



MAGNETIZER SWIMMING POOLS REFERENCES

Installations 2013-2014

LOCATION: South America

SIZE: 400 m³

USE: Adults, Recreational

CAPACITY: 200 persons per day, 500 persons per weekend

RESULTS: Before Magnetizer installation a white line at the water level was visible after water evaporation. Besides there were many black lines embedded in-between of the ceramic tiles, which were very difficult to remove, demanding many hours of work to clean them. At night, when the lights were on, the water seemed to be slightly foggy.

Upon Magnetizer installation, a week later, the white line disappeared and never was visible again. As far as the black stains are concerned they are much easier to remove and when they appear the operator removes them with great ease, simply brushing them from outside of the swimming pool, unlike before when he had to do get himself into water to brush those algae shoots and bath tube rings with a small brush.





Magnetizer installation on 4" PVC pipe.

LOCATION: South America

SIZE: 300 m³

USE: Children, Recreational

CAPACITY: 200 persons per day, 500 persons per weekend

RESULTS: Having already positive experience with Magnetizer installation in the swimming pool for adults same Recreational Center bought a year later (2014) a system for the children swimming pool. It presented the same problems of the white line at the flotation level, foggy color when the lights were lit on at night and lots of black stains/lines at the junction of the ceramic tiles.

The results have been equally positive: the white line has been removed, the water color is crystalline, and the black stains have disappeared and when they come back, the operator removes them easily.

They decided to place an automatic chlorine dispenser and they could not establish yet the precise reduction of consumption, but it is evident, according to those in charge of the pool maintenance, that less chlorine is effectively used.



Crystalline water in the swimming pool for children after the Magnetizer installation.



One can see a white water mark (line) on the blue wall before the Magnetizer installation. It was totally and permanently removed by Magnetizer.

Just one week after the Magnetizer installation the black stains and lines in between the ceramic tiles started to disappear. When they re-appear (caused by tanning / sun protecting lotions, algae, etc., they are much easier to remove by the pool operator.



MAGNETIZER SYSTEM USED: M-4 T/S



Magnets installed on the 4" PVC pipe. Plastic ties are cut when the job is finished.



Magnetizer Industrial Technologies, Inc.
Para Power Corp
1173 Pittsford Victor Road
Suite 250
Pittsford, New York 14534

Att: Michael Flanigan

Dear Mike,

I am writing to thank you so much for helping with my issues at our pool. Since you have placed the Magnetizers on the pool, I have seen a remarkable difference in the clarity of the water. My lifeguards are telling me that the chemicals levels have been great and they have noticed they are going through less bromine. All chemical usage is down over 30% since we started the test. They also say that there is significantly less vacuuming and water line scum.

My members are thrilled with the feel of the water. It has a very clear, soft feel to it. I am no scientist but whatever these magnets are supposed to be doing, they seem to be doing the job. Thanks for making me a believer.

It is now the end of our 2014 season for the pool. We will be purchasing the Magnetizer system for the 2015 season. I cannot disappoint the members after the great reviews this year.

Keep Swinging,

A handwritten signature in black ink, appearing to read "Darlene Sommer", with a long, sweeping horizontal line extending to the right.

Darlene Sommer
Director of Golf / General Manager
Champion Hills Country Club
675 Championship Drive
Victor, NY 14564
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585.742-2462 Fax
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Older Installations



YMCA OF SAN JUAN

YMCA of San Juan
PO BOX 360590,
SAN JUAN, PR 00936-0590

Paul M. Vilaró Nelms
President

Vivian Dávila
Executive Director

TO WHOM IT MAY CONCERN:

In 1987, after six long years of absence, I was recruited to work in the Y M C A of San Juan as Aquatic Director.

It was a new Y M C A with good facilities, but with many mistakes in construction, especially in the swimming pool. The capacity of this pool is 150,000 gallons, it is made of concrete, and was constructed over an area of swamp and lowlands. It is in the open air, and measures about 90 feet in length. The hours of use are from 6:30 AM to 9:00 PM. It is used continuously except December, January and until the middle of February, the slowest season. The temperature of the water in the season of use fluctuates between 84° F and 96° F. In the months of June and July we have a day camp and we serve approximately 1000 persons a day. This includes children from six months of age, the handicapped, and regular members. This gives you an idea of the difficulty in the problem of balancing the water, especially the dissolved solids (TDS), and the hardness of the water. Also, this pool cannot be emptied to lower the levels of hardness and dissolved solids, because in its construction there was not installed a hydrostatic valve to equalize the pressure. This always caused me great concern, in that the pool needs to be emptied annually, or when the TDS and the hardness are at their highest levels.

