Magnesium Hydroxide Liquid
A preferred solution for odour control

A catchment dosing approach,
with remote monitoring services.

ACTI-Mag™

Case Study Snapshot

Challenges

- Odour in sewage network due to high hydrogen sulphide (H_2S) generation.
- Heavy build-up of Fats, oils and greases (FOGs) in the network.
- Frequent need for vacuum truck cleaning leading to increased maintenance costs.
- High treatment costs due to high chemical use (lime and alum) and associated equipment and maintenance.

Solution

- Dose the network with Calix's ACTI-Mag magnesium hydroxide liquid.
- Remote monitoring and weekly reporting, to ensure ongoing control of H_2S and pH levels, and optimization of ACTI-Mag usage.
- Eliminate STP lime dosing & reduce alum dosing.

Benefits

- Reduced H_2S generation and release within the catchment.
- Significant FOGs reduction within the catchment.
- Savings on STP chemical use and maintenance.
- Optimization of chemical usage, enabled by Calix SCADA monitoring services and reporting.
- Ongoing monitoring and customer support during COVID travel restrictions.

** SCADA: Supervisory Control and Data Acquisition.*

Background

LOCATION

Cassowary Coast Region, Queensland, Australia

OBJECTIVES

- Manage H_2S and odour levels.
- Eliminate or reduce FOGs build-up in the network.
- Save on chemical and maintenance at the treatment plant.
- Ongoing monitoring and optimisation in remote area.

Introduction

Mission Beach is a mixed residential and tourist area in the Queensland wet tropics region and is home to the iconic Cassowary. A sewerage scheme was commissioned by Cassowary Coast Regional Council in 2006 to collect the wastewater from three constituent communities and pump by two major stations, at Wongaling Beach and North Mission Beach, to the Main Transfer Pump Station (MTPS). The MTPS then pumps 23km to the Tully Sewerage Treatment Plant (STP).

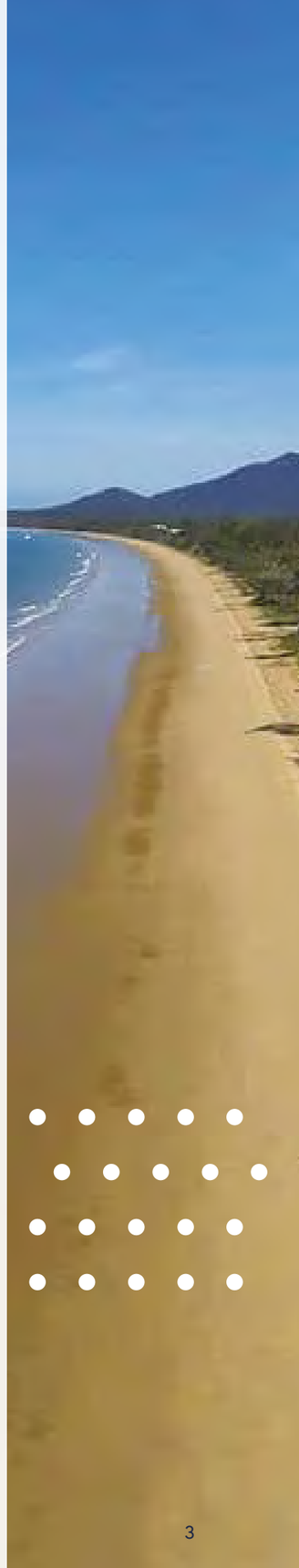
This sewer main suffered significant corrosion due to “rotten egg gas” (H_2S) release in the drained sections. The Tully plant is designed for partial bio-phosphate removal with trimming by liquid alum dosing and powder lime dosing for alkalinity and pH correction.

ACTI-Mag™

A trial of Calix’s ACTI-Mag Magnesium Hydroxide Liquid (MHL) dosing commenced in December 2017 with the primary objective being to control septicity, odour and corrosion issues. Calix also proposed the additional objectives:

- the control of Fats, Oils & Greases (FOGs) build-up
- elimination of lime dosing at the Tully plant
- significant reduction of alum dosing for phosphate removal

The trial eliminated odours by maintaining pH between 8.2 and 8.5. Pump station cleaning has been substantially reduced due to decreased FOGs accumulation. The lime dosing system was prone to blockage and breakdowns, however dosing of ACTI-Mag has allowed suspension of lime dosing. Also, the Alum dose rate has been reduced by more than 75% whilst still consistently meeting the phosphate effluent discharge limits.



