

**Better quality produce ...  
and longer shelf life**





# the world's leading post harvest treatment system

## Produce better quality produce ... and gain longer shelf life

By combining the strongest disinfection together with a powerful fungicidal action, iodine and the Isan system delivers the best quality produce, ensures minimal product recall and longer shelf life.

**T**he Isan™ system is superior to any other sanitation system in the world. Automated and self-regulating, it requires no chemical mixing ... and gives you certified delivery too.

It has proven to be highly effective on bacteria and fungi in tests conducted by leading research laboratories in Australia and the United States\* and is being used by major fruit and vegetable growers and processors around Australia.

Growers and processors who have installed Isan systems are now reducing product breakdown, increasing shelf life and saving a great deal of time, effort and money ... and the environment.

### Consider the key benefits Isan delivers:

- > Longer shelf life and less product loss for produce;
  - > Significant improvement in the quality of produce;
  - > Higher kill rates on bacteria and fungi;
  - > The most environmentally clean system available;
  - > Fully automated computerised control;
  - > Complete 'data logging' of disinfection and fungicide levels for customers and HACCP auditors;
  - > Helps conform with increasingly stringent food safety regulations;
  - > Cost effective;
  - > Improve water management – save water and cost;
  - > No chlorine or fungicide residues to recover and dispose;
  - > Substantial reduction in corrosion, resulting in longer equipment life;
  - > Treated wastewater can now be reused over and over again;
  - > Reduced OH&S risks;
  - > No chemical mixing;
  - > Guaranteed nationwide maintenance and support.
- ... and you also gain a strong return on your investment.

### Tougher conditions

With increasingly stringent regulations and difficult environmental factors impacting on fruit and vegetable production, all growers and processors face a challenging future.

Immediate needs include a more efficient and economical method of post harvest treatments for produce to achieve increasing levels of food safety and longer shelf life.

Isan has been acclaimed by leading agricultural scientists as one of the world's most effective fruit and vegetable post harvest treatment systems.



## Massive advantages

Unlike chlorine-based systems, the Isan system uses a patented form of pure iodine which is both safe for the environment and easy to handle. Supplied in sealed canisters, this iodine completes its fungicidal and disinfection activity at remarkably low dosages.

In a world's first, the residual iodine and iodine by-products are automatically recovered

from the wash and converted back for reuse – a totally closed loop system. Complete automation and accurate monitoring guarantees that the correct amount of active iodine is always in the wash tank water stream. Operators can view and control the combined fungicidal and disinfection process – even from remote locations – and download and print the constantly monitored data.

There is full accountability, minute-by-minute if you want it. At the touch of a button, you can provide your buyers with Quality Assurance audit certificates with each batch processed.

**No other system in the world matches Isan for quality, efficiency and control.**

\* CSIRO, US Department of Agriculture, Sydney Post Harvest Laboratory, Agricultural Research Service (Philadelphia) and California Polytechnic State University (San Luis, Obispo).

Tino Grossi is one of Australia's main producers of gourmet lettuce.

"The Isan system has had an enormously positive effect on our business. It has more than doubled the shelf life of our produce and saves us time and money."

**Robert Lee, Packing Shed Manager, Koorelah Farms, one of Australia's largest tomato pack houses.**

"The Isan System has been a welcome addition to our plant this year. It has proved highly effective at postharvest disease control and simply easy to operate."



# features and benefits fruit and vegetable processors

The Isan system substantially reduces the incidence of fungal growth, spoilage organisms and food-borne pathogens on fruit and vegetables, thereby increasing shelf life and reducing illnesses caused by contamination.

**> Effective chlorine replacement:**

Comprehensively replaces disinfection by existing chlorine wash systems, eliminating all of chlorine's negative aspects and handling problems including growing environmental issues at the same time as adding a powerful fungicidal activity.

**> Higher kill rates on bacteria and fungi:**

Extensive testing and pack house use has proven that the Isan system consistently achieves high bacteria and fungal kill rates on a wide range of fruit and vegetables. It has been proven to even surpass some fungal kill rates of dedicated fungicides.