When I met with Sr. Victor Reyes, and he spoke to me about the "Magnetizer", the levels of hardness of the water were over 1,000 ppm, and the dissolved solids were found to be 1500 ppm. I had read something about the magnets in magazines, and asked some persons related to the sale of chemicals. They indicated that they disregarded this product, and others indicated that the product was not controlling the hardness, nor stabilizing the ph. But when Sr. Reyes came to me and offered to install the product, without financial obligation, to prove his claims, I thought that nothing would be lost by trying, and if he was going to demonstrate the product in a pool, it might as well be here in the Y M C A.

In this waym, I accepted the challenge. The first six months were spent in discussion to decide on the best way to document the proof, and how the test should be conducted.

My motto is "seeing is believing" (like St. Thomas Aquinos, a feeling somewhat more Puerto Rican). The changes could not be seen until one day Victor brought me an article about the magnets which more or less signified the



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YMCA Mission:
To put Christian principles
into practice through
programs that build healthy
body, mind, and spirit for all.

TO WHOM IT MAY CONCERN

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changes in the water to be treated with the magnets, and that the hardness would not be eliminated, but would be integrated with, or suspended in, the water itself.

From this day I understood that the changes in the hardness were not chemical, but physical. Even though the hardness was 2,000 p.p., no residue or deposits existed on the walls of the swimming pool, inside the pipes, nor in the filter. The water always appeared impeccably clean, in spite of the fact that the dissolved solids had risen to 3,000 p.p.m.. It was supposed that the larger concentration of contaminants would affect the ph, but it was not so.

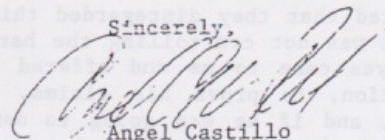
Here we use powdered chlorine, and no matter what the season of the year, the ph is found to be between 7.2 - 7.6. Something very important is that it is possible to have fluctuations of ph, and if it is not interfered with, it will stabilize itself. Another thing to note is that before the liquid chlorine is added, it is difficult to stabilize the ph. The difference is between powdered chlorine and stabilized chlorine. The changes are magnificent. It can be said that it is not necessary to use bicarbonate to raise the alkalinity nor acid to lower the ph, and much less soda ash. In relation to algae and its control, the ones most difficult to control are black algae and mustard algae.

Before, we would have to spend hours diving to scrape the bottom of algae, but since we have the magnetizer, the control is minimal, maintaining acceptable chlorine levels.

I am no longer preoccupied with the hardness, or the dissolved solids, and it has been five years.

I give thanks to God for allowing me to accept this test, and also to Sr. Victor Reyes for showing me this new alternative which permits control of certain problems without the use of chemicals, with the costs and risks that they bring.

Sincerely,



Angel Castillo
Aquatic Director

P.S. In the month of July, 1997, a visual inspection was made of the interior of the filter, and we discovered that the sand which was found in the filter was loose; there did not exist traces of deposit in the walls nor in the pipes inside the filter. (PHOTOS AVAILABLE UPON REQUEST AS PROOF)

TRANSLATION OF THE POLISH TESTIMONIAL FROM THE CITY SPORT AND RECREATION CENTER

Opinion regarding the use of MAGNETIZER by the American company, the MAGNETIZER Group, Inc. (USA).

The MAGNETIZER has been installed on the technological water on the swimming pool of our Center in Bialysdok.

While overhauling the installation, a section of about 30 meters of old pipe, covered by 1-2 mm of scale, has been left. The MAGNETIZER has been installed, and after filling up the pool with about 200 cubic meters of water from the city pipeline, the circulation pumps were put on. After 3 hours of the pulsating work of the pumps, large quantities of stone (scale) debris were being dragged into the pool, and on the surface of the water there were greasy stains. The water was extremely dirty and did not seem to have any hope for quick improvement, therefore, the filling up of the swimming pool has been interrupted, leaving for about 16 hours, the circulation and filtration on the sand filter without airing them. After that time, the water was crystal clear, and only on the bottom there were large amounts of debris. It used to be a rule, that at the 2 meter level of the water, the bottom of the swimming pool would become unseen, this time the water was translucent, even though it had a green hue. To clean the pool to the crystal state, which had never been obtained before, much less time and means have been required, in order to bring it to such translucence. The water surface was becoming, in the same time, blue. Also at the same time, the water is soft and the obtrusive chlorine cloud has disappeared even though the chlorine is significantly felt in the hall.

