



Iodine is one of the world's strongest disinfectants. Together with the brilliant AIS technology, it delivers safe and powerful water sanitation, with a large range of applications and environmental benefits across multiple industries.

the power of iodine

Technology and operating methods

Iodine, a powerful disinfectant for over 100 years, is further enhanced by AIS's technology to maximise its superior performance. As a result, the AIS system uses very low dosages of iodine (5ppm to 30ppm) to achieve outstanding kill rates on fungi, bacteria and viruses.

Iodine - a dark, dense, crystalline solid (4.96 g/ml) at room temperature - slowly dissolves in water to form a concentrated solution, in equilibrium with its crystallised form, of about 250 ppm (0.25g/litre). The AIS system uses specially manufactured iodine, BioMaxA®, which dissolves up to four times faster than regular iodine.

> **Why iodine kills micro-organisms:** Iodine dissolved in water is a potent broad-spectrum biocide even at low concentrations (1-30ppm). Iodine (I₂) accepts an electron (e⁻) from the molecule it is reacting with in a process called oxidation and turns the iodine molecule into the non biocidal iodide (I⁻) ion:



When in contact with micro-organisms such as bacteria, viruses, fungi and protozoa, iodine is able to rapidly penetrate their cell walls and oxidise a number of critical components within the cell. The combined effect of these oxidative reactions is cell death.

> **Toxic disinfectant replacement:** Extensive and ongoing laboratory testing has demonstrated outstanding results in fungal kill rates on a wide range of fruit and vegetables (efficacy data available on request). The unique opportunity to replace certain toxic fungicides with a highly effective biocide in an environmentally clean process is highly significant.

AIS system eliminates the significant risk of food operators introducing chlorine-based carcinogenic by-products into the environment or the food chain.

> **Iodine – the ideal biocide**
For more than 100 years, iodine has been recognised as one of the most effective medical antiseptics available.

NASA recognises iodine's unique qualities, using it as the only water disinfection process on all manned space flights and in the international space station. It is also an essential ingredient in our daily diet.

> **Fully automated**
Every AIS installation has a fully automated computerised control system to electronically monitor biocide levels and automatically dose the water at preset levels. Electronic monitoring of the remaining iodine helps to ensure timely replacement of canisters.

> **Environmentally friendly**
AIS is high among the world's most environmentally responsible and friendly disinfection systems.

In many applications, virtually no biocide by-products escape into the environment.

Significantly, further reduction in toxic fungicide by-products can result from reduction in fungicide use.

> **Virtually non corrosive**
The AIS system is far less corrosive than any other system.

- iodine itself is around seven times less corrosive than chlorine;

- the concentration of iodine used is usually five to ten times less than equivalent chlorine dosage levels.

> **Safe and user-friendly**
The AIS system is the safest and most user-friendly disinfection system available.

> **Eliminates chlorine from the food chain**
Being iodine based, the

> **Automatic adjustment to organic load**

The AIS system constantly monitors the active iodine disinfectant available and quickly self-adjusts dosage levels to meet any increase in the organic load. This fully automated process happens in 'real time' and is a unique feature of the AIS system.

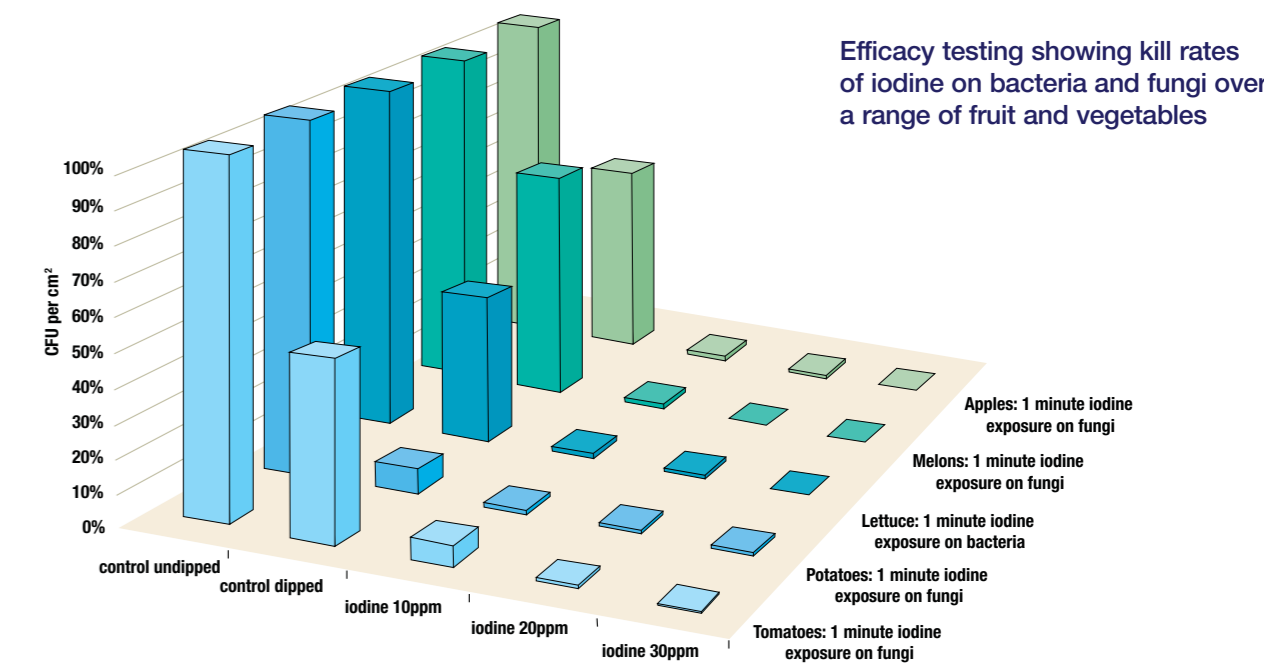
> **No chemical mixing**
Chlorine and fungicide use involves diluting and mixing highly toxic chemicals.

