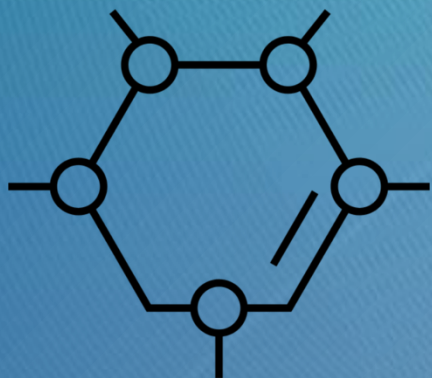




DIOTIN

CREATING A CLEANER TOMORROW TODAY





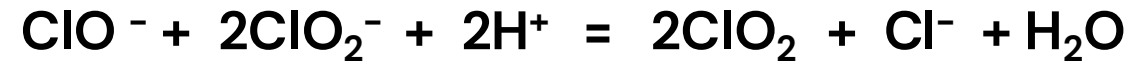
In-situ production of chlorine dioxide for water systems:

- A formulated, single drum product
- Ready to use, no on-site generation is required
- Unique chemical buffering for product stability, safety and optimised biocide release
- Chlorine Dioxide is created when added to water ($\text{pH} < 10$)



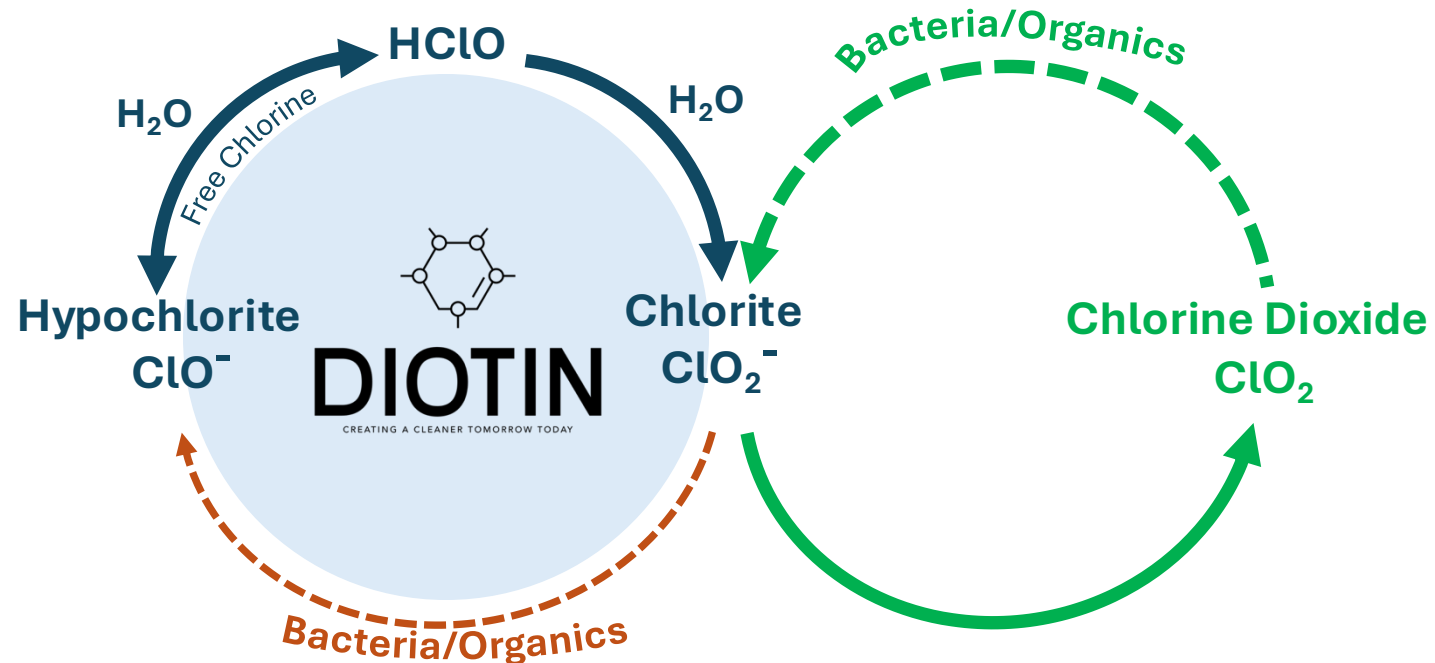
A Unique Chlorine Dioxide

In-situ generation of Chlorine Dioxide by oxidation:



Two active biocides: chlorine dioxide, generated from sodium chlorite by oxidation with the active chlorine released from sodium hypochlorite in solution.