**> No pH adjustment:**

Chlorine only operates effectively within tightly controlled pH levels. As chlorine is added to water, pH moves outside these limits, making the chlorine less effective as a disinfection treatment.

By contrast, iodine operates in a very wide pH range. It has little or no adverse effect on pH, eliminating all of the pH monitoring problems encountered with chlorine.

## > Environmentally friendly:

The Isan system is one of the world's most environmentally responsible and friendly disinfection systems. Virtually no biocide by-products escape into the environment. Significantly, further reduction in fungicide by-products can result from reduction in fungicide use. The complete process captures all by-products and converts the captured by-products back into the original biocide, providing an environmentally clean closed loop process.

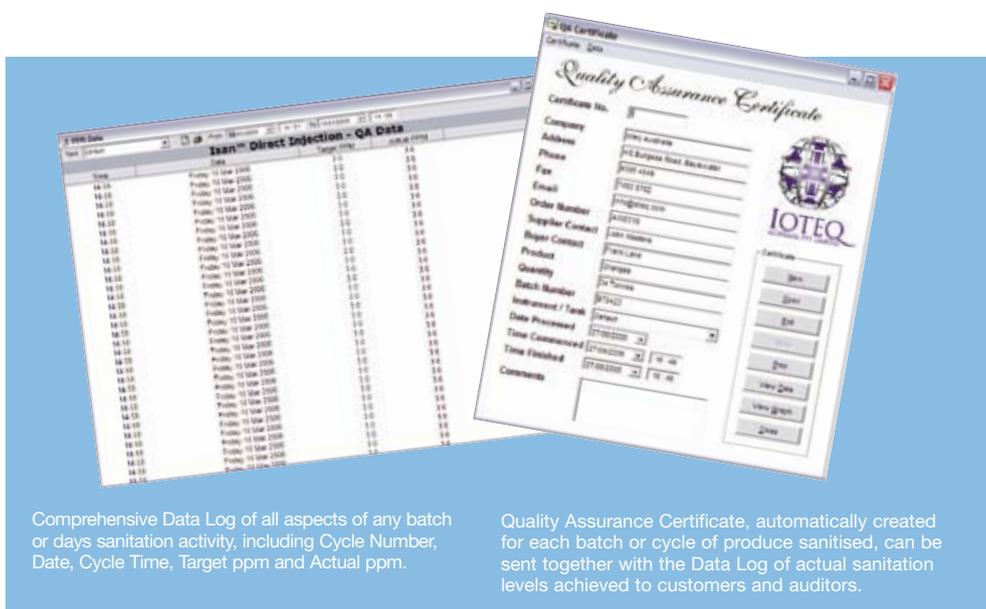
## > Almost no corrosion:

The Isan system is far less corrosive than any other system:

- iodine itself is seven times less corrosive than chlorine;
- the concentration of iodine used is usually five to ten times less than chlorine dosage.

## > Iodine – the ideal biocide:

For over 100 years, iodine as a disinfectant has been recognised as one of the most effective medical antiseptics available. Even 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.



Comprehensive Data Log of all aspects of any batch or days sanitation activity, including Cycle Number, Date, Cycle Time, Target ppm and Actual ppm.

Quality Assurance Certificate, automatically created for each batch or cycle of produce sanitised, can be sent together with the Data Log of actual sanitation levels achieved to customers and auditors.

## > No chemical mixing:

Chlorine and fungicide use involves diluting and mixing highly toxic chemicals.

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

## > Automatic adjustment to organic load:

The Isan system constantly monitors the active iodine disinfectant/ fungicide 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 Isan system.



## > Fully automated:

Every Isan System is equipped with a fully automated computerised control system. This system electronically monitors the biocide level and automatically doses the water to maintain preset levels. Electronic monitoring of the remaining iodine helps to ensure timely replacement of canisters.

## > 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 on constant and effective disinfection levels. No more hand-written reports.

## > Q/A Audit certificates:

Customised audit certificates can be generated automatically

for all batches of produce disinfected. This certificate can be printed and/or emailed direct to your customer.

