ProMinent®

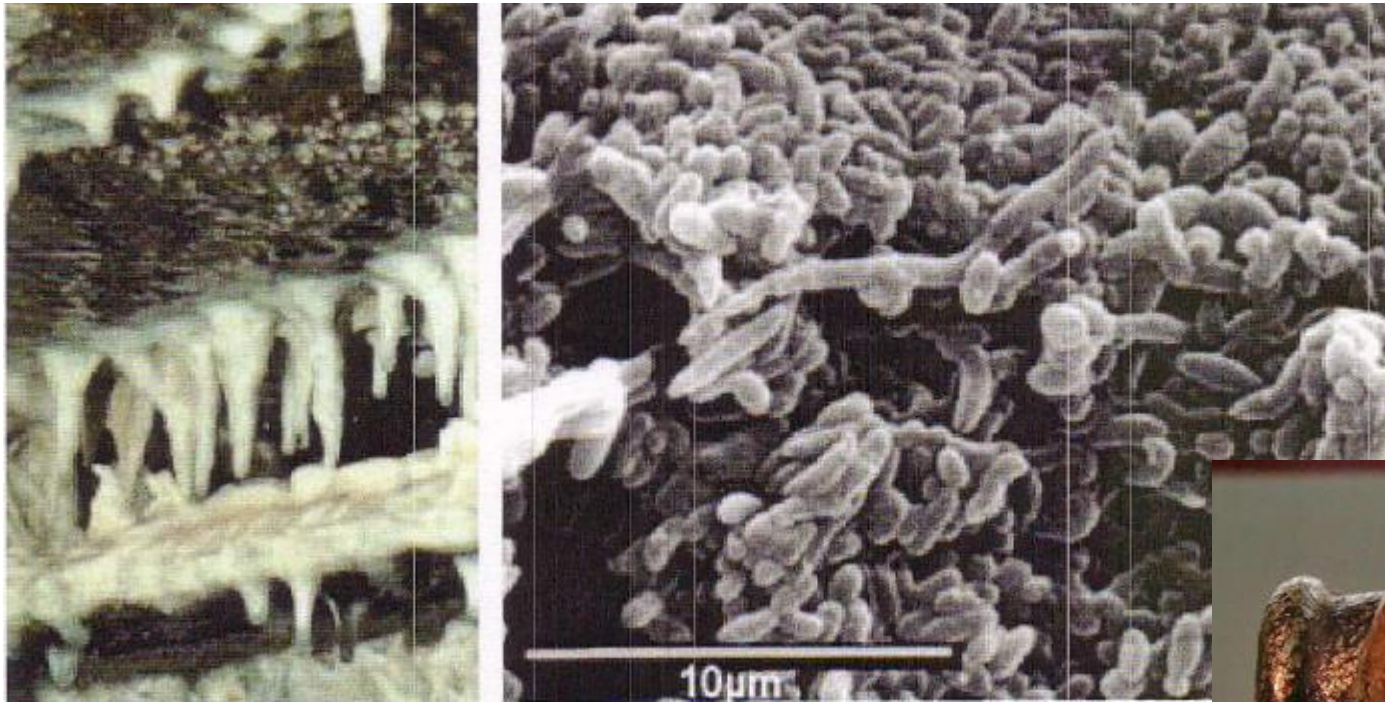# Disinfection solutions for Legionella control

Methods of Legionella control: *Prevention*

- Sensible planning of piping and fittings

- Selection of material

- Hydraulics (high current velocity, no „dead" angles)

- Regular maintenance

- Regular control and cleaning of boilers

- Regular legionella control
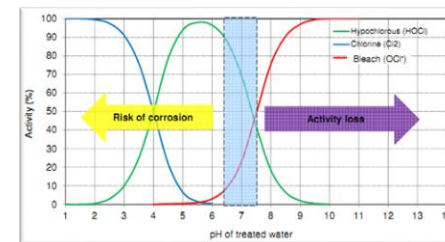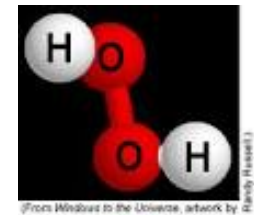
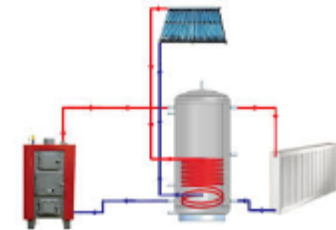View of a 20 years old tube

