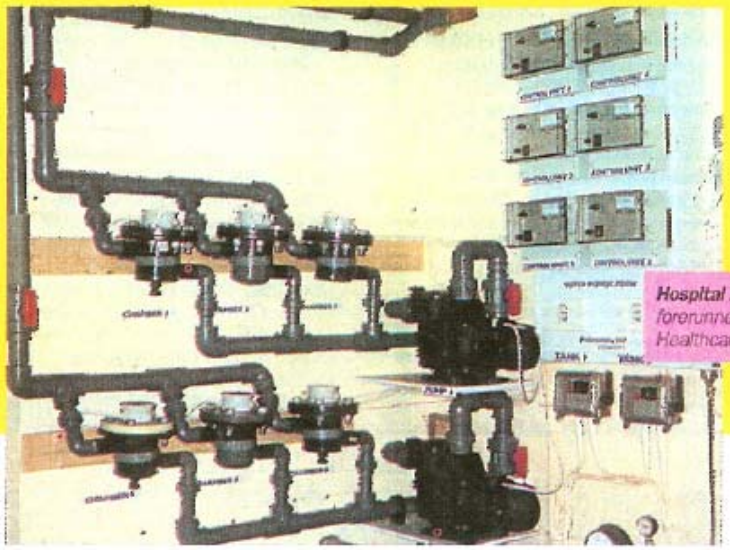
Effective, economical

Ionisation water treatment has enormous potential due to the high cost savings it realises, its low running cots and minimal environment impact. Whilst this method, of adding copper and silver ions into water to eliminate micro organisms, has proven to operate effectively, UK hospital estate management are still reluctant to accept this new technology because of little UK research into its effectiveness, application and control.

In spite of sufficient available proof, the HSF, and the NHS are sponsoring water ionisation research programmes at BSRIA and CAMR. Positive results of the BSRIA program, now reported (see this page) give the ionisation process substantial credibility.

To enhance its water ionisation system, **ProEconomy** has initiated an extensive R&D program in cooperation with the PHLS in the UK and TNO, a large research institute in Holland. The system, Orca, will include on-line monitoring facilities and integration to computer management systems using the latest innovative technologies. It will be low cost, practical, environmentally sound and automatically release enough copper and silver ions to kill micro organisms whilst not exceeding the permitted levels of silver and copper within the ionised water.

Please complete the Reader Enquiry Card for more information on the Orca water biocidal treatment.



Hospital installation: *ProEconomy's forerunner of the Orca at Aylesbury Vale Healthcare's Manor House Hospital.*

Enquiry Number 402

Tests highlight the benefits of water ionisation for controlling legionella

Tighter budgets prompt a review of conventional water treatment methods. More and more hospitals are installing the Orca water ionisation treatment system from **ProEconomy**.

The current control measure to inhibit the growth of Legionella species is the circulation of water at 60°C which introduces a risk of scalding. Some hot water systems, particularly in old hospitals, are difficult to raise to current standards without enormous expenditure. The risk of scalding due to the high water temperatures has to be controlled by installing thermostatic mixer valves in all public and patient areas. This is expensive. And in some cases hot water systems, even when running strictly according to current standards, remain colonised with Legionella pneumophila.

The positive results of the BSRIA and PHLS projects resulted in aggressive marketing of copper and silver water ionisation systems. Pressure is now on the HSE to revise the HS(G) 70 guidelines.

A safe system

"Keeping the ions under control is necessary and a real challenge," says Birgitta Bedford director of UK water treatment company ProEconomy. When ion concentrations are too low they are unable to eradicate bacteria, too high and they exceed the permitted levels. So at present, copper and silver ion levels in the treated water have to be checked by time-consuming laboratory analysis. What is needed, says Birgitta, is a cost effective system of precise continuous measurement. On-line analysers do exist, but they are too expensive and do not detect low levels accurately. ProEconomy has developed an on-line sensor with the Dutch research organisation TNO which is now being tested at laboratories in Holland on stability, meeting set criteria.