Complexed reaction, in chemical Equilibrium:



A Unique Chlorine Dioxide

DIOTIN produces complexed Chlorine Dioxide:

- Created in the liquid phase, no gassing off (high residual longevity)
- Complexing reduces potential for system corrosion/degradation
- More effective than generated ClO_2 & sodium hypochlorite at high temperatures
- Buffered complex in equilibrium with free chlorine minimises AOXs

A Comprehensive Approach:

DIOTIN technology has created one of the most versatile and powerful oxidants in water treatment for the control of:

- Bacteria
- Biofilm
- Pathogens
- Fungi/Yeasts
- Waterborne Viruses

DIOTIN

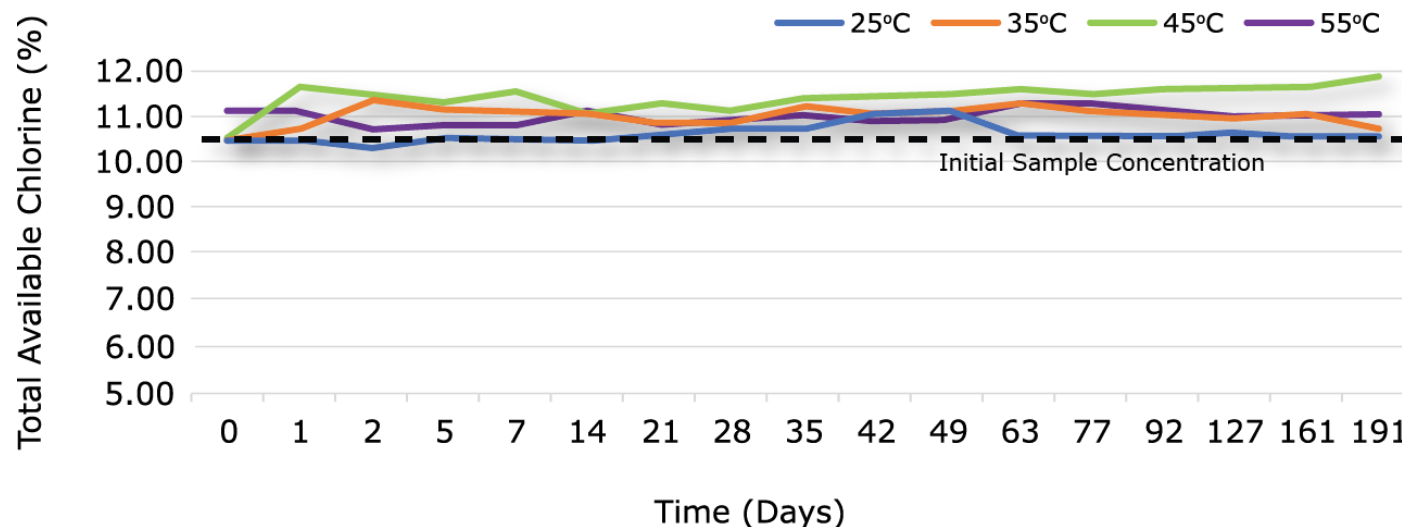
**Total potential oxidising power =
60g/Kg (60,000 ppm)**

- Potentially 10x more efficacy than Hypochlorite
- Up to 2x the ClO_2 residual of generators