After a month and a half from starting up the pool, the pump driven water now only spits out little pieces of stone (scale) with smudges covering the bottom.

Miejski Ośrodek
Sportu i Rekreacji

Mudimex (Polska) LTD

Warszawa

ul. Puławska 31/24

Opinia dotycząca zastosowania magnetyzera amerykańskiej
firmy Magnetizer Group Inc. (USA).

Magnetyzer zamontowano na instalacji wody technologicznej basenu pływackiego naszego Ośrodka w Białymstoku przy ul. Włóknienniczej.

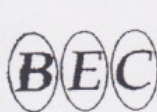
Remontując instalację pozostawiono odcinek ok. 30 mb rurociągu starego, zarosniętego kamieniem, warstwą I-2mm z przylegającymi grudami. Zamontowano magnetyzer i po wpuszczeniu ok. 200m³ wody z wodociągu miejskiego uruchomiono pompy cyrkulacyjne. Po 3 godz. pulsacyjnej pracy pomp do basenu wsypywały się z rurociągu duże ilości kamiennego gruzu, a na powierzchni wody znajdowały się tłuste plamy. Woda była niezwykle brudna i nie rokowała nadziei na szybką poprawę. Przerwano więc napełnianie basenu pozostawiając na ok. 16 godz. cyrkulację i filtrację na filtrach piaskowych bez napowietrzania. Po tym czasie woda była krystalicznie czysta tylko na dnie niecki leżały duże ilości gruzu. Opróżniono więc basen i po oczyszczeniu przystąpiono ponownie do napełniania. Regułą było, że przy dwumetrowej warstwie wody wodociągowej w basenie dno stawało się niewidoczne, tym razem woda była przeźroczysta choć miała barwę zielonkawą. Na jej oczyszczenie do stanu krystalicznego, którego nigdy przedtem nie osiągnęto, zużyto znacznie mniej czasu i środków niż dawniej do doprowadzenia do takiej przeźroczystości. Tafla wody stała się przy tym niebieska. Woda jest przy tym miękka, a z dna basenu znikła uciążliwa chlorowa chmura, choć chlor w hali jest odczuwalny znacząco.

W półtora miesiąca od uruchomienia basenu pędzona pompami woda wyrzuca wciąż, obecnie już drobne okruchy kamienia smugami zaścieławiające dno.

Białystok 18.10.92r.

* This document is a certified
copy of the original.





شركة بهوان الهندسية (ش.م.م.)
BAHWAN ENGINEERING COMPANY (L.L.C.)

مسب ٧٠٢ - ١١٢ ، سلطانة عمان - تليفون : ٨٢ ، ٨٢ ، ٧٩٧٠٨١ ، ٧٩٧١٦٩ : تليكس : ٩٦٨١ ، ٩٦٨٢ : فاكس : ٩٦٨٣ ، ٩٦٨٤ : بريد إلكتروني : info@mundi.com
P.O. BOX 703, RUWI-112, SULTANATE OF OMAN

6th March, 1997

Mr. Ambrose Vase,
M/s. N.M.N. Al Ismaili Trading,
P.O. Box 900
P.C. 117,
Sultanate of Oman

Dear Sir,

REF : ON LINE MAGNETISER FOR SWIMMING POOL APPLICATION

We thank you for suggesting the installation of the magnetiser for one of our in-house VIP villas - swimming pool. It is over 8 months now that we have installed the on-line magnetiser.

First of all, installation of magnetiser was very quick and hassle free job. There was no pipe line cutting or modification works involved. As directed by you, we had to just clamp on the magnetiser on the pipeline and the job was done.

We were quite surprised to see that the application like this could make improvement in the swimming pool water quality and savings in chemical consumption.

