiency of 96 % within 5 weeks of inoculation. During the trial changes in the loading of the biofilter also illustrated the adaptability of the MÓNASHELL media as it continued to sustain high removal efficiencies with significantly increased loading.

Client Comments

"I was impressed with the way Bord na Móna approached our need to prevent nuisance odours. They thought about the problem and presented a structured programme to assess our current situation and anticipate our future requirements."

Richard Mawby
Process Development Manager

"We are committed to achieving good relationships with our neighbours and to being a responsible company in our local community. So ensuring we do not produce nuisance odours is a high priority for us as is using effective technology with a low environmental impact. We are a very clean company with strong ethics. I was impressed with the way Bord na Móna approached our need to prevent nuisance odours. They thought about the problem and presented a structured programme to assess our current situation and anticipate our future requirements. They were experienced and astute enough to realise they needed to look at the global picture.

While Bord na Móna presented three options together with the relative capital and running costs, enhanced biofiltration was clearly the way forward. Biofiltration fits with our business ethics, from reusing sea shells in the media to employing natural biological processes.

As well as being environmentally friendly it has the added advantage of lower capital and running costs. When I spoke with Bord na Móna I was also impressed by the professionalism of their staff. I met a number of project managers as they showed me around sites where they had addressed other odour problems. All of them understood the issues we were trying to tackle at our plant. They were able to provide valuable insight into a potential way forward taking into account the whole system; they did not approach this project merely to sell us a piece of equipment. They weren't trying to sell us a technology, they were selling a sustainable solution.

I was very happy with the way things went and I would recommend Bord na Móna to other companies looking to solve odour problems. They have thought about our problem, provided us with carefully thought through solutions and proved that they have the skills to deliver what they promised."

Contact us for more details or visit our website on **www.bnm.ie/environmental**

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