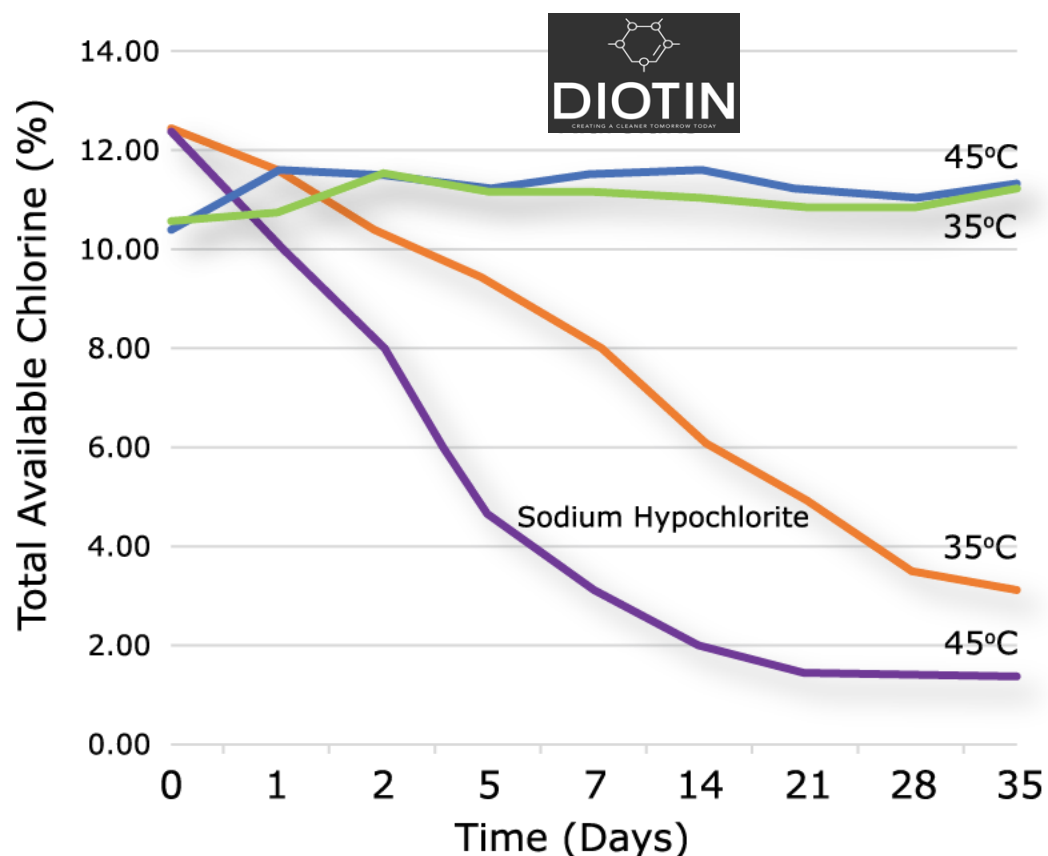
DIOTIN High Temperature Stability

Testing for degradation in available chlorine:



- No loss of chlorine was observed at any temperature tested (25–55°C)
- No degradation of product means:
 - Improved safety; no toxic gassing or odour issue
 - Ability to bulk store, improved ESG (fewer shipments, no packaging disposal)
 - Confidence In supply & storage in hot climates and remote areas
 - No product wastage

DIOTIN comparison with 12.5% Sodium Hypochlorite:

