
PURATE TECHNOLOGY

& INTRODUCTION TO CHLORINE DIOXIDE

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NALCO Champion

An Ecolab Company

Agenda

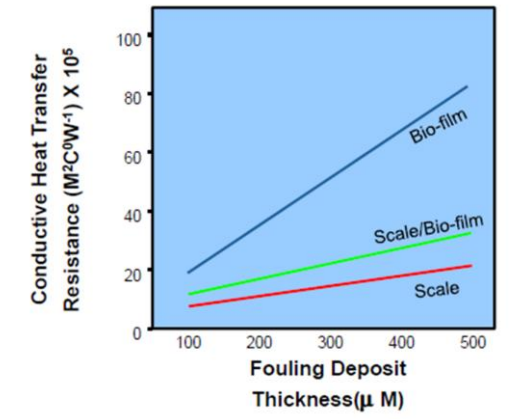
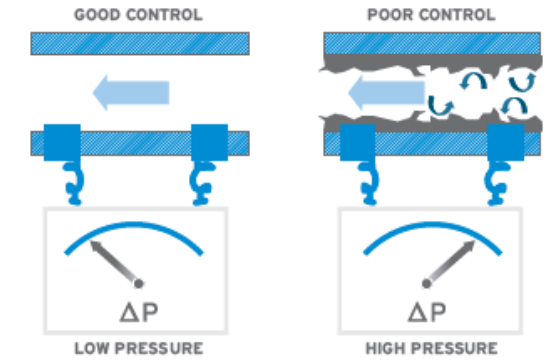
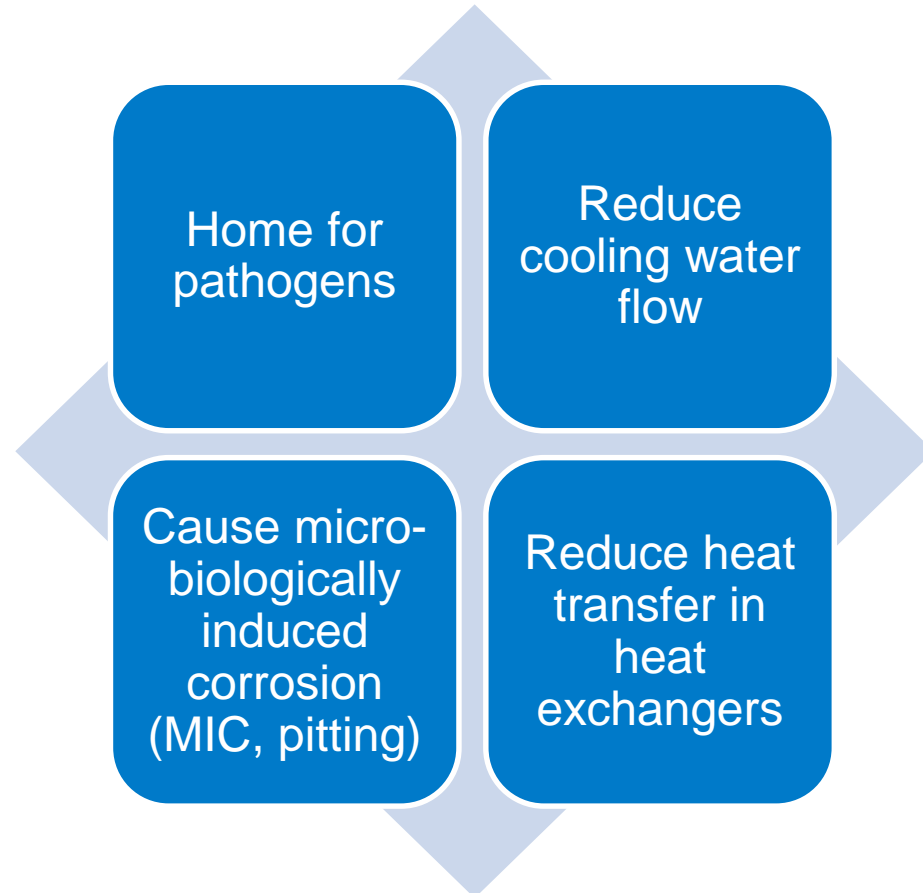
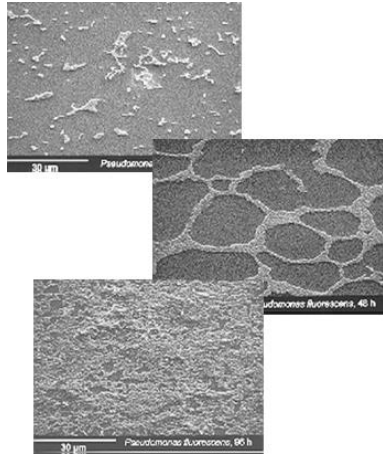
Microbio Control / Biofilm Challenge

Chlorine dioxide advantages vs other biocides

Purate Technology

Purate Case Study

Microbio Control / Biofilm Challenge



CHLORINE DIOXIDE ADVANTAGES OVER OTHER BIOCIDES.

