

HIGHLIGHTS

AQUA-Cal+™ and disease control in prawns

BOOSTER-Mag™: less chemicals with better crop health

Protecting wet wells against corrosion

ACTI-Mag™ outperforms sodium hydroxide



Calix's trailer-mounted, purpose-built PROTECTA-Mag™ rig is used to carry out Vertical Spray Operations. A crew of two, trained for the spray application, traffic control and confined space entry (if required) carry out the application. Our network of local partners can deliver our solutions across Australia & New Zealand, to ensure you receive the same high quality of support, product and customer service, no matter where you are.

EDITORIAL

Welcome to Issue Number 21 of the Calix Newsletter.



Phil Hodgson
CEO

Our cover photo features our latest PROTECTA-Mag™ trailer, delivered recently to our new applications partner Laser Plumbing (<http://www.laserplumbing.com.au>). Laser Plumbing have already coated and protected 45 manholes in the last few weeks and we look forward to working with them to rapidly expand our market. An article in this newsletter also features PROTECTA-Mag™ being applied to wet wells, a traditionally expensive and difficult asset to protect, made easy with our technology.

This newsletter also features the final results of our expanded BOOSTER-Mag™ trials on tomatoes, as well as recent AQUA-Cal+™ data on the very topical problem of prawn disease. Both products continue to develop well, and our AQUA-Cal+™ product growth recently hit a milestone with our first export to the huge Indian market. AQUA-Cal+™ has also recently been advanced to the finals of the Australian Business Awards – New Product Innovation.

Our R&D efforts also continue, with some great results on a collaborative project with a major food and beverage company to improve their waste water discharge and reduce their use of dangerous chemicals also featured in this newsletter.

I hope you find our recent progress as interesting and inspiring as the team at Calix do!

KEY MILESTONES

AQUA-CAL+™ AND DISEASE CONTROL IN PRAWNS

Calix has recently conducted lab trials (trials where conducted in Blue Archipelago laboratory at I-kerpan facility) on green vibrio, the bacteria behind “EMS” or early mortality syndrome, the most devastating prawn disease in South East Asia.

In these tests, the level of green vibrio in prawn pond bottom sludge was observed over a 4 month (typical prawn grow-out) period.

As can be seen from the following table, in both aerated and non-aerated samples, the sludge treated with Calix AQUA-Cal+™ returned zero green vibrio.

Water Parameters	Before Treatment	Control no aeration (CX)	Control with aeration (CA)	AQUA-Cal+ 100ppm no aeration (AX)	AQUA-Cal+ 100ppm with aeration (AA)
pH	8.4	8.5	8.5	8.6	8.6
Alkalinity (ppm)	120	125	115	195	220
Vibrio Green (CFU/ml)	170	120	110	0	0

HOW DOES IT WORK?

Testing at the University of Queensland has confirmed the ability of our nano-active magnesium products to bind phosphates and nitrates within the tiny particle pores, due to the very high surface area of our materials. In a prawn pond bottom, this means that these waste products of healthy bacterial colonies are “soaked-up” on our particles, helping keep an oxygenated and balanced environment, and preventing the rapid outbreak of pathogenic bacteria.

EXPORTS GROWING

In addition to several recent successful exports to Malaysia, we are also pleased to announce our first shipment via our Malaysian partner – Maha Chemicals – to India – another huge potential market.



Mixing up a batch of AQUA-Cal+™ in India.



In 2016, India became the largest exporter of shrimp in the world.

BOOSTER-Mag™ LATEST RESULTS

BETTER CROP HEALTH BUT LESS CHEMICAL TREATMENT WITH BOOSTER-MAG™



Following on from promising field trials across 3 farms in the 2015/2016 season, the first of the 2016/2017 expanded scale BOOSTER-Mag™ field trials is now complete with hand harvesting and mechanical harvesting undertaken on the 28th February and 19th March respectively.

The chemical spray record and hand-harvest data obtained to date are instructive. Spray records indicate that 7 fewer hard chemical sprays were applied in the trial plot with no ripening agent used. In addition to a late season application of ripening agent, nine separate conventional pesticide (sprays typically insecticide and fungicide blends) were applied on the control plot.