Our observations are as under :

- The quality of water has improved, in the sense that the swimming pool water has a silky feeling and looks clear. Before using this instrument there seems to be scaling on the border of the swimming pool above water surface line, which totally disappeared now.
- The chemical consumption during peak summer has come down by around 40%
- The filter efficiency has improved due to non-scaling of filter media.

We are happy that we have used the above magnetiser and have no hesitation in recommending for other users.

Thanking you,

Yours faithfully,
for BAHWAN ENGINEERING CO. LLC.

S.V.R. KAMATH
SR. MANAGER, M&E SERVICE

Certificate No. CC 160271



CRANFIELD UNIVERSITY

SCHOOL OF WATER SCIENCES

MRes Thesis

Academic Year 1995-1996

JOANNA ELIZABETH STARMER

**Magnetic treatment of swimming pool water for enhanced
chemical oxidation and disinfection.**

Supervisor: Dr. Simon A. Parsons

September 1996

**This thesis is submitted in partial fulfillment of the
requirements for a degree of Master of Research.**

ABSTRACT

Magnetic water treatment is potentially of great benefit to pool water treatment in terms of the reduction in use of oxidizing chemicals in water treatment. Magnetic treatment has been variously shown to stabilize solution pH, eliminate corrosion of materials and reduce system downtime. In addition to the reduction in running costs, physical water treatment is generally viewed as being more environmentally acceptable; reducing the use of the strong oxidizing chemicals conventionally employed for disinfection.

This study determines the efficacy of a magnetic treatment device on the inactivation of a model micro-organism (*Escherichia coli*), chlorine consumption and concomitant disinfection by product formation in a swimming pool water analogue. Effects of magnetic water treatment on physical parameters such as scale deposition; conductivity and pH are reported, as well as the key performance determinants of chlorine consumption, micro-organism inactivation rate and trihalomethane (THM) formation. A commercially available magnetic treatment device (Magnetizer) was used throughout.

It was found that in all cases chlorine loss was more rapid in the control than in the magnetically treated water. The bactericidal efficiency of the free chlorine was unaffected by magnetic treatment, such that the *E. coli* kill rate for a given disinfectant dose was increased by an average of 25% by this physical conditioning. In addition, it was found that generation of THMs was reduced by magnetic treatment at any one free chlorine level.

ACKNOWLEDGEMENTS

I would like to thank the representatives of Magnetizer in the UK for the sponsorship of this project.

I would also like to thank my supervisor, Dr. Simon Parsons, and Dr. Simon Judd for their assistance.

MAGNETIC TREATMENT OF SWIMMING POOL WATER FOR ENHANCED CHEMICAL OXIDATION AND DISINFECTION.

1 INTRODUCTION

1. *Background*

Many industries, including the swimming pool industry, are being urged by regulatory bodies such as PWTAG and pressure groups to use non-chemical treatment processes wherever possible (Gosling, 1996). PWTAG also places pressure on operators of swimming pools in the UK to employ the “least hazardous option” in terms of health and safety and environmental concerns (Gosling, 1996). The contaminants of swimming pool water are mainly urine, sweat and micro-organisms introduced by the swimmers. The major disinfectant used in swimming pool water treatment is sodium hypochlorite which has a bactericidal action that can be suppressed to some extent by interaction with other chemical contaminants (Black, 1996). Reaction with these organic contaminants result in the generation of disinfection by products (DBPs), the simplest of which are the trihalomethanes (THMs). The nature of these products and the extent to which they are generated depends upon the prevailing physical and chemical conditions (PWTAG, 1995). However, they are generally undesirable as they are all at least suspected carcinogens, teratogens and mutagens (Gosling, 1996).

2. *Magnetic water treatment (MWT)*

1.2.1 *Chemical effects*

The application of magnetic treatment to water has a long history, and has been used mostly to remove and control scale deposition (Donaldson, 1988; Baker and Judd, 1995). Calcium carbonate scale is estimated to cost industry around £ 1 billion per year (Darvill, 1993). The benefits of magnetic water treatment are claimed to include energy and water savings along with a range of benefits which prolong the life of the system's component parts and hence the life of the system itself. Magnetic treatment has been shown to stabilize pH, eliminate corrosion, reduce downtime, maintenance and cleaning costs and bacteria and remove the risks associated with the handling of chemical detergents such as sodium hypochlorite used in swimming pool water treatment (Ifill, 1994). Magnetic treatment has been successful in a range of systems including industrial heat exchangers, cooling towers, water treatment plants and household use (Baker and Judd, 1995), and may prove useful to the leisure industry in reducing the heating and disinfection expenses involved in managing swimming pools. In addition to this physical water treatment is more environmentally acceptable than the use of strong oxidizing chemicals.