"Another venture was the development of a unique method to overcome the problem of scaling-up of the electrodes, as electronic de-scalers are not efficient enough," Birgitta explained. "We will be testing this system at Isebrook Hospital in Wellingborough soon, but we are pretty confident from our own laboratory tests that we have found the solution."

Major contracts

ProEconomy has been involved in water ionisation treatment for over four years. It believes in evaluation of new ideas and opportunities in order to enhance its products so that quality of unmatched value is delivered. ProEconomy says that because of this vocation it has recently secured several major contracts.

The company is hoping to attract hospital sites in both Holland and the UK for 'real-life' testing of the sensors and the de-scaling device.

Enquiry Number 653

Eradicate legionella

Water ionisation treatment is the safest, most practical and effective way to control legionella without the need for chemical treatment or increasing hot water temperatures.

Conclusions of a recently completed BSRIA project were: "Water ionisation is effective against legionella in both cold and hot water systems with reduced temperatures as low as 35°C."

The PHLS commented already in 1994 that: "Water ionisation treatment using copper and silver is effective in the control of legionella pneumophila in hospital hot water systems."

ProEconomy installed its water ionisation treatment system, the Orca, at the Aylesbury Vale Healthcare NHS Trust's Manor House in August 1995. A recent report concluded: "The results of the installation of the water ionisation treatment system clearly show that water quality has not been reduced. In fact the quality has improved even though the temperatures have been lowered from 60°C to around 42°C. Not only does this mean that thermostatic mixing valves do not need to be installed, but, also, as a further benefit, the storage tanks themselves do not need to be cleaned as there is no evidence of biofilm or contamination in the tanks."

ProEconomy has recently secured a grant for a project which will research the feasibility of developing a uniquely designed sensor which, when incorporated with the Orca, will create totally integrated functionality with on-line monitoring facilities. The study will also analyse the potential energy savings to be made when installing the Orca.

Enquiry Number 227

Legionella control in hot and cold water services:

Alternative strategies - should we be using them?

Legionnaires' disease will be known in history as a twentieth century disease. The major outbreaks of the disease in the late 1980s caused by cooling towers gave rise to public alarm in the health sector. Thankfully, these occurrences are now rare and attention has turned to hot and cold water services because these systems now account for the majority of identified cases of legionnaires' disease in the UK. The challenge now exists to reduce these sporadic cases. Whilst a temperature regime still remains the primary method of control advocated in health care premises for hot and cold water services, there is a need to consider alternative technologies where temperatures cannot be achieved.

In 1994 **BSRIA** started to evaluate alternatives such as silver/copper ionisation. With support from the Department Of The Environment, NHS Estates, HSE and 11 other sponsors from industry we built the BSRIA test rig facility for hot and cold water services. This consisted of three identical commercial-size hot and cold water services systems designed to replicate the size of installation commonly found in a small home for the elderly. Three rigs were built in order to compare one rig using a temperature regime with hard water (control rig) against two rigs using silver/copper ionisation at reduced hot water temperatures with hard and soft water. The results from this work, published in BSRIA Technical Note TN6/96 (ISBN 0 86022 438 4) and reported in Hospital Management Today (April 1996), concluded that ionisation could form the basis for an effective strategy for the sterilisation of hot and cold water installations. However, there is a need for designers to assure themselves that performance is not adversely affected by the quality of the water supply; for example hardness can present particular problems. Consideration of implications for health of introducing silver/copper ions also needs to be part of the assessment of the design of an installation. In 1996, we turned our attention to Chlorine Dioxide and conducted similar tests using the same test rig facility (see photo). The results from this work have not yet been published but preliminary indications of performance are promising. Full results from this study will be available this summer from BSRIA.

As the twentieth century draws to a close it is important to recognise that this disease can be reduced or controlled by the building services industry. If health estates cannot achieve a temperature regime they must gain a better understanding of the issues involved and start evaluate the effectiveness of alternative strategies.