Contaminated pipework

Abb. 11 Rasterelektronen- mikroskopische Aufnahme eines Biofilms in einem Kupferrohr einer zentralen Desin- fektionsmittel- Verteilung (Auf- nahme: G. Tusche- witzki).

10µm

Methods of Legionella control

- *Thermal: heating > 70°C*

- *UV radiation*

- *Ultrafiltration*

- *Hydrogen peroxide*

- *Ozone*

- *Chlorine*

Methods of Legionella control: **Thermal**

- Heating of line system to > 70 °C result in:
  - High energy consumption
  - Danger of scalding at taps
  - Not applicable for very long lines

- By a temperature above 55 °C an increase of legionella in the boiler is prevented but not in increase in the system
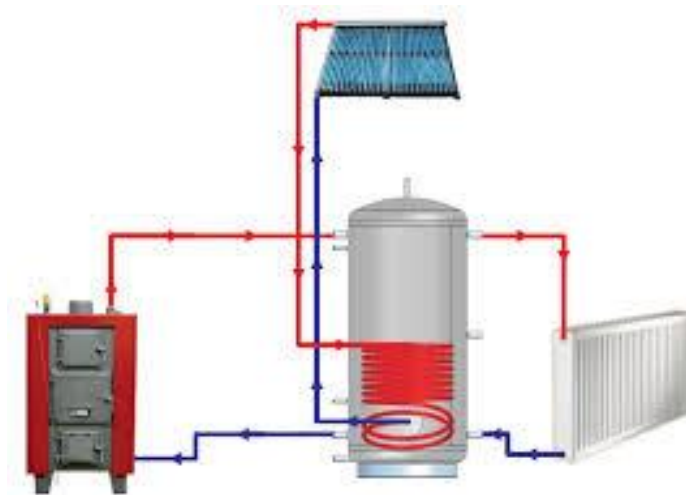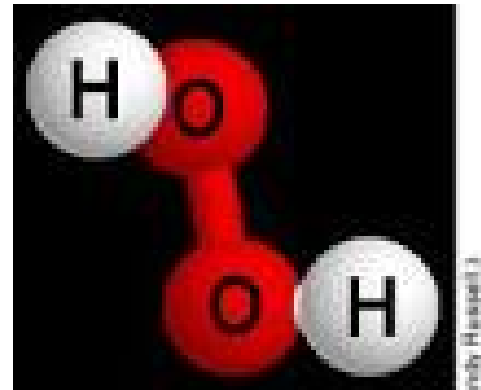
Methods of Legionella control: **UV radiation**

- Radiation of hot water by low pressure UV systems
    - High radiation dose is required in case of amoeba infestation
    - No depo effect – UV is effective only in one point inline and does not have a lasting disinfection effect.
    - No protection against reinfection in biofilm

Methods of Legionella control: **Hydrogen peroxide**

- Line sanitation by hydrogen peroxide

- H2O2 (Hydrogen Peroxide) acetified by HCl (Hydrochloric Acid), H2SO4 (Sulfuric Acid) or HNO3 (Nitric Acid)

- Treatment over night or on the weekend

- No water withdrawal during treatment

- High costs

- e.g.: ca. 10,000.- EURO for treatment in a rehabilitation facility with 280 beds and 30 m³ pipe volume

- No protection against reinfection

Methods of Legionella control: **Ozone**

- **Strong disinfectant**

- **Reduced to O_2 without residues**

- **but:**
  - Only several minutes half-life in water
  - No depo effect – does not remain in pipework