Advantages of ClO₂ over Cl₂ / Hypo

Excellent control of Bio-films

Very fast rate of disinfection

Effective at low dosage rate

Significantly lower corrosion rate

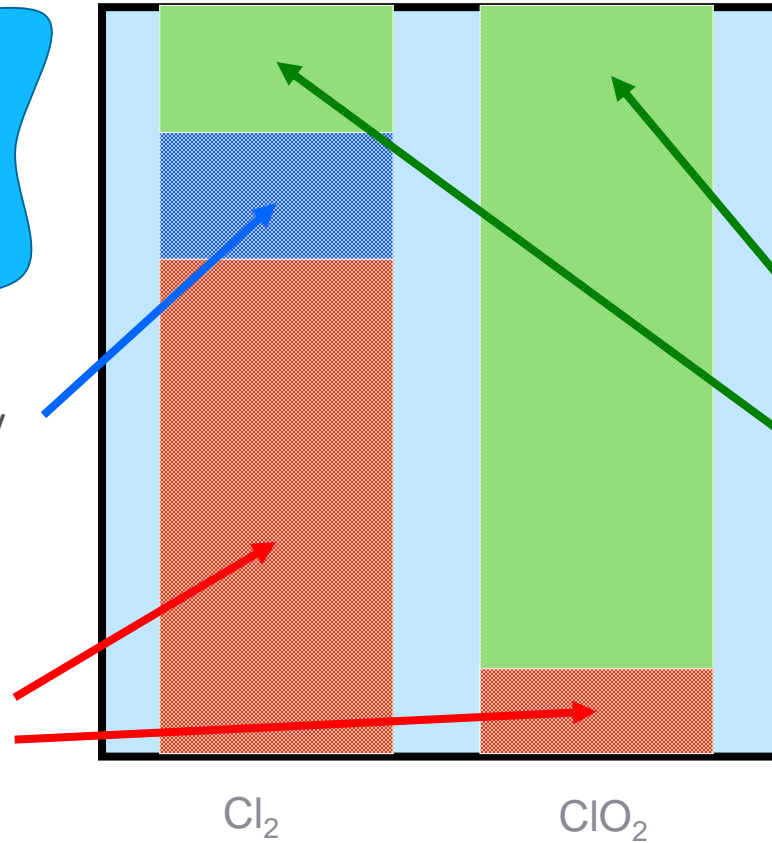
Why Use ClO₂ - Selectivity



How chemistry impacts dosage requirements

Amount 'inactivated' by pH effects

Amount consumed by organics



- Non Reactive with Organics (No THM or HHA, Low TOX)
- Non reactive with ammonia
- Disinfection less dependent on pH