It is hoped that the dissemination of BSRIA research will go some way towards achieving this goal.

Nigel Pavey
Principal Research Engineer
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IONISATION WATER TREATMENT
FOR HOT AND COLD WATER SERVICES

In 1994 **BSRIA** set up a two year research project to assess the effectiveness of ionisation at reduced water temperatures against a temperature regime for legionella bacteria in hot and cold water systems. This was carried out because of the increasing awareness that a temperature regime is not always acheivable, particularly in health care premises, and other water treatment strategies such as Ionisation could be used if they can be shown to be effective.

The research was concerned with infecting three full size hot and cold water services systems built at BSRIA laboratories in Crowthorne, Berkshire with legionella bacteria and then attempting to disinfect using a temperature regime in hard water and ionisation in hard and soft water. The ionisation process is concerned with adding silver and copper ions into water to inhibit micro-organisms including legionella bacteria. Manufacturers suggested that the level of ions required to produce an effective disinfection in the hot and cold water system was 400 µg/1 of copper and 40 µg/1 of silver. To avoid test driving any particular manufacturers product a "hybrid" ionisation unit was constructed by BSRIA.

The infection took seven weeks and was designed to allow a mixture of waterborne micro-organisms, including a non-pathogenic strain of Legionella pneumophila, Serogroup 1, sub type 'Pontiac' to infect all three rigs. Each rig was inoculated via the cold water cistern and the hot water storage temperatures were held at 35°C to promote bacterial growth.

During disinfection the hot water in the ionisation rigs was left at 35°C whilst the hot water in the temperature regime was increased to 60°C. For the cold water systems all three rigs had cold water storage temperatures around 20°C.

The results for a temperature regime showed that there are a number of concerns regarding its efficacy. In cold water storage the results showed that in the absence of residual chlorine in the mains water, biofilms can establish themselves in glass reinforced plastic (GRP) cisterns built to byelaw 30 standards. Furthermore, the cold water cistern was a source of contamination to the hot water storage calorifier, cold water pipework circuit and water outlets such as showers and low temperature mixing valves. In hot water storage, the design and operation of the hot water storage calorifier did not provide complete protection from legionella harbouring in the base of the vessel even though the base water temperature was elevated. The temperature regime also showed that the design and operation of hot water storage calorifiers did not provide complete protection from legionella being drawn into the hot water circuit even when the flow water temperature was maintained at 60°C.

The results for ionisation with soft water showed that where silver and copper ion concentrations can be maintained at 40 µg/l and 400 µg/l respectively, ionisation was effective against legionella in both cold water systems and hot water systems with reduced water temperatures as low as 35°C. In water outlets such as showers, low temperature mixing valves, hot water dead leg taps and cold water taps the results showed that ionisation was effective against legionella if a silver concentration around 40 µg/l was achieved and maintained.

Disappointing results were achieved from the ionisation rig with hard water because the electrodes frequently scaled up and the high level of dissolved solids in the water complexed the silver ions out of solution. Where silver concentrations could be maintained around 40 µg/l in the hard water, ionisation was shown to be effective against legionella. Results also showed that the ionisation process was pH sensitive. To overcome these problems manufacturers of ionisation units are currently using other water treatments in conjunction with ionisation such as scale control, filtration, pH control or water softening.

In summary, the project illustrated that ionisation water treatment does have a valuable part to play in hot and cold water installations provided that the application is properly assessed and designed as part of an overall water treatment regime by reputable and experienced companies.

A detailed record of the project results may be found in the BSRIA Technical Note TN/96 entitled Ionisation Water Treatment For Hot And Cold Water Services.

Further information on ionisation water treatment may be obtained from the Institute Of Water Ionisation Technologies, 28 Nottingham Place, London W1M 3FD.

This research project was supported by the Department Of The Environment, NHS Estates, Health & Safety Executive and 11 other sponsors from industry.

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