Technical Compliance Consultants Ltd
753 Beach Road, Browns Bay
PO Box 35 366
Browns Bay, Auckland, 0753
Tel: 09 475 5240
Fax: 09 475 5229
Mobile: 027 274 0973
email: INFO@techcomp.co.nz
website: www.techcomp.co.nz

EnviroSwim Pool Sanitizing System

Risk Summary

March 2012

Summary

When operated within the guidelines provided in the EnviroSwim ES-3 Operating Manual the system has been risk assessed as ;

- Maintaining water quality within New Zealand standards for environmental discharge and human consumption
- effectively sanitizing swimming pool water

Introduction

NZS 5286: 2010 covers the requirements for the operation and maintenance of pool water quality and methods of treatment. It covers fresh water, sea water and geothermal pools and spa pools.

Traditionally, disinfection is carried out using chlorine in one form or another and to a lesser extent other systems such as bromine and ozone.

Where “other systems” are used Section 8.8 of the NZ Standard recommends that a risk assessment be carried out under “practical conditions”.

The EnviroSwim system generates a mix of copper and silver ions to disinfect the pool. In addition it provides oxygenation by electrolysis to raise the dissolved oxygen level to oxidise organic matter and ultra sonication to physically dislodge mineral caking.

In order to meet Section 8.8 for “other systems” a risk assessment has been carried out. (ref: EnviroSwim Pool Sanitizing System Risk Assessment TSG Ltd December 2007).

Background

The use of copper and silver in solution to disinfect water is well known and well documented. The use of copper-silver ionization for drinking water production came to prominence in 1960 when the use of a small ion generator was reported that disinfected drinking water aboard the Apollo Space Craft.

Today copper-silver is used in hospitals to deactivate Legionella bacteria and in the USA and Australia for swimming pool disinfection.

It is also used to disinfect bottled drinking water and to eliminate bacterial and fungal contaminated fishponds.

New Zealand’s Drinking Water Standards limit the level of copper ions to 2 mg/L and silver to 0.1mg/L. This has limited relevance for swimming pool water in terms of affecting average daily intake on which WHO recommendations are based.

Mode of Action

Positively charged copper ions bind to the negatively charged cell walls of micro-organisms. The resulting bonding disrupts the cell wall permeability causing nutrient uptake to fail. This process also exposes the cell to penetration by silver ions that bond to the protein amino acids in DNA and RNA causing the cell to cease cell division and thus to eventually die out.

Copper-Silver Ion Disinfections in Swimming Pools

A number of commercial units are available worldwide utilising the electrolyte discharge of copper and silver ions into water. In most cases these are used in conjunction with chlorine or ozone to oxidise and breakdown organic matter such as skin flakes, skin grease, sunscreen lotion, urine etc. normally found in pools.

The EnviroSwim System and Pool Water Quality

Watertech Services International Pty Ltd in Queensland manufacture a copper-silver ion system for domestic and commercial pools. In addition the system produces oxygen bubbles to provide and maintain a supply of dissolved oxygen to aid the oxidation of organic matter.

EnviroSwim Health Risks

The summary below is based on the assumption that the EnviroSwim system is run within the recommendations of the Operating Manual (ES-3). This requires that the pool operator monitors the alkalinity, calcium hardness and Total Dissolved Solids as with using a chlorine treatment.

a) The disinfection power of copper-silver ions is well documented. Its efficiency is reported to vary with pH. However pH is recommended to be checked every 2 weeks.

b) The presence of micro-organisms and pathogens in Enviroswim treated water is likely to be low both from reported anecdotal experience of other similar systems plus independent tests conducted by Tweed Laboratories in NSW (available on request).

c) The speed of disinfection is comparable to chlorine systems as reported by the independent Tweed Laboratories study using pseudomonas aeruginosa test organism.

d) The reported levels of copper ions in the pool water are well within the New Zealand Drinking Water Standards. The system provides a kit to test copper levels (but not silver). The acceptable copper range is 0.25 – 0.4 mg/L which is well below the NZ Drinking Water Standard of 2 mg/L.

e) The silver ion concentration could be up to 0.04 mg / L which is below the NZ Drinking Water Standard Provisional Maximum Allowable Value of 0.1 mg / L and below a level deemed by WHO to pose a health hazard in terms of possible daily intake.

f) In situations of high pH, silver may precipitate out reducing the bacteriological effectiveness of the water without the operator knowing. The risk of this is judged to be low if pH is monitored as required

g) High pool water temperatures have no effect on the disinfection properties of the EnviroSwim system whereas the risk of loss of disinfection properties in a chlorinated pool is medium to high.

h) Providing alkalinity, calcium hardness and total dissolved solids levels are maintained in the same range as recommended in NZS 5826:2000 the risk of these parameters affecting the efficiencies of the EnviroSwim system should be low to medium.

i) No theoretical evidence could be found to endorse the fact that the oxidising power of dissolved oxygen as indicated by the DPD colorimetric test is comparable to that indicated as 3 – 5 mg/L free chlorine. However the risk is low that the EnviroSwim system's oxygenation will not oxidise and eliminate organic contaminants.

Conclusion

The risk to the health of persons swimming in a pool not operated according to the recommended procedures is theoretically similar whether an operator uses a chlorine based disinfection or the EnviroSwim copper-silver disinfection system.

Swimming pool water treatment products are required to be registered in Australia with the Australian Pesticides and Veterinary Medicines Authority (APVMA).

The EnviroSwim system has APVMA registration. No such registration is required in New Zealand under the New Zealand Agricultural Compounds and Veterinary Medicines Group (ACVM).

Chemicals that destroy living organisms outside of human bodies may have an ecotoxic hazard under the Hazardous Substances and New Organisms Act 1996 (HSNO). Since copper ions kill algae and silver ions destroy micro-organisms it is an ecotoxic substance.

Since copper and silver ions in water for the purpose of disinfection can be legally present in New Zealand the EnviroSwim system legally fits the New Zealand legislation for ecotoxic hazard substances under the Group Standard "Water Treatment Chemicals [subsidiary hazard]".

Peter Dawson BSc MNZIC
TCC Ltd
23 March 2012

References:

1. EnviroSwim Pool Sanitizing System Risk Assessment ; TSG Ltd Dec. 2007
2. NZS 5286:2000 Pool Water Quality
3. AS/NZS 4360:1995 Risk Management
4. Dual Sanitation with Copper Silver Ion – www.idealdistributors.com references
5. Lenntech internet data copper-silver ionization (www.lenntech.com)
6. Tweed Laboratory Centre [Pseudomonas aeruginosa disinfection in spa pools laboratory experiments with EnviroSwim system 6 May 2004]
7. EnviroSwim Model ES-3 operating manual
8. New Zealand Drinking Water Standards 2005

****