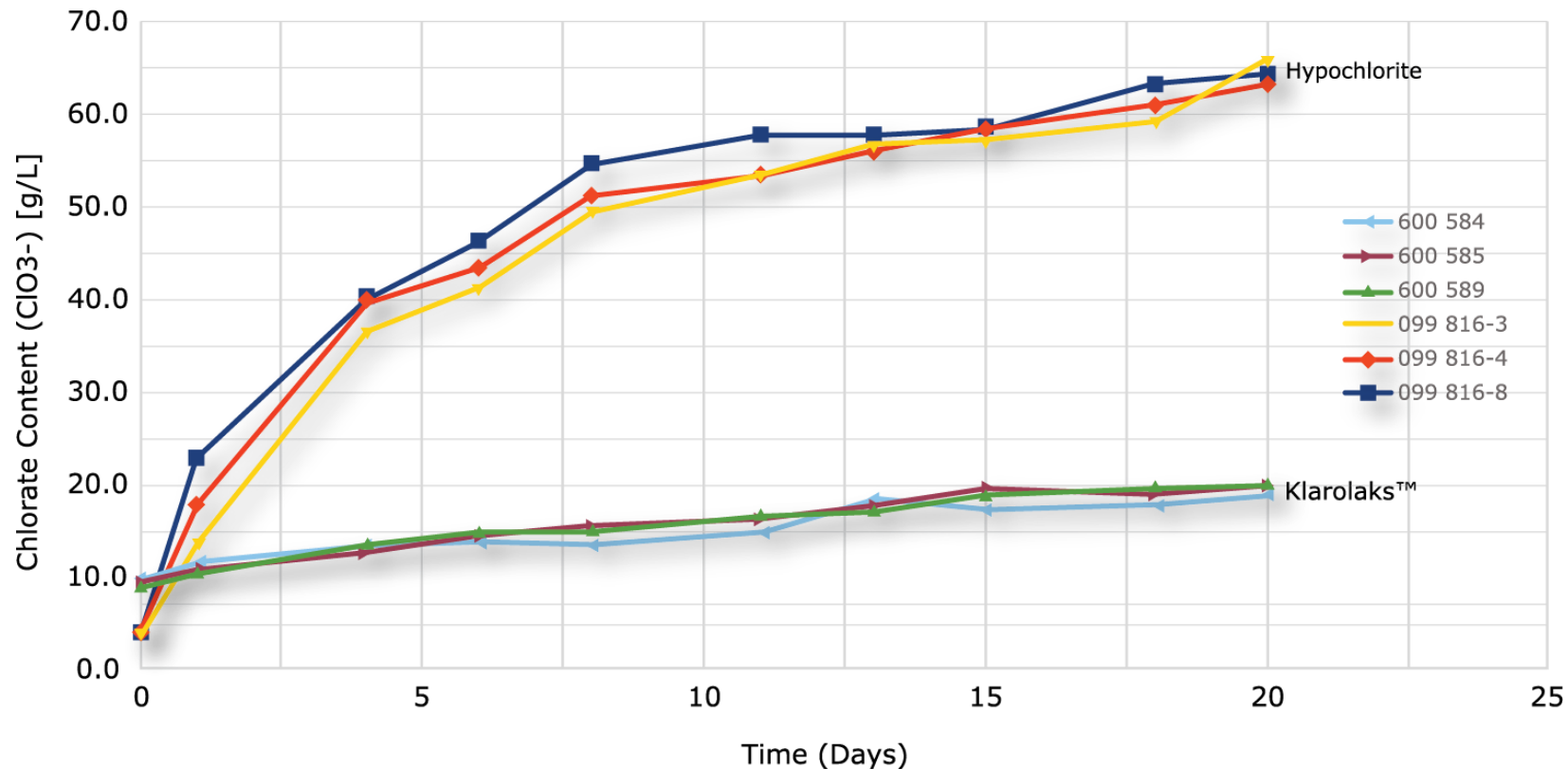


Observations:

- High degradation of hypochlorite at high temperature means:
 - Significant increase in chemical required for system control
 - Useability of fresh product is less than 2 weeks.
- Rapid decomposition of hypochlorite **forms high levels of chlorate**, creating issues for use as a disinfection for potable water in hot climates.
- DIOTIN maintains stability and does not degrade at higher temperatures to add chlorate into the stored product.
- DIOTIN is stable for +12 months at elevated temperatures, giving continuity in supply and confidence in sustained control of system disinfection.