By comparison, the AIS system uses a patented form of iodine, which is supplied in a sealed canister. Handling or mixing of chemicals is eliminated – totally.

> **Complete data logging**
Disinfection levels in the wash water can be recorded in any preset time cycle and stored permanently. These logs provide your customers and HACCP auditors with certified proof of constant and effective disinfection levels. No more hand-written reports.

Key benefits of AIS:

- > Fully automated digital (mV) accuracy
- > Extremely easy to use and maintain
- > Safe and environmentally responsible
- > Full data logging and QA certificate generation available
- > No pH monitoring or acid dosing required
- > Cost effective sanitation and disease control
- > Ion selective electrodes for precision (mV) control
- > Superior to all other biocides where organic load exists
- > No chemical mixing, minimising OH & S issues
- > Eliminates bacteria and fungal spores for total sanitation and protection
- > An Australian-developed innovation



Test results from the Sydney Post Harvest Laboratory, Australia

> **Iodine vs chlorine – why AIS delivers the most powerful biocide:** Active killing agent: Chlorine in solution converts to two compounds: Hypochlorous Acid (HOCl) and Hypochlorite (OCI⁻).

HOCl is biocidal and will remain in solution only at pH above 6.5. (Below this pH, HOCl breaks down and will gas off quickly out of solution.)

In contrast, iodine breaks down into four principal compounds: Iodine (I₂), Hypoiodous Acid (HIO), Tri-iodide (I₃⁻) and Iodate (IO₃⁻). Both I₂ and HIO are strong biocidal agents. I₃⁻ and IO₃⁻ are only present in very low concentrations and only significant at very high pH; greater than 8.5.

> **Effect of pH:** To maximise the concentration of the required HOCl chlorine compound, the wash water must be maintained within a narrow pH range (6.5 to 7.5). However, the natural chemical consequence of adding chlorine to water is to alter the pH level, dramatically affecting biocidal action. At a pH of 8.0, the active HOCl has dropped to only 25% of its level at pH 6.5. This level is also less than 30%

as effective as iodine at the same pH. In addition, chlorine reacts three times faster than iodine with proteins. The effect of this reactivity is to substantially and quickly reduce the effective biocidal action of chlorine in solutions with a high organic load.

The active iodine compounds, I₂ and HIO, remain effective at much higher concentrations over a much wider pH range (pH 3.0 to pH 8.5).

> **Measuring iodine:** AIS's purpose-built, iodine-specific electrode shows the reading received from the iodine in the solution as an mV chart. Due to the unique properties of iodine, the AIS system can monitor, record, control and adjust the active iodine in solution in real time and at ppm rates from 0.5ppm to 50ppm. This ability to so accurately control the active biocidal ingredient is in stark contrast to chlorine which cannot be accurately controlled automatically at any concentration above 8ppm.

> **Trihalomethanes:** Governments and environmental agencies globally regulate the maximum level of trihalomethanes (THMs)

- cancer-causing chlorine by-products - allowed in wastewater. They are now restricting the release of chlorinated wash water into the environment to prevent further contamination. Treatment of chlorinated water to remove THMs is an expensive exercise.

By comparison, iodine as used in the AIS system does not produce undesirable by-products or THMs either on the produce or in the wash water.

> **Iodine and minimising corrosion:** The corrosion effect of chlorine is dramatically greater than the iodine delivered in the AIS system for the following principal reasons:

> Due to the difference in both oxidation potential and atomic weight between chlorine and iodine, the corrosion effect of chlorine is more than seven times that of iodine;

> As shown above, the dosages of iodine necessary to be as effective or more effective than chlorine are between five to ten times less than chlorine. So, not only is the iodine significantly less corrosive, but the dosages present are also less.

Once installed, the AIS

system will result in significantly longer equipment life, leading to substantial capital equipment cost savings.

"Our birds now look healthier, whiter and are drinking considerably more."

"We are now achieving a consistent iodine residual at the drinkers and have observed a reduction in mortalities since installing the AIS system 12 months ago."

Don and Pat Bigham, Victoria 21/03/2003

"The AIS system has been a welcome addition to our tomato plant this year."

"It has proved highly effective at postharvest disease control and simply easy to operate."