2. *Biological effects*

Water is the major component of bacterial cells and the dissolved ion content in the intracellular water is the source of nutrition for the cell. One report shows that magnetic treatment of water can enhance the solubility of ions in the water, and proposes this the mechanism by which magnetic fields affect biological systems (Lin and Yotvat, 1990). It has also been proposed that magnetism may affect ion polarity, increasing membrane permeability and hence the amount of chlorine which can enter a cell, thereby enhancing its disinfecting properties (Ayrapetyan et al, 1994). A number of reports exist investigating the mechanisms by which magnetically treated water affects the cells and micro-organisms, the observed effects apparently varying from stimulatory to inhibitory depending on field strength and frequency of the magnetic field (Chizhov, 1975; Goodman et al, 1976; Moore, 1979; Berg, 1993). Many reports are concerned with the nature of the medium in which the micro-organisms exist (Berg, 1993; Okuno et al, 1993). Strong magnetic fields have been seen to enhance the growth of the model bacterium *Escherichia coli* cultured on a range of growth media (Okuno et al, 1993), but on the other hand, low strength alternating and pulsed fields have been shown to inhibit growth (Smith et al, 1993).

3. *Magnetic treatment of swimming pool water*

The last few years have seen the development of magnetic treatment devices (MTDs) for, amongst other applications, swimming pool water treatment. It is claimed by the suppliers of these devices that such devices have a number of beneficial effects including:

- The reduction of scale.
- The suppression of chlorine volatilization.
- The inhibition of microbial growth.

Of special interest, and as a direct consequence of the above, is filter surface loading or fouling. Fouling of sand filters in swimming pool treatment can be largely attributed to clogging of the surface of the filter by organic materials, such that back-flushing becomes necessary long before the full capacity of the filter has been reached. The application of a magnetic field via the specified magnetic treatment device might thus be expected to reduce the fouling of the filters by:

- a) Inhibition of biological growth and/or
- b) Enhanced breakdown of organic materials due to the maintenance of higher chlorine levels in the water

It is these two key phenomena that form the basis of the study.

One of PWTAGs stated main principles is that “the less disinfectant and other chemicals needed to maintain good water quality, the better”, and that “the only chemical you should use is a lot of water” (Gosling, 1996). In addition to this basic premise, enhanced disinfection would be of great benefit in terms of cost. At the moment, pools in the UK spend an average of £500 per annum on disinfectants. Should the 25% saving previously claimed be possible, the 1600 pools in this country would save a total of £2 million on disinfection costs per year (Ifill, 1994).

2. *LITERATURE SURVEY*

To assess the extent of the possible benefit MWT could have for the treatment of swimming pool water, the literature survey covered the following areas:

- 1) The operation and standards of swimming pools
- 2) Disinfection of swimming pools*
- 3) Chemical contamination of swimming pools
- 4) Biological contamination of swimming pools
- 5) Factors affecting disinfection
- 6) Magnetic treatment of water
- 7) The effects of magnetic fields on biological activity
- 8) The effects of magnetic fields on chemical activity

*Where “disinfection” is defined as the conscious inactivation of pathogenic organisms and viruses.

2.1 *The operation and standards of swimming pools*

The Pool Water Treatment Advisory Group’s (PWTAG’s) Pool Water Guide (1995) sets out guidelines and outlines legislation which ensures water quality and therefore public safety. The regulations control water temperature and chemical additions and bather load in order to ensure bather safety and good water quality. The treatment of swimming pool water is made compulsory by The Swimmers Pools Regulations of September 1991 4 (1) in Britain, and on the continent by other European legislation such as DIN standard 19 643 in Germany. PWTAG guidelines give maximum bather load as 1 bather per 2.5 m² for safety, whereas the Department of Environment (DOE) uses the formula below in order to maintain water quality. PWTAG lay down strict guidelines for pool water quality in terms of suspended and dissolved solids as well as physical properties (Table 1).