Fats, oils and greases (FOGs)
A challenging issue

Fats, oils and greases can build up and become fatbergs.

Fatbergs are caused when oils and fats are tipped down the drain and congeal with other products, including so-called flushable wet wipes.

While each state has their own utility providers, there were at least 360 blockages per months caused by fatbergs in sewers serviced by QUU — which take in the Brisbane area and four other local councils.

That's out of a total of 3,500 blockages in QUU sewer pipes that together cost $1.2 million to clear. Fatbergs also caused almost 250 sewage overflows.

But fats, oils and greases also play an important role in wastewater treatment plants, particularly those with anaerobic digesters that capture biogas to generate electrical and thermal energy.

ACTI-Mag™

Why is ACTI-Mag different
to generic magnesium hydroxide slurries?

ACTI-Mag is a concentrated and stabilised suspension of magnesium hydroxide (also known as milk of magnesia). An inorganic compound with the chemical formula $Mg(OH)_2$.

Highly fluid, ACTI-Mag has proven to flow easily in most dosing systems. With a higher neutralising value per dry kilo when compared with caustic and lime and being significantly safer than other traditional alkalis, ACTI-Mag is a very cost competitive option for hydrogen sulphide gas (H_2S) control in sewers and industrial waste treatment as well as for several other applications including phosphorus and partial nitrogen removal from wastewater.

Calix's ACTI-Mag has several advantages over other generic MHLs.

- Neutralises waste streams up to 30% faster than generic brands.
- The pH peaks at 10.3 and buffers in the solution between 8.5 and 9.
- The MHL dissolves slowly over time with particles remaining in suspension for as long as needed.

NEWS

Brisbane residents warned about fatbergs brewing under city

Dosing your network with ACTI-Mag Magnesium Hydroxide significantly eliminates H_2S odours and saponifies and dissolves fats oils and greases (FOGs).

Reference

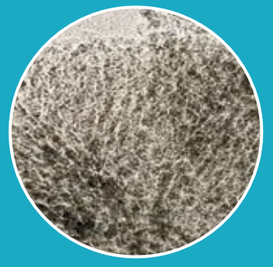
https://www.couriermail.com.au/news/queensland/brisbane-residents-warned-about-fatbergs-brewing-under-city/news-story/1d7b8868ac18c3a38ea604d93a85aebd

Slurry chemistry podcast
ACTI-Mag Magnesium Hydroxide's reactivity in wastewater treatment

Watch our slurry chemistry podcast to understand ACTI-Mag Magnesium Hydroxide's reactivity in wastewater treatment:

https://youtu.be/2pFW31G6Rc4

ACTI-Mag Manufacturing Process



'Mineral Honeycomb'– nano-pores from CO_2 release during calcination

Calix's magnesite (magnesium carbonate) is mined and calcined in-house. Vertically integrated manufacturing means better service, reliability and performance. Calix is certified ISO 9001:2015 for process development, manufacture, delivery and application of mineral based products.

Calcination is an ancient process used to produce lime in a kiln. Calix "Flash Calcination" process involves grinding magnesite to around one thousandth of a millimetre in size, and then rapidly "flash" heating the particles for a very short time at up to 800 degrees Celsius. As chemically bound CO_2 "fizzes out" of the particles, we rapidly cool the magnesium oxide (MgO) produced which remains in a very reactive high energy state, leaving a very porous, honey-comb-like structure.

Calix technology is uniquely placed to capture the released CO_2 with demonstration projects in the lime and cement industry already underway. For more information, visit: https://www.project-leilac.eu/

ACTI-Mag is manufactured by hydrating Calix's high surface area magnesium oxide. This means it has the high reactivity of a nano-active material, without the potential health and handling issues.