Robert Lee, Packing shed manager, Koorelah Farms, Queensland 05/09/2004



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> Fruit & vegetables

Our technology accurately measures and delivers very low dosages of iodine to achieve superior pathogen kill rates.

Iodine and the AIS system combine the strongest disinfection with digital accuracy and mV control; delivering both the highest quality produce and a longer shelf life for you and your customers.

Automated and self-regulating, AIS maintains its target dosing levels at all times irrespective of water quality. It requires no chemical mixing, pH monitoring or acid dosing.

Highly effective on bacteria and fungi in tests conducted by leading research laboratories in Australia and the United States, the AIS system is now being used by major fruit and vegetable growers and processors around Australia. Growers and processors who have installed AIS systems report reduced product breakdown, increased shelf life, reduced OH&S issues and significant savings in time, effort and money, and on the environment.



> Hydroponics and nurseries

Risk minimisation

Fully automated, AIS delivers disease control throughout your nursery by providing pathogen-free water and, optionally, a residual of iodine to your crop.

Its excellent disease and pathogen control throughout the facility reduces the need for costly fungicide treatments and minimises crop losses.

It is 100% effective over a broad pH range, does not react with nutrients and is one of the best treatments for root and foliage diseases such as pythium, phytophthora, fusarium, botrytis and mildew in treatment water.

Recycle and save
Using surface irrigation and recycled water, it is imperative for pathogens to be totally eliminated.

As water quality changes daily and seasonally, disinfection methods must be reactive and dose accurately; irrespective of organic load.



> Poultry

Poultry drinking water
Maintaining a constant residual of iodine at the drinkers may reduce disease transmission, improve gut-health and reduce mortality levels. Combined with its palatability at these accurately controlled low levels, birds are drinking more and the system is helping to achieve improved feed conversion; delivering a competitive advantage.

Egg production
Australian Iodine Solutions has received Food Standards Australia and

New Zealand (FSANZ) approval for the use of iodine in egg sanitation.



> Dairy and livestock

The AIS system can be used for a variety of automated applications, which will consistently help to reduce cell counts and mastitis. Uses also include yard-washes, pre-milking udder sprays, cup rinsing and pre and post milking line and vat washing.

Automated and accurate to 30ppm, the systems are suitable for tank dosing or in-line applications and offer a cheaper more automated and accurate alternative to iodophor based products.

> Commercial water treatment

Environmentally clean removal of bacteria facilitating water reuse provides recycling and minimisation of waste discharge for commercial operators.

> Manufacturing

Industry must maximise recycling and reduce waste disposal at the same time as reducing bacterial levels and addressing OH&S issues.

> Cooling towers

Accurate, automatic and controlled bacteria reduction is fundamental to effective cooling tower operations. Reduction in corrosion is now also a strong economic driver.

> Pharmaceutical and pure water manufacturing

AIS technology can deliver extremely high pathogen, viral and fungal

kill rates in water for critical manufacturing operations utilising pure water.

> Swimming pools and spas

The automatic self adjustment to increases in organic load provide benefits to swimming pool and spa industries where rapid increases in organic load often create challenges for effective disinfection.

> Hospitals and health establishments

Control of bacteria levels in hospitals and health establishments is critical. Aged care establishments also often require additional critical food disinfection at point of use.

> Airborne disinfection

Australian Iodine Solutions's AIS technology can be used within airflow environments in which there is a need to ensure that airborne micro organisms have been destroyed.

> Aquaculture

Effective disinfection of fish eggs, larvae and tank water is critical for aquaculture production.

> Equine swimming pools

Treatment of equine swimming pools for pathogen control may be further enhanced by the medicinal qualities of iodine for cuts, abrasions and infection control.

Furthermore, the gentle nature of iodine is a better alternative to oxidants such as chlorine, which may contribute to the dulling of a horse's coat.

> Meat processing

Due to iodine's strong pathogen kill rates, opportunities exist to either replace or supplement existing meat processing sanitation systems.

AIS has a system for every size operation



FVS Range

Post-harvest fruit and vegetable sanitation

Food processing and fresh-cuts

Pharmaceutical and water purification

Typically treating wash or dump tanks

May be used in bulk-dip applications or spray-bar washing systems

DIJ Range

Direct injection systems for in-line dosing

Treating surface water for pathogen control

Applications where a residual of iodine is required at the sprinkler/dripper heads

Suitable across variable flow rates and water demand requirements

Ideal replacement for 'basic' dosing systems and eliminating all of the guesswork

Ideal for variable water flows and quality, maintaining its target concentration at all times

- Wholesale nurseries
- Hydroponics facilities
- Poultry and dairy

MDS/SDS Range

Mobile and static dosing systems ideal for tank treatment applications

Suitable for a range of tank sizes up to 1 megalitre capacity

Suitable for long-contact-time applications and absolute kill rates

- Wholesale nurseries
- Hydroponics facilities
- Poultry and dairy

- Equine pools
- Cooling towers

- Aquaculture
- Manufacturing and commercial water treatment

The AIS Patent (Pending) system – developed and manufactured in Australia

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