Chlorate formation in Hypochlorite vs. DIOTIN at 50°C Over Time

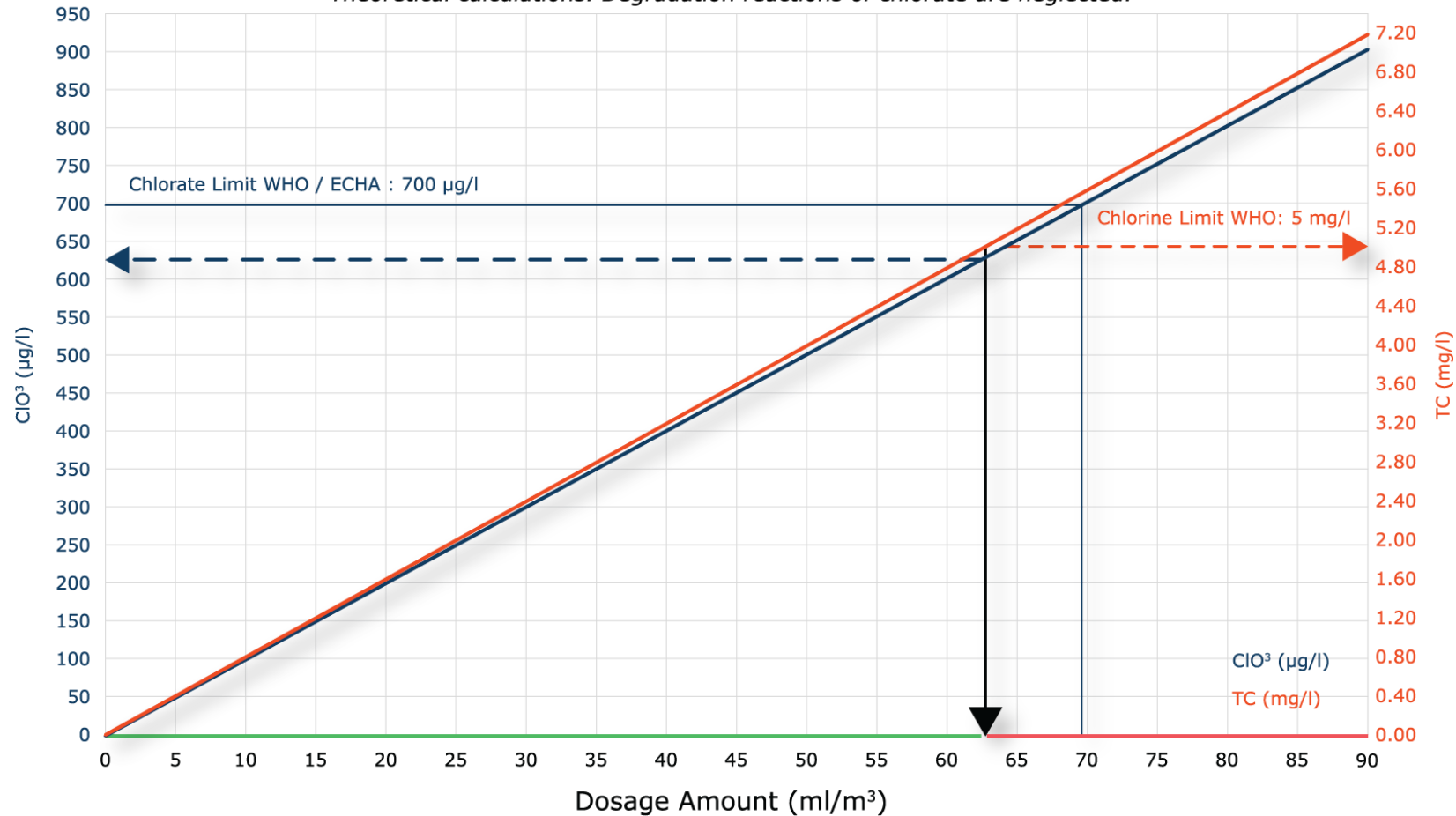
DIOTIN batches 600 584, 585 and 589 produced 22 days before t=0
Hypochlorite IBCs 099 816-3, -4 and -4 delivered 2 days before t=0



