

# The Filtration Society: Addressing environmental issues

**D**r Graham Rideal of Whitehouse Scientific – and a former chairman of the Filtration Society – gave *Filtration+Separation* some highlights from a recent meeting.

The Filtration Society was formed over 40 years ago to collate the existing filtration and separation technologies of the day and to promote research and development into new technologies for the future.

Never have the objectives been as important as in today's world where international industrial process development threatens to undermine the global ecosystem through irresponsible waste disposal.

The Filtration Society was therefore very proud to sponsor a recent seminar entitled Regulatory and Technical Issues in Environmental Control where emission standards were reviewed and the latest groundbreaking research presented that will have a significant impact on the cleanliness of our environment.

## Emission Control

The scene was set by Stephen Taylor from the Environmental Agency, who introduced the latest emissions standards and well illustrated the synergistic association between legislators and business. Far from having a negative effect on production costs, several examples were given where, through joint consultation, erstwhile 'pollutants' could be turned into valuable by-products.

Nevertheless, emission standards for both air and water quality will become increasingly more stringent within the next few years and, unless some businesses begin to plan now, they will be unable to attain the proposed standards.

A theme introduced, which prevailed throughout the seminar was the concept of 'end of pipe' solutions. While 'throwing a filter on the end' may be an acceptable solution in many cases, the key to

significant efficiency improvement must be through total process integration to reduce the production of pollutants in the first place.

In the case of incineration, one of the biggest problems for the future is controlling the emissions of hydrogen chloride, the principle decomposition from Polyvinyl Chloride (PVC) one of the most prevalent components of plastic waste. Later speakers introduced some elegant solutions of HCl removal in hot gas filtration.

## Blast off

The theme of air quality was then developed by Simon Tebb of TSI Instruments, but in this case relating to the quality of the air we breathe in our place of work. 'Sick building syndrome' used to be a totally unknown phenomenon, hence the use of the word 'syndrome', but was responsible for the demolition (often by explosives) of multi-million pound office blocks on an international scale.

Simon Tebb's talk entitled 'A practical guide to Performance Measurements in Mechanical Heating, Ventilation and Air Conditioning', described the use of the latest analytical tools to 'diagnose' the sickness.

Paradoxically, increasing the filter efficiencies on the inlet to air conditioning systems very often compounded the problem because the reduced internal air pressure could allow the ingress of particular contaminated external air through vent holes or even poorly fitting windows.

Without the backup of powerful scientific evidence from sophisticated instrumentation, the notion that a building

could be saved by fitting a lower grade filter on the air conditioning system would have been greeted with derision.

## Science or media driven

It is well known that those with the loudest voices get heard, unfortunately very often above the scientific argument. We must be careful therefore that environmental hazards are not ranked according to media pressure.

For example, Dioxins are a very emotive group of pollutants from incineration, simply because they have received extensive press coverage. The air emission limit has therefore been set at 0.1 nanograms per cubic meter.

Heavy metals, on the other hand, do not sound nearly as dangerous and have received comparatively little press coverage. Consequently, the limit is 0.5 milligrams per cubic meter, a 5000 fold increase in concentration.

It was reported this month that Alzheimer's disease is increasing at an exponential rate. As rational scientists, we would be foolish to exclude a link to heavy metal atmospheric pollution. But then the Curies saw no danger in radiation! Nevertheless, a pollution free environment demands the elevation of science above the media in setting our limits on the various pollutants.

## A 'hot potato'!

Largely because Dioxin discharge from incineration has in recent years been a media 'hot potato' (an English expression meaning hot to handle), increased attention has been placed on all types of emissions from the incineration process, so the media do have their part to play.

A significant factor in the emissions from incineration flue gases is that temperatures can exceed 400 degrees centigrade, so conventional bag filters cannot be used.

Chris Withers of Caldo Engineering and Andrew Startin of Madison Filter, then presented two excellent papers reviewing the exciting developments in ceramic filters. Not only can fine particulates be removed at high temperature but, by incorporating catalysts in the filter media, it is possible to take advantage of the high temperatures to chemically remove a wide range of harmful oxides and heavy metal vapours.

## Flue Gas Cleaning

In a very interesting talk that was both amusing and packed with the latest scientific developments, Tal Golesworthy from Environmental Development Technology developed the chemical reaction theme and emphasised the importance of understanding the chemical and physical processes before considering the filtration solution.

A very comprehensive overview of industrial flue gas cleaning, principally from power generation was then presented. The techniques ranged from pulsed electrostatic precipitation, through various novel filtration media to wet and dry scrubbing of flue gases.

## Clean water

Domestic waste water has increased significantly in recent years, especially in developed countries where automatic clothes and dish washers are now common

place. In addition there has been an increased commercial usage resulting in an enormous load being placed on conventional water treatment plants, very often with limited physical space to expand.

Colin Deakin of GE Zenon presented the latest developments in waste water treatment: Membrane Bioreactors (MBR) set to revolutionise waste water treatment.

He reported that, although it has been over 25 years since MBRs were originally developed, it is only in the last 10 years that scale-up and reduced costs have made the technology commercially viable and only in the last few years that plants can handle the required volumes. When coupled with an increased efficiency and a footprint up to 50% the size, it is not surprising that MBRs are increasingly replacing conventional water treatment facilities and can be found in over 300 locations around the world.

## Chemical tailoring

A fact not often appreciated is that over 80% of pharmaceutical processing involves metal catalysis so trace metal removal from liquid effluent is a very sensitive issue in the light of the latest stringent emissions legislation. Kevin Treacher of Reaxa presented a fascinating talk on a novel, highly efficient metal scavenging system.

Highly selective pharmaceutical catalysts are often based on extremely expensive heavy metals. For example, rhodium can cost up to \$210,000/Kg, so there is a great financial incentive in addition to the environmental pressure to ensure that the

element is recovered.

Highly efficiency scavenger cartridges containing specific chemical sites have been developed that are over 98% efficient in heavy metal removal. This compares with conventional systems such as activated carbon or silica where efficiencies below 10% are often seen.

## The Landfill time bomb

The final presentation was a real wake up call to those involved in landfill waste disposal. James Heath of Cyclerval Ltd reviewed the impact of economic and commercial issues in municipal waste management. With the ever-increasing penalty per ton combined with a minimum of five years in planning and 25 years in payback through gate fees, the inability to quantify safety and commercial uncertainties could lead to financial disaster to those involved. Financing the channel tunnel is a very good example of what could go wrong.

## Conclusion

This was one of the most significant seminars hosted by the Filtration Society in recent years and the effect of both the new legislation and the problem solving technologies discussed will undoubtedly have a ripple effect in years to come.

Bound copies of the lecture notes can be obtained through [www.filtsoc.com](http://www.filtsoc.com).

Contact:  
Graham Rideal at  
[info@whitehousescientific.com](mailto:info@whitehousescientific.com)