## > Safe and user-friendly:

The Isan system is the safest and most user-friendly disinfection system available.

Its controls warn the operator of any breach of preset levels and also, in certain circumstances, can shut down the system. These warnings can be audible, visual and/or sent electronically to a telephone or a computer.

## > Eliminates chlorine from the food chain:

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

**Andrew Smith from Smith's Taminick produces stone fruit** including peaches, cherries and nectarines. His farm has been using the Isan system for some time and is very happy with the results.

"The only water available is dam water and it has to be made potable before washing the produce. The Isan system has given us outstanding results. We have recorded zero counts of *coliforms* and *E.coli*; something we have never seen before," he said.

"The system runs automatically and self monitors. Other systems are manual and require more time and effort, but the Isan system runs on its own and support from the IOTEQ team has been more than we expected. They are keen to service our needs, to ensure the system is running smoothly and to meet our requirements," Andrew said.

# the power of iodine

## Technology and operating methods.

Iodine, a powerful disinfectant for over 100 years, is further enhanced by the Isan technology to maximise this superior performance. Consequently, the Isan system allows for very low dosages of iodine (5ppm to 30ppm) to be used to achieve superior kill rates on fungi, bacteria and viruses.

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

### Why iodine kills micro-organisms:

Iodine dissolved in water is a potent broad-spectrum biocide even at low concentrations (1–30ppm). Iodine ( $I_2$ ) 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 wall and oxidise a number of critical components within the cell. The combined effect of these oxidative reactions is cell death.

### Fungi and fungicide 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 that will remove all by-products is highly significant.



## Iodine vs chlorine – why Isan delivers the most powerful biocide:

### Active killing agent:

Chlorine in solution converts to two compounds: Hypochlorous Acid (HOCl) and Hypochlorite (OCl<sup>-</sup>). Only 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 principally four compounds: Iodine (I<sub>2</sub>), Hypoiodous Acid (HIO), Tri-iodide (I<sub>3</sub><sup>-</sup>) and Iodate (IO<sub>3</sub><sup>-</sup>). Both I<sub>2</sub> and HIO are strong biocidal agents. I<sub>3</sub><sup>-</sup> and IO<sub>3</sub><sup>-</sup> 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, I<sub>2</sub> and HIO, remain effective at much higher concentrations over a much wider pH range (pH 3.0 to pH 8.5). As well, the Isan system constantly

