

Hanovia's UV Lamp – UV is a simple, elegant disinfectant system and one that will increasingly replace the more traditional chemical techniques

New French rules on UV sparks call for more UK research

Reservations on the effectiveness of UV systems in swimming pools have led the French Government to introduce a series of new regulations which have come into effect this summer. The impact of the new rules have led to calls for more research to be carried out in the UK on the increasingly popular method of water treatment. Both sides of the debate have been able to restate their case in the build up to more investigation

The French Ministry of Health for Youth and Sports has issued new regulations on the use of UV systems in swimming pools which have sparked a plea for more independent research to be carried out.

The recent studies have also rekindled the debate on the UV systems in Britain particularly on the debate whether it can create other pollutant problems when it breaks down combined chlorine, as well as some free chlorine.

The new regulations on the use of UV in swimming pools follow two independent studies into the by-products produced during the UV oxidation process.

The most recent French study from the

National Research and Safety Institute showed an increase of THMs (particularly chloroform) in pools where the system is in use. A study by the Danish Technological Institute in 2002 showed very similar results. Trihalomethanes (THMs) are chemical compounds and are environmental pollutants, and many are considered carcinogenic.

The report did not recommend a ban on UV and it made some positive comments about the system's effect on reducing chloramines, but it did highlight reservations that are so serious they have stimulated the French Government to introduce the following regulations:

- Measurements are taken of total organic carbon (TOC), chlorides and trihalomethanes (THMs) in pool water at least monthly
- Tests should be taken of nitrogen trichloride and THMs in the air twice a year
- Ensure there are no more than 100 micrograms per litre of THMs in the pool water at any time (as recommended by the World Health Organisation)
- Pools equipped with UV must use at least as much fresh water as the pool did before UV installation and not less than 30 litres per bather per day
- Ensure that the air renewal rate is maintained, or if necessary increased, to the level that existed before UV was installed.

The report states that the analyses must be conducted by qualified laboratories and that the tests are financed by pool operators, not the relevant local authority environmental health departments.

The new regulations will inevitably lead to higher costs for the swimming pools using UV and could be a blow to local authorities who are using the systems on the premise of cost savings and the 'green' credentials of using less water for dilution.

The French authorities have asked for a listing of all French pools using the system and will be enforcing the regulations whilst analysing feedback about UV from managers.

Specialist pool water treatment company Gaffey Technical Services Ltd has been sceptical about the claims for UV technology in swimming pools for some years and has refused to supply it to customers.

Andrew Gaffey explains why: "We have been concerned for a while that UV may cure one problem and create another. When UV is used with chlorinated water, it is effective in breaking down combined chlorine, as well as some free chlorine, but that creates by-products, including THMs, which are recognised carcinogens. Chloramines can't simply disappear, in other words, you can't have a reaction without any consequences. For regular/competitive bathers and lifeguards, these by-products could cause a long term

"IN THE UK, IT SEEMS POOLS ARE BUYING INTO UV TO REDUCE FRESH WATER DILUTION ON THE GREEN 'LOW CHLORINE' TICKET. THE REPORT RAISES CONCERNS THAT UV COULD ACTUALLY BE PRODUCING OTHER MORE HARMFUL POLLUTANTS THAN IT ACTUALLY REMOVES"

health risk. Pollutants can build up in the water and in the air above the pool. You can't see or smell them, so there doesn't appear to be problem, and they're difficult to measure.

"In the UK, it seems pools are buying into UV to reduce fresh water dilution on the green 'low chlorine' ticket. The report raises concerns that UV could actually be producing other more harmful pollutants than it actually removes. Also, if these regulations are adopted in the UK, pools will have to increase the amount of fresh water they use. Add to that the cost of regular laboratory tests (on top of the existing costs of electricity and replacement lamp tubes) and the total cost of running the system would increase sharply. In Denmark, the sale of UV technology into public pools had virtually halted after research on real pools was published by the Danish Technological Institute, showing very similar findings to the French.

As well as being regulated in France, the use of UV technology is not included in the German DIN standard or the Austrian Bathing Hygiene Regulations."

He adds: "UV has gained a lot of ground in recent years, but we, and other companies within the pool industry, feel that the French study raises some serious concerns about its use. As the French have done, we'd like to see further independent research done in the UK on UV systems in real pools to measure the extent of the issues here."

Hanovia UV specialists said the French study investigated the effects of medium pressure UV lamp radiation on water quality in a chlorinated indoor swimming pool.

The following conclusions were drawn:
1 radiation from medium pressure UV lamps led to an increase in active chlorine due to photolysis of combined chlorines. It was therefore possible to reduce the levels of injected chlorine into the water and also to reduce the water renewal volume while still maintaining the bacteriological quality of the water within allowable limits. Hanovia claim this is one of the main reasons why UV should lead to reduced THM's



ABOVE: UV arc tubes like this from Hanovia are used also in a range of processes where water passes through the chamber and the UV kills any microorganisms present by disrupting DNA

THE CASE FOR UV

- UV reduces the levels of injected chlorine into the water and also reduces the water renewal volume while still maintaining the bacteriological quality of the water within allowable limits.
- Radiation from the medium-pressure UV lamp helps Total Organic carbon removal, which may be the result from its partial mineralization.
- Pool chemistry is complex and THM formation is a combination of bather load and chlorine levels. As UV reduces organics and allows lower chlorine, it should mean lower THMs.