Distinctly in the trial plot, BOOSTER-Mag™ was applied on 7 occasions at a 1.5 kg/ha (every two weeks approx.) requiring additional intervention with conventional pesticides on two occasions only (9 x spray events in total) to control:

- mid-season, localised heliothis grub hot-spots
- late season, localised russet mite hot-spots

Over the season, the grower (and the Australian Processing Tomato Research Council Inc. (APTRC) scout) commented that more or less equivalent levels of insect pest and disease pressure were encountered indicating that reduced pesticide use was achieved without obviously compromising general crop health. They also commented on the prevalence of a healthy biodiversity of life on the trial plots, noting the ubiquitous presence of spiders and other predatory and beneficial fauna.

PROTECTA-MAG™ FOR WET WELLS

WET WELLS ARE CRUCIAL ASSETS FOR TRANSPORTING SEWAGE. THEY ARE PRONE TO ACID ATTACKS AND CORROSION DUE TO THE LARGE AMOUNT OF "ROTTEN EGG GAS" GENERATED.

Historically, carrying out any corrosion protection or rehabilitation work in a wet well is always a challenge. The asset needs to be stopped or bypassed - all the equipment, supports, electricals etc. installed in the asset need to be removed and then re-installed after the work is completed. This explains why the cost for works on wet wells is very high and poses immense operational difficulties as the asset is out of service.

The coating options available today are also an issue next issue as they often peel, bubble, or crack in a relatively short period and need to be completely removed thereafter; a costly and difficult process.



A very simple process

A more cost-effective method is to use PROTECTA-Mag™ technology. PROTECTA-Mag™ not only protects the concrete and steel exposed to corrosion attack but also stops the chemical process responsible for corrosion by raising the surface pH, neutralising acids and inhibiting the formation of acid producing bacteria.



Treatment	Total Fruit Yield Tonnes/ha	Red Fruit Yield Tonnes/ha	Red Fruit Tonnes/ha Soluble Solids
Control - Average	105.62	91.14	5.01
Trial- Average	120.93	103.13	5.43

With marketable yield and soluble solids; up 13% and 8 % respectively, and in addition to the reduced conventional pesticide usage realised, the data indicates substantial marketable yield and yield quality benefits may be realised sustainably via BOOSTER-Mag™ adoption.

BOOSTER-Mag™ was recently featured in the March 2017 issue of Tomato Topics, a publication by the APTRC and Horticulture Innovator Australian for the processing tomato industry. Please contact us to receive a copy.



1. All the equipment remains in the asset;
2. The asset remains in operation;
3. Entry in the asset is not required;
4. Cleaning is done with relatively lower pressure water to protect the concrete against more erosion;
5. Once the coating has reached the end of its useful life, the the wet well can be cleaned with water and simply recoated, providing lifelong protection of the asset.

Additionally, all this is achieved at a very competitive cost. Calix has now established a network of local distributors and partners who can deliver PROTECTA-Mag™ across Australasia, to ensure you receive excellent customer service and support, wherever you are located.



Wet wells are typically complex sewer assets.

Learn more or watch how it is done by visiting the Wet Well Coating Solution page (under [Applications](#)), on the Calix website, or on our Youtube channel.

R&D UPDATE

ACTI-MAG™ PERFORMED BETTER THAN SODIUM HYDROXIDE IN WASTEWATER DISCHARGE.

One of Australia's major food and beverage companies, engaged in the manufacture and distribution of many well-known brands contacted Calix to help them better comply with wastewater regulations.