Chlorate contribution from DIOTIN

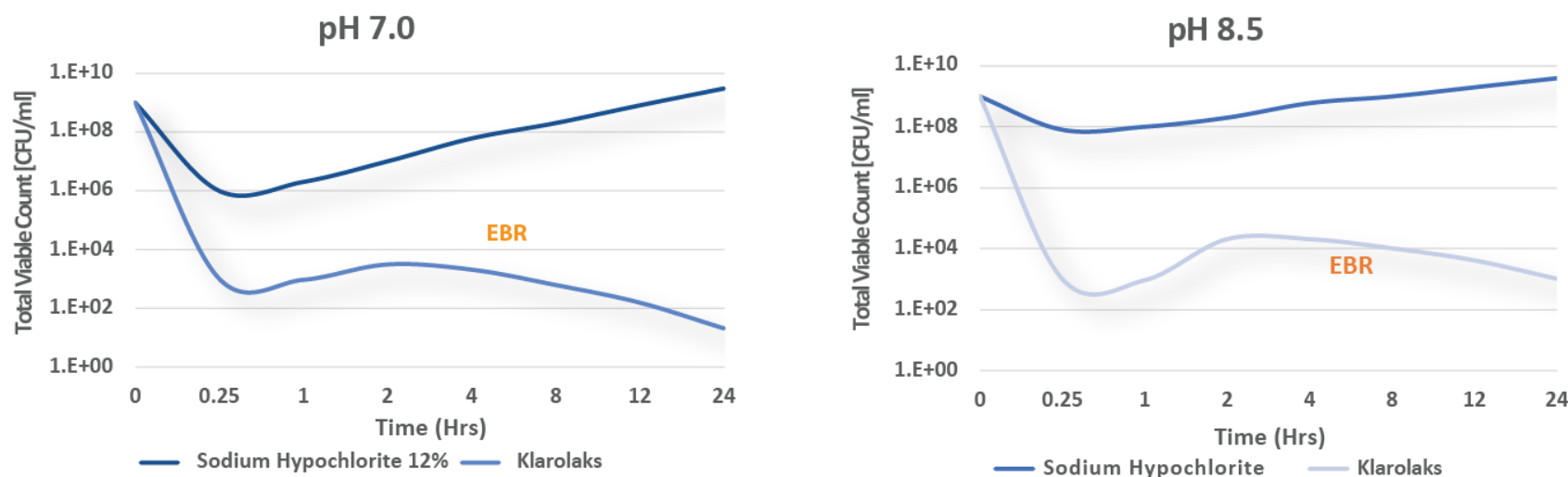
Chlorine — Chlorate in Water at different Dosing Rates Worst — Case — Calculation for Drinking Water (WHO):

Theoretical calculations. Degradation reactions of chlorate are neglected.



Independent Microbial Tests

Comparing microbial kill rate for 12% hypochlorite @10ppm Total Chlorine and 6% DIOTIN @0.5ppm Total Chlorine (MIC as tested).



Observations:

