Odour assessment secures air quality permit

The trend in Australia towards the use of quantitative methods for assessing the impact on communities of odour emissions from municipal wastewater treatment plants has resulted in the execution of a number of major odour studies recently.

Environmental regulatory agencies in each of the six Australian states are currently struggling to quantitatively define existing qualitative odour standards, which have been based on the 'no nuisance' or 'nil odour at plant boundary' approach. Inclination to specify a maximum boundary odour concentration of 1 Odour Unit per cubic metre has caused considerable concern for all major water authorities.

A recent odour investigation carried out for the Water Corporation of Western Australia by CH2M Hill has shed new light on what constitutes an 'acceptable' level of odour in the communities living adjacent to large municipal wastewater plants. In that study CH2M Hill was commissioned to carry out an odour audit of the Subiaco plant, the odour emission data from which were used to model odour dispersion into the surrounding residential areas. Modelling results were validated using the Corporation's extensive record of odour incidents and complaints. The plant uses the activated sludge process and has a capacity of 60 megalitres per day, and the purpose of the study was to determine the extent of improvement in odour levels in the community following the scheduled implementation of a major odour reduction program.

The bulk of the odour sampling used a cross flow odour flux hood to sample emissions from the liquid surfaces. The hood, a development of the Lindwaal hood used in Europe, enables odour emission rates to be adjusted for different prevailing wind speeds, a feature found to be important when modelling odour dispersion in light wind conditions.

Olfactometry was carried out in CH2M Hill's odour laboratory, which follows the draft CEN standard odour measurement. The Ausplume dispersion model, which is accepted throughout Australia as the preferred odour dispersion model, was used in this study. It is a development of the ISC models which originated in the USA.

The sampling results of the study determine specific odour emission rates (OU/m²/sec) and overall emission rates (OU/sec) for each of the sources within the Subiaco plant. These rates ranged from 1.6 OU/m²/sec for the secondary clarifiers, through 4.2 OU/m²/sec for primary sedimentation tanks, to 77.6 OU/m²/sec for the aerated anoxic zones of the aeration tanks. The data indicated that these anoxic zones and the secondary sludge digestion tanks were the dominant odour sources at the plant.

The modelling results strongly indicated that odour complaints were unlikely to occur at predicted ambient odour concentrations less than 5 OU/m³ (99.5 percentile conditions).

The two major benefits of the study to the Water Corporation were confirmation that the odour program would be effective, and a negotiated air quality permit for the plant based on a 99.5 percentile 5 OU/m³ level of odour.

Item supplied by Terry Schulz, CH2M Hill's Manager for Odour Services and Convenor of the IAWQ specialist group on Volatile Atmosphere Emissions from Wastewater Facilities (E-mail: T Schulz.ch2m.com), and Ivan Unkovich, a Supervising Engineer with the Water Corporation of Western Australia.

Reader Enquiry No. 539

Sensor digitally profiles smell

Bloodhound Sensors has just introduced the Bloodhound BH 114 Sensory Array System which digitally profiles smell. In food and drink, the characteristic bouquet or fragrance of a product is a key factor in how quality is perceived and can now be objectively and rapidly confirmed using the system.

The culmination of over a decade of research at the University of Leeds, this advanced system uses an array of 14 sensors and has already proved its capabilities in areas such as brewing and beverage production, identifying bacterial organisms, water contaminant detection and fermentation process control.

Several different patented sensor types are used to improve volatile differentiation and give consistent performance. The BH 114 links to a computer and runs Windows software with a powerful statistical package to record the smell profile and highlight discrepancies. Simply detecting differences between a control and a batch sample can be carried out; alternatively the Neural Network capability of the software can be used to 'learn' smell profile. With typical sampling times of 15 seconds, fast sample turnarounds are achieved.

Reader Enquiry No. 540

Catalyst aids organo-sulphide removal

Wet scrubbing with chemical oxidation using sodium hypochlorite is widely used to treat odorous gas emissions. ICI Katalco, however, has improved the process, notably by the inclusion of a fixed bed catalyst to enhance oxidation rates and thus improve abatement.

Conventional chemical scrubbing can be carried out using hypochlorite alone but this process has drawbacks. Three-stage scrubbing overcomes these drawbacks but, as a process, has relatively high capital costs and considerable chemical costs.

The ICI Katalco process is known as Odorguard and features a nickel oxide catalyst on an alumina support. Oxidation with hypochlorite occurs through the transfer of the oxygen from the hypochlorite ion in solution. The catalyst forms a highly reactive metal intermediate oxide which is able to reduce back to its natural state by oxidising adsorbed organics. As well as increasing oxidation reaction rates, chlorine formation and chlorination reactions are suppressed. The catalyst used enables many of the well-known problems associated with bleach scrubbing to be overcome, and facilitates odour removal efficiencies of greater than 99% in a single column.

Use of the catalyst also leads to an increased ability of hypochlorite scrubbing to remove organo-sulphides at high efficiency in addition to improved hydrogen sulphide removal.

Reader Enquiry No. 541

Cured by injection

AGA Gas has introduced its Aquaclean system to tackle the problem of hydrogen sulphide formation in effluent treatment plants, and works by feeding pure oxygen, not air, into the effluent system or storage tank.

One benefit is that energy consumption remains unchanged as the oxygen injection is facilitated by the vaporisation of the liquid oxygen. Also, Aquaclean can be installed quickly and simply and will allow plants to react to daily or seasonal peak flows.

A popular French tourist region was one of the first to benefit from Aquaclean: the system is preventing the formation of hydrogen sulphide in the sewer system at St Sulphice.

Reader Enquiry No. 542