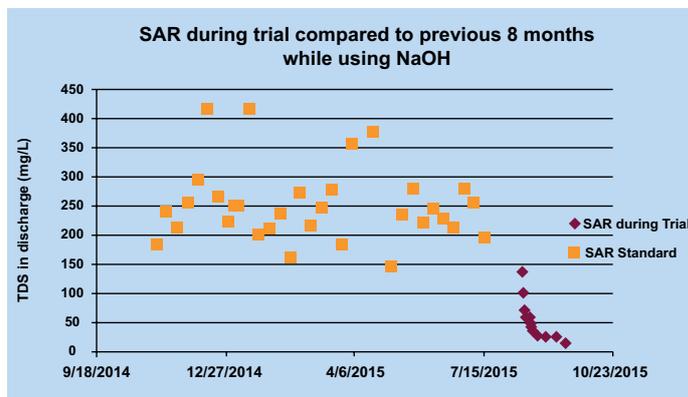
Years of high TDS (total dissolved solids) in the discharge water at their Sydney site resulted in the water utility requesting that they undertake a trial using magnesium hydroxide as an alternate neutralisation chemical to sodium hydroxide (caustic soda). This was proposed in order to reduce the sodium absorption ratio (SAR) of the discharge which is the ratio of the concentration of sodium ions to the concentration of magnesium and calcium ions and is used to quantify the ability of water to be used for irrigation.

Calix was contacted to supply ACTI-Mag™ to be utilised in the existing caustic dosing pumps, along with an additional conical based tank to prevent settling. The trial was conducted over a period of 46 days.

ACTI-Mag™ raised the pH effectively to the specified limits while significantly reducing the total dissolved solids to 60% of the previous 8 month average value. This was considerably less than the specified target value of a 25% TDS reduction. The SAR was reduced by an order of magnitude from 250 to 32.8 which is a considerable reduction compared to the initial target of 25%.

In addition to the TDS and SAR benefits, there was also a significant reduction in the volume of chemical used.

In addition to a better discharge water quality, the use of ACTI-Mag™ was found to be considerably less expensive than caustic, resulting in a yearly saving of around \$15,000.



	Magnesium Hydroxide Mg(OH) ₂	Caustic Soda NaOH
SAFETY	SAFE to handle and is classified as NON-HAZARDOUS .	Hazardous to handle. Skin / eye contact can cause severe burns. Breathing can cause lung damage.
ENVIRONMENTAL IMPACT	NO Environmental impact magnesium may provide benefit to environment.	Highly corrosive can cause immediate damage to environment.
EASE OF HANDLING	Supplied in concentrated slurry form (55-65%). Requires agitated storage to prevent settling. Freezes at 0°C. Containment not required other than for housekeeping.	Advanced safety training and protective clothing required. Containment required. 50% solution freezes at 13.9°C.
SLUDGE	Produces less sludge than caustic soda, lime and soda ash. Produces fast settling high solids sludge that is easily dewatered.	Metal hydroxide precipitate creates gel-like, slow settling sludge that is difficult to dewater.
REACTION CONTROL	Excellent control: fast acting to pH 6.0. Slower pH rise above pH 6.0 results in more controllable conditions.	Very fast acting to full neutralization, loss of pH control.
MAXIMUM PH IF OVER DOSED	9.0	14.0

INTRODUCING

SIMON THOMSEN - PROJECT ENGINEER

Simon earned his degree in Mechanical Engineering from the University of New South Wales, graduating in 2011. During his degree, he completed his industrial training with Calix, developing the concept and running heat and mass balances for the CFC15000 which was at the time in an early conceptual stage. After graduating, he joined Calix full time and immediately began work on the process design of the CFC15000 plant. Simon would end up being heavily involved in the plant from its conception and design, moving



to Bacchus Marsh through its construction and commissioning before it transitioned to a successful full time production facility.

Since then, Simon has taken on a multitude of roles as required by the varying needs of a fast growing company. These have included project managing periodic upgrades of the CFC15000 facility, managing the delivery of services for high value customers such as Melbourne Water and most recently, held a pivotal role in completing the engineering on the pre-FEED study for the LEILAC project in Europe.

In his free time, Simon enjoys getting outdoors running or on his mountain bike. He recently completed an ambitious personal project - building a Formula Vee racing car of his own design which he began racing in 2017.

To learn more about Calix technology, products, applications and services,
Visit www.calix.com.au
Or call 02 8199 7400

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