Calix ACTI-Mag trial

At Mission beach (MB) sewerage scheme

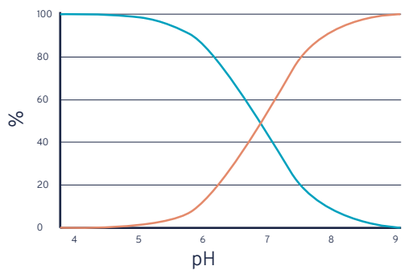
- 3 sub-catchments – North MB, Wongaling Beach, South MB.
- 18 pump stations.
- Pumped to Tully STP (23 km).
- 2.5 – 3 day retention time in dry weather.
- MB ~ 800 kL/d ADWF or 40 – 45% of total Tully STP inflow.
- Calix ACTI-MAG trial started on Dec 12th, 2017.
- STP Alum and Lime dosing – for Phosphorus removal and alkalinity addition /pH control.

Primary objectives and success criteria for the network

- Controlling the odour within the catchment, H_2S < 5 ppm.
- Eliminating build-up of FOGs in the sewer

Secondary objectives and success criteria for the network and plant

- Reduce corrosion within the network.
- Demonstrating no detrimental impact on the STP.
- Reducing or eliminating lime dosing at the STP.
- Enhancing the removal of Phosphorus (P) and Nitrogen (N).
- Consequently, reducing Alum dose at the STP. catchment, particularly at pump stations



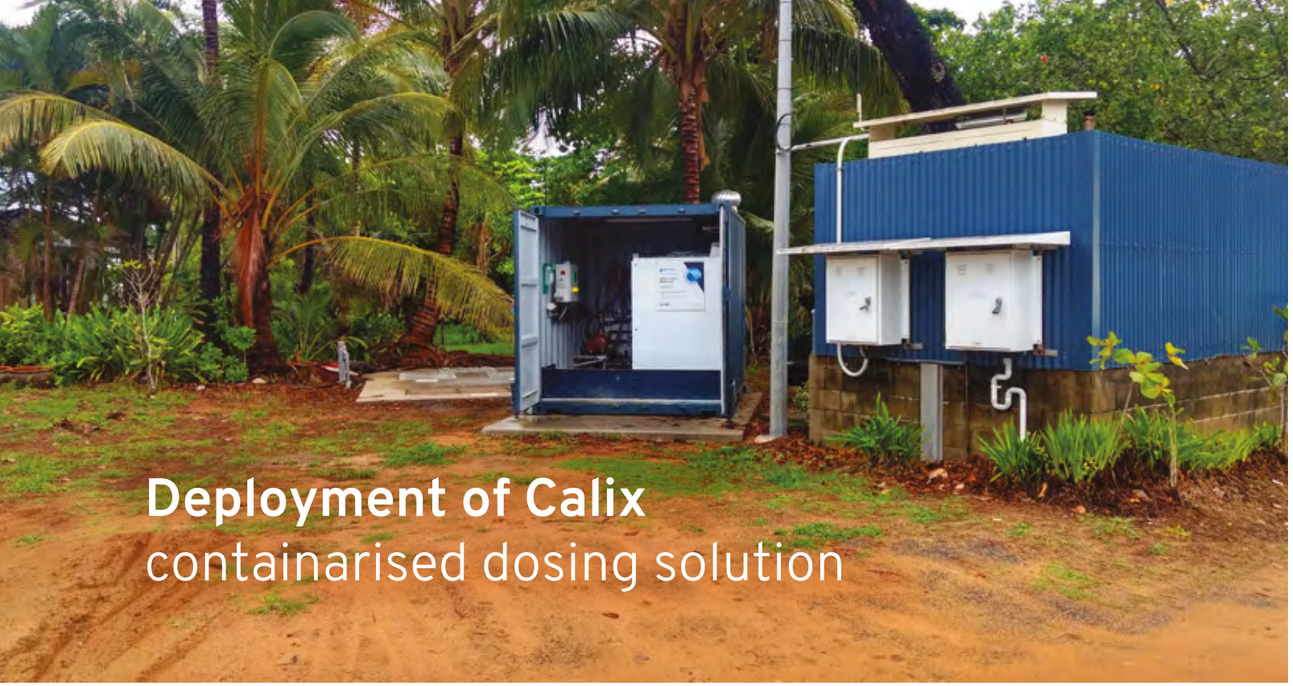
H_2S Chemistry

$H_2S_{(aq)} => HS^- + H^+$

At high pH HS^- predominates

- Limited H_2S release (locked-up)
- Greatly reduced odour & corrosion

Following the success of the trial at Mission Beach, Calix was awarded a multi-year contract for the supply of ACTI-Mag magnesium hydroxide, dosing equipment and monitoring services.