Materials

The study was conducted on the laboratory scale. The device was tested on simulated swimming pool water of known chemical and microbiological composition using a water of specification within PWTAG recommended concentration ranges (Table 8). Tests were restricted to relatively hard waters where scaling is more visible, although effects on scale formation were not rigorously quantified. Faecal coliform was used as the microbiological contaminant throughout the course of study, and human urine and sweat analogues were added (specified in Table A1, Appendix A). All tests were conducted using Spectrosol grade sodium hypochlorite with 12% free available chlorine (w/v) as the disinfectant and calcium bicarbonate to represent hardness of 200 ppm as CaCO₃, which would encourage scale formation while remaining within PWTAG's guidelines.

Limiting values of physiochemical parameters

Component	Low	High	Reference
Sodium Hypochlorite (mg/l)	0.42	1.40	1.05
Free chlorine (mg/l)	0.50	1.50	1.00
Sodium bicarbonate (mg/l)	168.00	336.00	336.00
Calcium Chloride (mg/l)	55.00	222.00	222.00
Sodium Humate (mg/l)	0.00	0.02	0.01
Sodium Chloride (mg/l)	0.00	2000.00	0.00
Sodium Sulphate (mg/l)	0.00	1500.00	0.00
PH	7.20	7.80	7.80
Temperature (°C)	28.00	32.00	32.00
*Body fluid simulant (ml/l)	0.00	0.05	0.05

* Simple analogue of human urine and sweat: Table A1.

3. OBJECTIVES

The investigation was focused on the suppression of chlorine desorption, and increased bactericidal action. Previous work within the School of Water Sciences (Ifill, 1994) has revealed that magnetic treatment has a small but significant effect on the retention of free chlorine, as well as on calcium carbonate scale formation. It was intended that further work be carried out to verify trends observed in the previous study, and determine the extent to which the observed chlorine retention affects the formation of

THM by-products. In addition, the direct influence of magnetic forces on bacteria viability will be studied.

The aim of the work was to test the efficacy of a magnetic treatment device (Magnetizer) in conditioning simulant swimming pool water so as to enhance chemical disinfection. To this end, the effect of the magnetic treatment on both microbiological and chemical activity was to be quantified.

It was intended that quantitative or semi-quantitative assessment of the effect of MTD's on free chlorine level, combined chlorine level, disinfection by-product formation, with specific reference to trihalomethanes and disinfection capability for faecal coliform would be provided, and that the results would refer to chemical conditions simulating those persisting in a normal swimming pool.

Mean chloroform concentrations after an initial free chlorine dose of 0.4 ppm

ANCOVA of mean chloroform concentrations at 0.4 ppm initial dose

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Covariates					
Combined CI (ppm)	1.090	1	1.090	0.307	0.058
Free CI (ppm)	0.976	1	0.976	0.275	0.601
PH	0.190	1	0.190	0.053	0.818
Temperature (°C)	1.769	1	1.769	0.507	0.479
Time (hours)	75.514	1	75.514	21.298	0.000
Main Effect					
Presence of MTD	20.429	1	20.429	5.660	0.000
Explained	120.415	6	20.069	19.000	0.000
Residual	283.651	80	3.546		
Total	404.006	86	4.698		

Summary of effects of MWT

1) **The pH of pool simulant solutions increased when organic compounds were present and decreased when they were absent.**

2) **No changes in solution conductivity were found.**

Magnetizer comment: This is to be expected since there was no evaporative water loss.

3) **No scale was formed, so no conclusive results were obtained.**

Magnetizer comment: With virtually no make up water or loss, scaling could not be significant.

4) **The turbidity of the solutions increased by an undetermined amount.**

Magnetizer comment: If a filter would have been used in the test rig, particles could have been filtered out.

5) **No direct biocidal effects were observed.**

Magnetizer comment: Test was only run in 8 - hour day shift.

6) **The cell death rate of E coli was significantly raised owing to increased aqueous chlorine.**

7) **Concentrations of free chlorine in solution were significantly increased by MWT at 0.8 and 1.2 ppm free chlorine doses.**

8) **Concentrations of combined chlorine in solution were significantly increased by MWT at and 1.2 ppm free chlorine doses.**

9) **Cell kill was improved at 0.4, 0.8 and 1.2 ppm initial free chlorine doses.**

10) **Chloroform production was suppressed at 0.4 and 1.2 ppm initial free chlorine doses; at 0.4 ppm this was significant.**