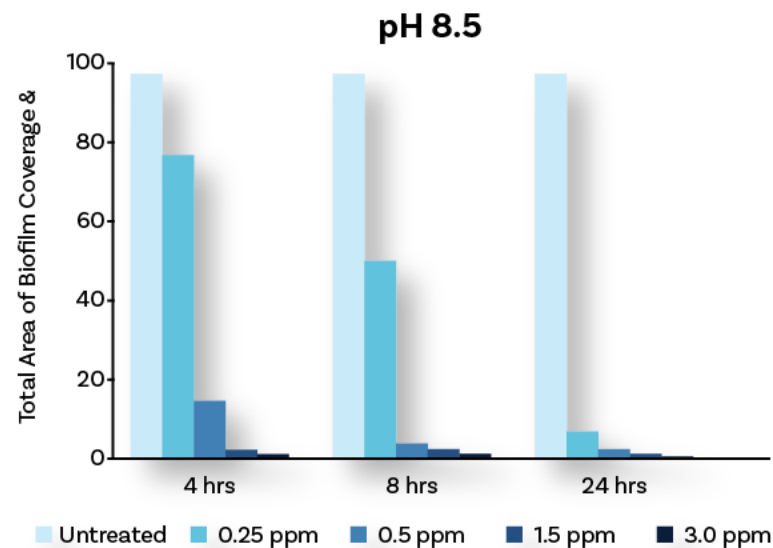
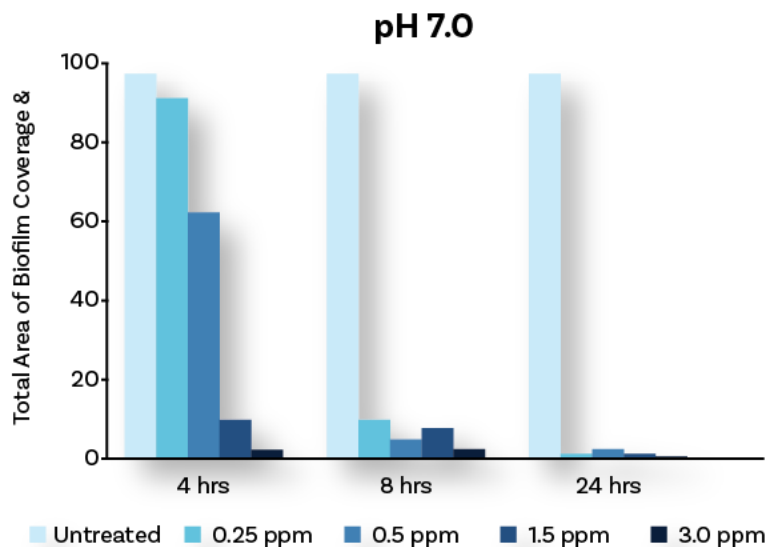
- Hypochlorite efficacy is weak and decreases with increasing pH. Initial kill is not sustained beyond 1 hour and microbial growth recovers.
- Tests demonstrate the Extended Biocide Release mechanism (EBR) within Klarolaks. Biocidal efficacy is maintained for +24 hours.

NOTE: To fully validate extremes of performance, DIOTIN used in these tests was 12 months old from date of manufacture.

Independent Microbial Tests

Biofilm Removal:

- Live cells exposed to sustained levels of DIOTIN at different pH show excellent, consistent kill rates and subsequent reduction in biofilm growth.
- A continuous level of 0.5ppm active chlorine for as little as 8 hours will sufficiently eradicate biofilm and inhibit regrowth over the pH range found in typical water systems.
- Shock dosing DIOTIN at 1.5 ppm active will effectively remove biofilm in less than 4 hours.

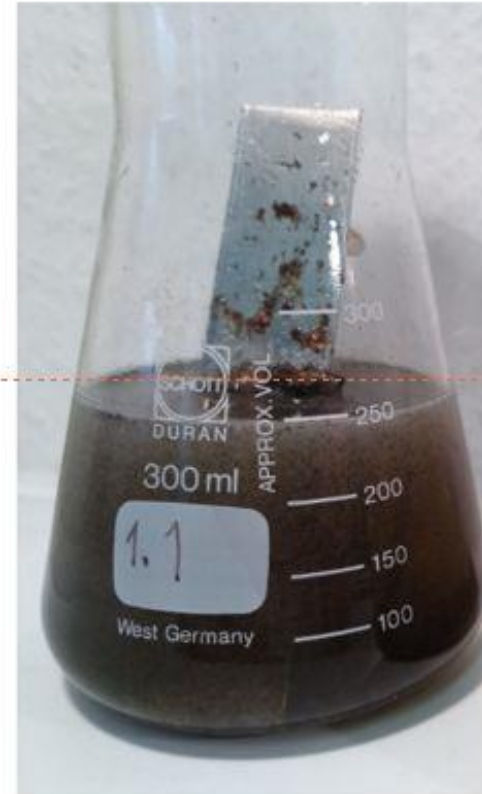


Corrosion Test: 316 Stainless Steel

27 hours DIOTIN vs 12% sodium hypochlorite



DIOTIN Stainless Steel: 1.4301/1



NaClO; Stainless steel: 1.4301/1

Application & Dosage

Application	Typical Dosage (ml/m ³ water)	Total Chlorine (mg/l)	Minimum Free Chlorine residual (mg/l)
Potable Water	10	0.6	0.25
Swimming Pool/Spa	30 - 40	1.8 – 2.4	1.0
Cooling Systems*	15 - 20	0.9 – 1.2	0.5
Process Water	20 - 100	1.2 – 6.0	0.5
Hot & Cold Water Services**	10 - 15	0.6 – 0.9	0.25

* Follow local authority guidelines on biocide levels for maintaining control of Legionella and other pathogens.