Deployment of Calix
containarised dosing solution

Calix leverages a culture of innovation to provide fully customised services such as design expertise, engineering know-how, detail engineering, installation, piping and commissioning services to provide turnkey systems for chemical dosing of Magnesium Hydroxide Liquid (MHL).

Our engineered and cost-effective solutions are tailored to meet your specific needs and budget.

Quick to install – our modular dosing units can be delivered on site by truck and are fast to set up and connect.

The following metrics are being continuously monitored within the network, through the customer and Calix's private SCADA control networks.

- pH logging
- H_2S (Odalog)
- FOGs build-up and SPS cleaning requirements
- The rate of corrosion (long-term assessment)

Results

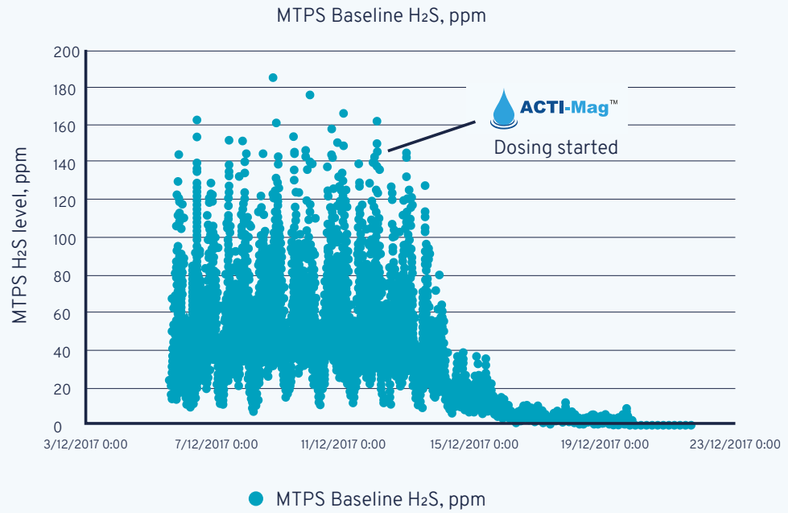
of primary objectives

1. Reduce H2S and odours to negligible levels

2. Reduced FOG build-up & reduced cleaning

Observations show that ACTI-Mag:

- Reduced H_2S and odour to negligible levels within 3-4 days of dosing.
- Eliminated FOGs build-up within the network and allowed rags to flow through to be captured by the STP.
- Eliminated the use of costly vacuum trucks to clean out 'fatbergs.'



FOGs
breakdown process

Wastewater has large quantities of low density, long-chain fatty acids.

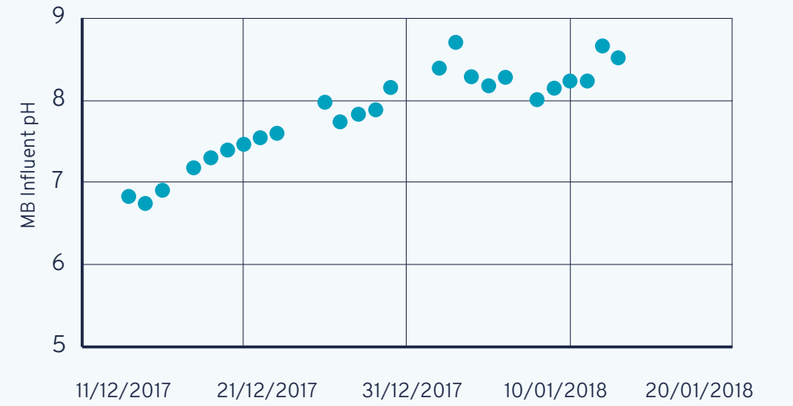
ACTI-Mag slowly releases hydroxyl ions, which breakdown low-density, large-chain fatty acids into glycerol and various types of soap, both of which are more readily digested by bacteria in wastewater.

The Carboxylate salts that are produced further facilitate the breakdown of other fats.

Results

of secondary objectives and other benefits of ACTI-Mag

- The pH levels the STP were stable and no low pH events occurred.
- Lime dosing was eliminated, leading to significant operational and maintenance cost saving; the alkalinity in effluent and the plant's pH was stabilised.
- Use of Alum dose was reduced by 75%, resulting in cost saving; consistently low effluent phosphorus concentration < 0.5 mg/L was observed regardless of flow.