THE CASE AGAINST UV

- UV could actually be producing other more harmful pollutants than it removes.
- The action of UV used with chlorinated water, breaks down combined chlorine, as well as some free chlorine, but creates by-products, including THMs, which are carcinogens.

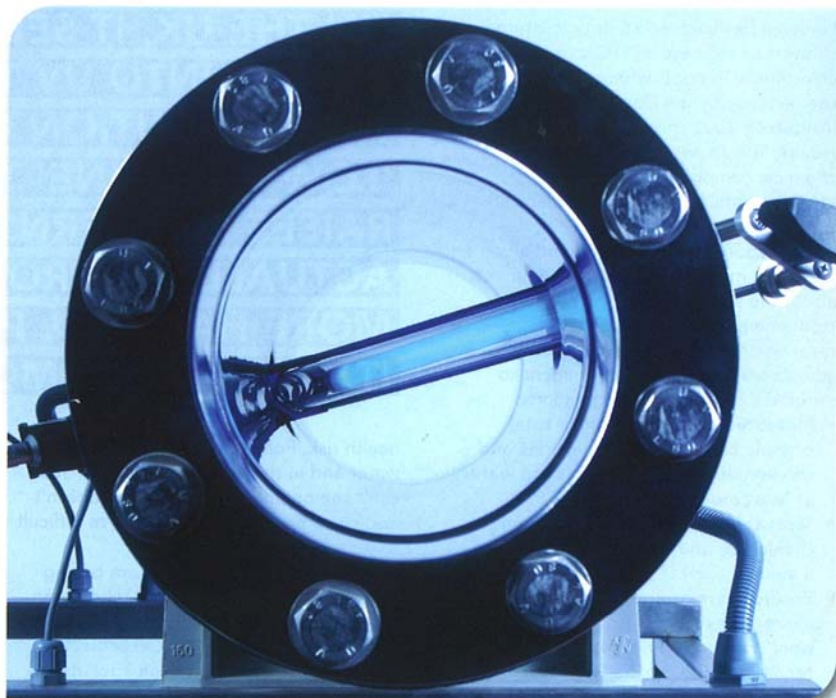
2 radiation from the medium-pressure UV lamp induced TOC removal, which may be the result from its partial mineralisation. This is correct says Hanovia and also explains why UV should lead to reduced THM's

3 UV radiation increased the level of total THMs, particularly CHCl_3 and CHBrCl_2 , but removed CHBr_3 and CHBr_2Cl . However, THM levels were lower than those allowed by the WHO for drinking water. The additional formation of CHCl_3 and CHBrCl_2 may be explained by the increase in active chlorine and by radicalising mechanisms initiated by UV radiation

Hanovia claims studies have also shown that UV reduces THMs (see news announcement from last year below). The reality is that pool chemistry is complex and THM formation is a combination of bather load (i.e. organic load) and chlorine levels. As UV reduces organics and allows lower chlorine, it should mean lower THMs. Any pool with high organics and high chlorine will have THMs. This was demonstrated clearly by the tests mentioned in the announcement below – when the chlorine dosing equipment failed, the pool switched to manual dosing – chlorine levels increased and THMs increased dramatically.

The impact of the changes in France come at a time when sales of ultra violet systems for the UK's swimming pools are set for another record year. It's now an established and accepted method of water treatment for the smallest to the largest indoor pools.

UV system suppliers claim it not only destroys chloramines, the unpleasant by-



products of chlorination, but is also an effective disinfectant in its own right, which means pool operators can drastically reduce chlorine usage (commonly down to as little as 0.5ppm).

Virtually no microorganisms are immune to UV, even chlorine-resistant pathogens. It also significantly reduces the need for backwashing and dilution, saving considerable costs for pool operators.

Although the need for chlorine is greatly reduced with UV, small amounts are still needed to ensure residual

disinfection – and this is where some of the problems arise with those who doubt the full effect of the UV treatment. Chloramines are formed when free chlorine reacts with sweat or urine in pool water. Trichloramines in particular are powerful irritants which are responsible for eye and respiratory complaints and the unpleasant 'chlorine smell' commonly associated with indoor pools. Chloramines are also corrosive and in time can lead to damage to pool buildings and structures such as ventilation ducts. **spn**

LEISURE CENTRE TESTS SUPPORTS THM REDUCTION

Independent tests carried out last year at a UK leisure centre showed a dramatic reduction in TOC (total organic carbon), THMs (trihalomethanes) and combined chlorine in pool water following the installation of a Hanovia medium pressure UV system.

The tests were carried out by WRK Design and Services Limited, an independent chemical engineering consultancy at the Lightwaves Leisure Centre in Wakefield.

The objectives were to analyse swimming

pool water samples for TOC, THMs, active/free chlorine and TDS (total dissolved solids) before and after the installation of a UV water treatment system.

In all cases, there was a significant reduction of TOCs, THMs, combined chlorine and TDS post-UV. Transmission values were higher post-UV, indicating a reduction in suspended organic material (with correspondingly lower absorbance) as a result of UV. The lower combined chlorine levels also indicated lower levels of organic material, matching the higher

transmission values. Chlorine reacts with organic material to form combined chlorine, so lower organics would result in less combined chlorine, lower absorbance, and therefore higher transmission.

"The results of the analysis indicate that the medium pressure UV system at Lightwaves Leisure Centre was beneficial in reducing the TOCs and THMs to very low levels (~ 25 µg/litre) up to 14 days after installing the UV system."

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