Amount available for disinfection

Chlorine Dioxide Cannot be
Compressed or Shipped

Purate Technology

ψ Purate + acid



Purate®

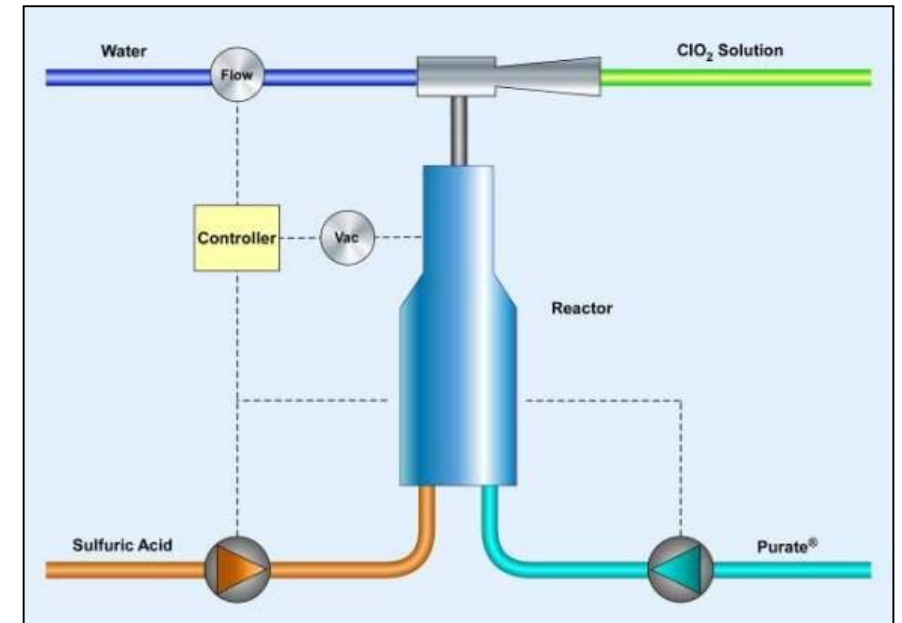
SVP-Pure® Process

Advantages

- Efficient – 95% conversion at standard conditions
- No need of Cl₂ Gas
- **No chloride contribution**
- **High precursor concentration minimize storage requirements and freight costs**
- Excellent cost structure
- **Two Chemical Program – reduces truck traffic**
- Patented
- **High quality equipment – safe and reliable**

SVP-Pure[®] Generator AD (base unit)

- The reaction chamber operates under vacuum
- The chlorine dioxide gas is sucked into the motive water stream which creates the chlorine dioxide solution and provides the transport mechanism to the point of application
- Multi-level safety interlocks are part of the standard system
 - Loss of vacuum
 - Low motive water flow
 - PLC hardware fault
 - Chemical Pump fault
 - & Others
- Safety in-design enable production of ClO₂ every day in hundreds of Unites all over the world



SVP-Pure[®] ClO₂ Generator Model AD DS



SVP-Pure[®] ClO₂ generator
+ four-point dosing system



- Back pressure control valve
- Control Valves
- Mag Flow Meter
- Water Booster Pump
- ClO₂ Booster Pump

40 Feet ClO2 Production Container

Maximum safety and ease of operation



Fully Enclosed Container (FEC) Inside View

PURATE CASE STUDY.

Sea Water Cooling System.

The Sea Water Cooling System in the Middle East has a history of bio-fouling leading to poor thermal efficiency

Historical attempts to address this had not been successful due to a variety of factors including efficacy and control problems.

Purate technology has addressed these factors and is providing a significant improvement in microbiological control and thermal efficiency.

The trial has focused on better targeting of the chlorine dioxide to further improve cost-effectiveness as we work towards finalizing the target dosage.

Further improvements to safety and monitoring required.

Visual Inspection

Purate[®]
Leading ClO₂ Technology™



Microbiological Analysis

| Plant 35 – Plate # 4 | BEFORE ClO ₂ INJECTION | AFTER ClO ₂ INJECTION |
|-------------------------------|-----------------------------------|----------------------------------|
| Analyte | Result | Result |
| AEROBIC BACTERIA | | |
| Total Viable Count @ 35°C | 130 000 CFU/gram | 9 000 est. CFU/gram |
| Pigmented Bacteria | 1 Type | Not Detected |
| Total Coliforms | <1 000 CFU/gram | <1 000 CFU/gram |
| <i>E. coli</i> | <1 000 CFU/gram | <1 000 CFU/gram |
| <i>Pseudomonas spp @ 35°C</i> | 7 000 est. CFU/gram | <1 000 CFU/gram |
| Spores | 3 200 CFU/gram | 4 300 CFU/gram |
| ANAEROBIC BACTERIA | | |
| Sulfate Reducing bacteria | 30 000 CFU/gram | 300 CFU/gram |
| FUNGI | | |
| Mold | <100 CFU/gram | <10 CFU/gram |
| Yeast | <100 CFU/gram | <10 CFU/gram |

Summary of Improvements



| Aspect | Improvement |
|--|--|
| Safety | A safer system for employees and environment but more to do |
| Monitoring & Control | Significant improvements achieved with additional monitoring (ORP) recommended. |
| Analysis & Visual | Considerable reductions in microbiological activity known to contribute to fouling and under deposition corrosion. Cleaner surfaces. |
| P15- VDU strainer backwash frequency improvement | 330% |
| P15 –VDU HX Heat Transfer Coefficient | ~ 21/6% |
| P15- VDU Over-Head Production | ~ 7% |
| MED- Heat Transfer Coefficient | ~ 70 % |



Thank You