Slow pH rise – 3 weeks (v/s 3-day retention)
– attributed to FOG breakdown and observed the associated release of 'aged' rags.

Struvite

forms in pipe bends due to pressure differential in the flow, release of dissolved CO_2 & a small rise in pH.

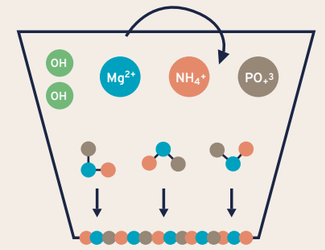
Struvite
A treatable nuisance

Magnesium Ammonium Phosphate (MAP), commonly known as Struvite, is a crystalline precipitate of Magnesium, Ammonia, and Phosphate.

$Mg^{2+} + NH_4^{+} + PO_4^{3-} + H2O \Rightarrow Mg.NH_4.PO_4.6H_2O\ (s)$

Nuisance Struvite forms in pipe bends due to pressure differential in the flow, release of dissolved CO_2 & a small rise in pH . This leads to a crystalline build-up creating blockages and restricting flow.

The advantage of dosing ACTI-Mag is that it precipitates ammonia and phosphate as struvite directly in the sludge matrix and stops uncontrolled struvite forming in pipelines and on treatment structures.



Turnkey solutions for chemical dosing, wherever you are located.

We can help you review and optimise your wastewater process to make sure your system is running smoothly and cost effectively.

The unique and highly reactive property ACTI-Mag magnesium hydroxide offers many benefits:

- **Efficient H_2S levels and odour management**
- **Dissolution of Fats, Oils and Greases (FOGs)**
- **Elimination of struvite blockages**
- **Tangible chemical and maintenance costs savings**

Engineered by us, our cost-effective dosing solutions are designed to meet your specific needs and budget. Quick to install, Calix modular dosing units can be delivered to site by truck and are fast to set up and connect.

Calix leverages a culture of innovation to provide fully customised services such as:

- design, engineering, installation, and commissioning of dosing equipment;
- monitoring and reporting services to ensure full and ongoing control H_2S and pH levels, whilst optimising usage rate and chemical costs.

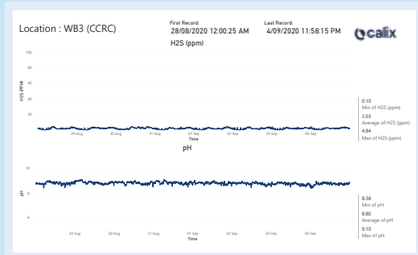
...so that you can review your network, get the information you need - when you need it - to make sound decisions based on reliable data.

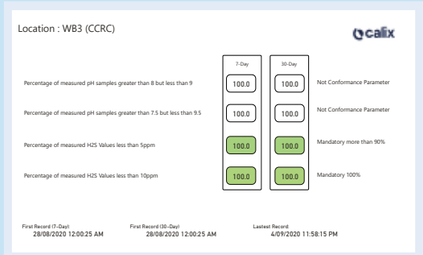
"Calix reports are clear, simple to read, and have really made a difference."

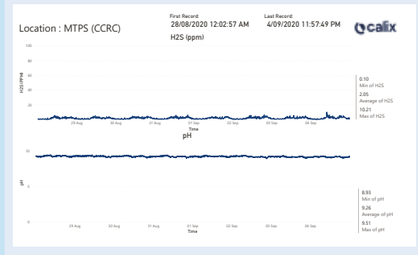
(Geoffrey Smart Manager Water, at Cassowary Coast Regional Council)

Watch our success story - Magnesium Hydroxide Liquid for odour control

https://youtu.be/GdnOuJSF1dw







calix

A Global Company

From our base in Australia, we've reached out across the globe. We are now present on four continents and distribute our solutions in many countries.

Distribution Partners

Calix has established a network of local distributors and partners who can deliver our solutions across the globe, to ensure you receive excellent customer service and support, wherever you are located.

calix.global

Calix is committed to sustainable practices that contribute to saving the planet. This means we try to reduce printing where possible or make sure that when we do print it is on 100% recycled paper.

100% Recycled Paper