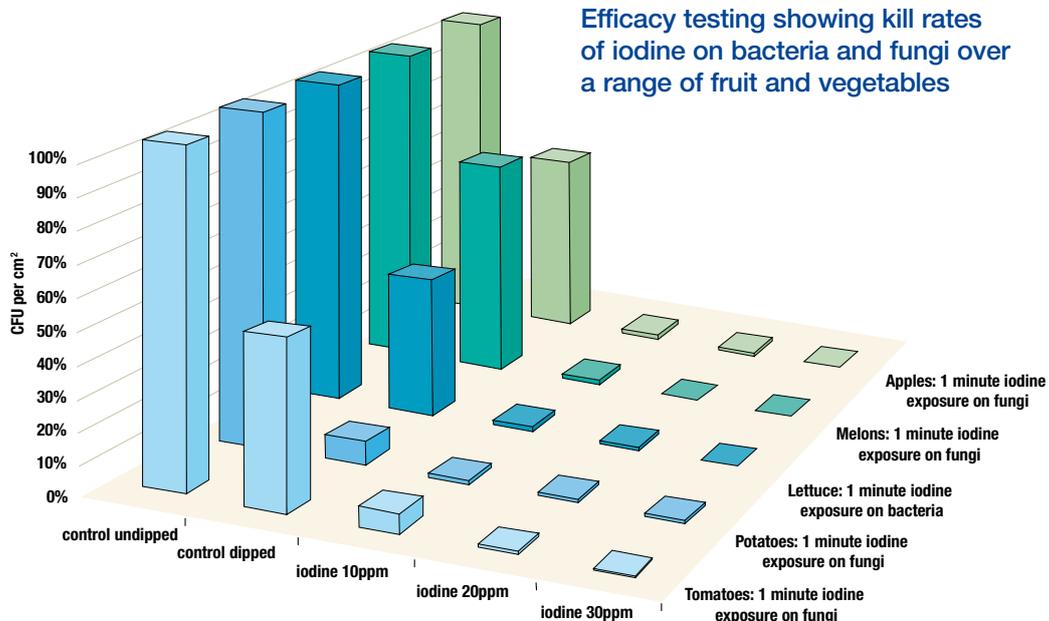


Fig. 1.0 Test results from the Sydney Post Harvest Laboratory, Australia

removes the iodide compounds formed, which further enhances the concentration of the active iodine compounds remaining in solution.

### The Isan system and its unique anion exchange resin:

The Isan system continuously removes disinfection by-products in an environmentally clean process by running the wash water through its proprietary anion exchange resin. At the same time, diatomic iodine (I<sub>2</sub>) is being added to the wash water throughout the day.

By using the Isan system in this way, species of iodine that dominate are diatomic iodine and hypoiodous acid – the most powerful biocidal species of the iodine family.

### Measuring iodine:

Isan™'s purpose-built, iodine-specific electrodes convert the millivolt (mV) reading received from the iodine in solution directly to a ppm reading. Due to the unique properties of iodine, the Isan system

can monitor, record, control and adjust the active iodine in solution in real time and at ppm rates from 1ppm 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 from occurring. Treatment of chlorinated water to remove THMs is an expensive exercise.

By comparison, iodine as used in the Isan system does not produce undesirable by-products nor THMs on the produce or in the wash water.

### Iodine and minimising corrosion:

The corrosion effect of chlorine is dramatically more than iodine as delivered in the Isan 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 has been demonstrated 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 significantly less.

The Isan system, once installed, will consequently result in significantly longer equipment life leading to substantial capital equipment cost savings.



The multi-award winning Isan system FVS 0700

System Specifications*	Isan FVS 0035	Isan FVS 0070	Isan FVS 0150	Isan FVS 0250
Power	240 V single phase	240 V single phase	240 V single phase	240 V single phase
Capacity (subject to water conditions)	Up to 35 tonnes per 8 hour day	Up to 70 tonnes per 8 hour day	Up to 150 tonnes per 8 hour day	Up to 250 tonnes per 8 hour day
Running Cost** (filtered water)	\$1-\$1.50 per tonne	\$1-\$1.50 per tonne	\$1-\$1.50 per tonne	\$1-\$1.50 per tonne
Canister replacement cycle	30-90 days	30-90 days	30-90 days	30-90 days
Measurements	Depth	1050mm	1050mm	1370mm
	Width	700mm	1400mm	1400mm
	Height	1200mm	1200mm	1200mm

\*Comprehensive additional models available for hydroponics, nurseries, direct injection, manufacturing, industrial and sewerage waste water.

\*\* Running costs can vary depending on water conditions. Dirty water will consume more iodine.

“In my experience this is the most accurate, effective and user friendly sanitation system available for fresh produce. It is not only very effective at eliminating undesirable bacteria and other microorganisms from the surface of fresh produce, but also does not have problems with dangerous trihalomethanes – a problem with chlorine sanitation systems. It is extremely safe for the operator to use due to innovative packaging and delivery systems and finally is very environmentally friendly since it retains all iodine and iodine breakdown products using a unique iodine recovery technology.”

Dr Stephen Morris  
Sydney Postharvest Laboratory  
North Ryde, Sydney Australia

“Ioteq has created and developed one of the most important advances in food plant sanitation offering state of the art technology and significant advantages for the agricultural and food processing industries.”

Dr. Joe Montecalvo  
Professor and Consultant  
Food Science and Nutrition Department  
California Polytechnic State University  
San Luis Obispo, CA USA

The Isan system – developed and manufactured in Australia



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ABN 57 103 281 410 APVMA Approval No. 54212/10kg/0204