** For system flushing & compliance disinfection/cleaning refer to HSG 274 & BS 8558 for dosage and contact time.

Oxidant Performance Comparison

Biocide	Biocide Efficacy		24-month Shelf Life	Potential Harmful by-products	Handling & Ease of Use	Corrosivity*	Cost in Use
	pH Dependence	Temperature Dependence					
DIOTIN	● ● ●	● ● ●	● ● ●	● ●	● ●	● ●	● ●
Hypochlorite	● ● ●	● ●	● ● ●	● ● ●	● ●	● ●	● ●
Generated ClO ₂	● ● ●	● ● ●	● ● ●	● ●	● ● ●	● ●	●
Stabilised Bromine	●	●	● ● ●	● ● ●	● ● ●	●	● ●
Bromine 2 pack (Hypo + Bromide)	●	●	● ● ●	● ● ●	● ●	●	●
Peracetic Acid	● ●	● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●

* All above oxidants are corrosive to metals & dermal tissue

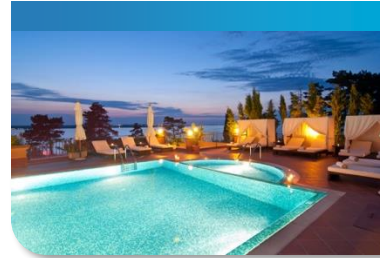
● ● ● Excellent

● ● ● Very Poor

Operational Sectors



Healthcare



Leisure & Hospitality



Animal Husbandry



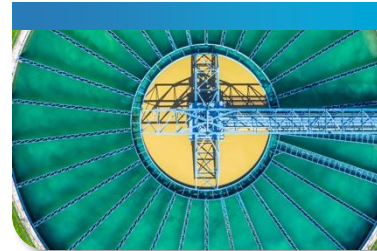
Food Processing



Desalination



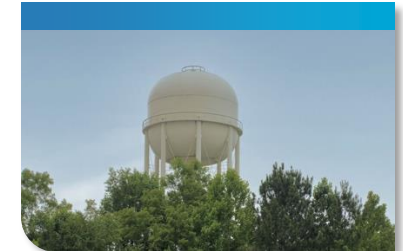
Cooling Towers



Wastewater / Recycling



Municipal Drinking
Water



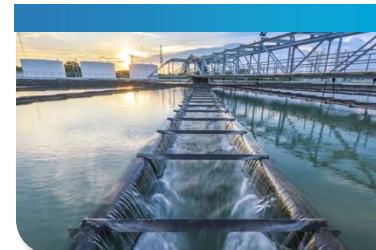
Reserve Water
Storage



Oil Production



Pipeline Disinfection



Heavy Industry



Petrochemical &
Refining

Application & Control

- Dose directly from the container using a mechanically actuated diaphragm pump with a PVC or Teflon head.
- The pump should be controlled via flowrate (Contact head water meter or level switch into a water storage/header tank, or flow switch e.g. RO machine).
- DIOTIN residual can also be maintained for once pass and recirculating systems using an inline sensor (ORP/Free Chlorine) connected to a controller or SMART pump.
- Monitoring residual chemical is achieved using reagent test kits (e.g. HACH DPD test kit, Palintest Kemio kit (photometric methods) or by Iodometric titration.

Key Attributes Summary

-  In situ equilibrium of mixed oxidant inhibits the formation of harmful chlorinated by-products
No mixing of hazardous chemicals is required
-  High product stability
Minimal vapour evolution during transport and storage
-  No gassing from solution, including hot or turbulent water, spray systems etc.
Minimises headspace/water line corrosion
-  Powerful disinfectant, even at low dosage. Performance is not limited by pH
Biocidal efficacy is maintained over a wide range of water pH (4 to 9.5)
-  Operational cost reduction – lower chemical use, fewer shipments, increased energy efficiency



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