- **Good usage in cooling towers and air washers**

Bacteria E. Coli
Time [min] for 99% reduc
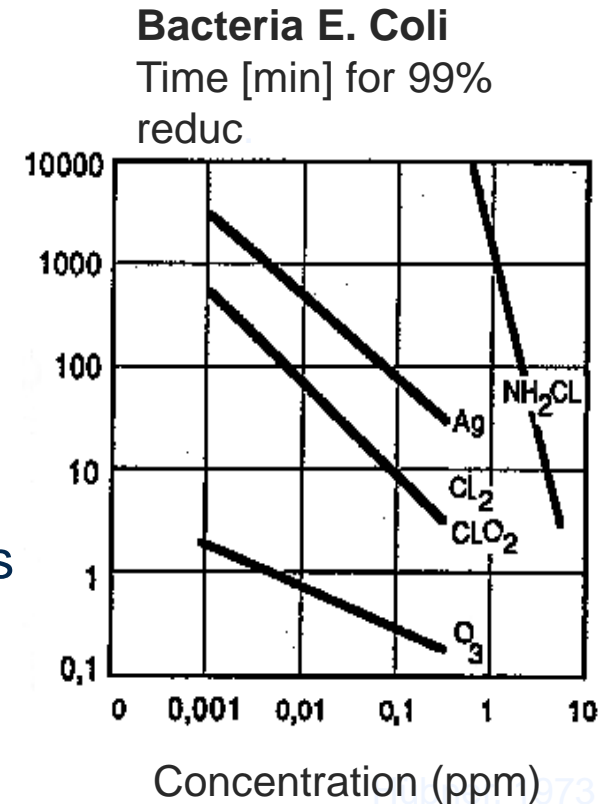
Concentration (ppm)

Methods of Legionella control: *Chlorine*

- Water treatment by chlorine bleaching or calcium hypochlorite solution

  - No sufficient disinfection effect without simultaneous adjustment of pH value

  - High concentration needed for reduction / prevention

  - No reduction of biofilm, thus no protection against reinfection

  - Water may smell and taste of chlorine
  - Formation of harmful bypoducts (THM's)
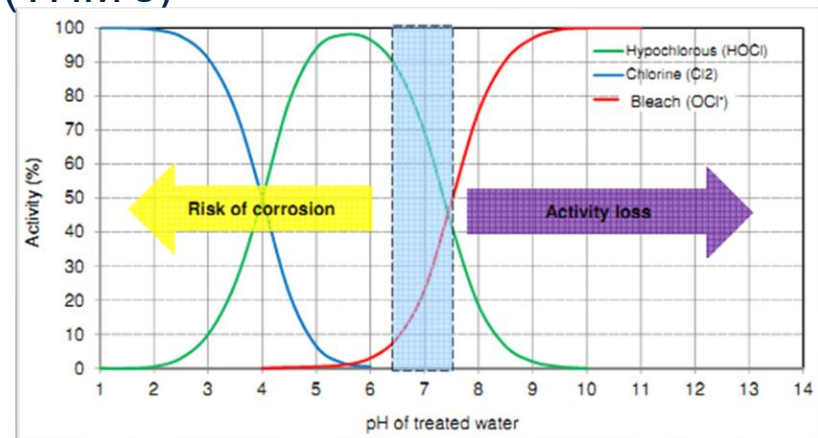
Methods of Legionella control: *Chlorine dioxide*

- Generation on site eliminates large chemical storage

- High disinfection effect independent of pH value

- Stable in water and active up

  to several days

- Reduction of biofilm in piping

  at low concentration, thus protection against reinfection

- Reliable reduction of other germs

- Fight against pseudomonads problem in hospitals

- Low corrosion risk due to low chloride levels

Maximum allowed residual values in The Netherlands

Disinfection of drinking water
0,4 mg/l

Feed water for the horticulture
10 mg/l

Bottle sterilization in the beverage industry
10 mg/l

Treatment of rinsing water in the food industry
0,4 mg/l

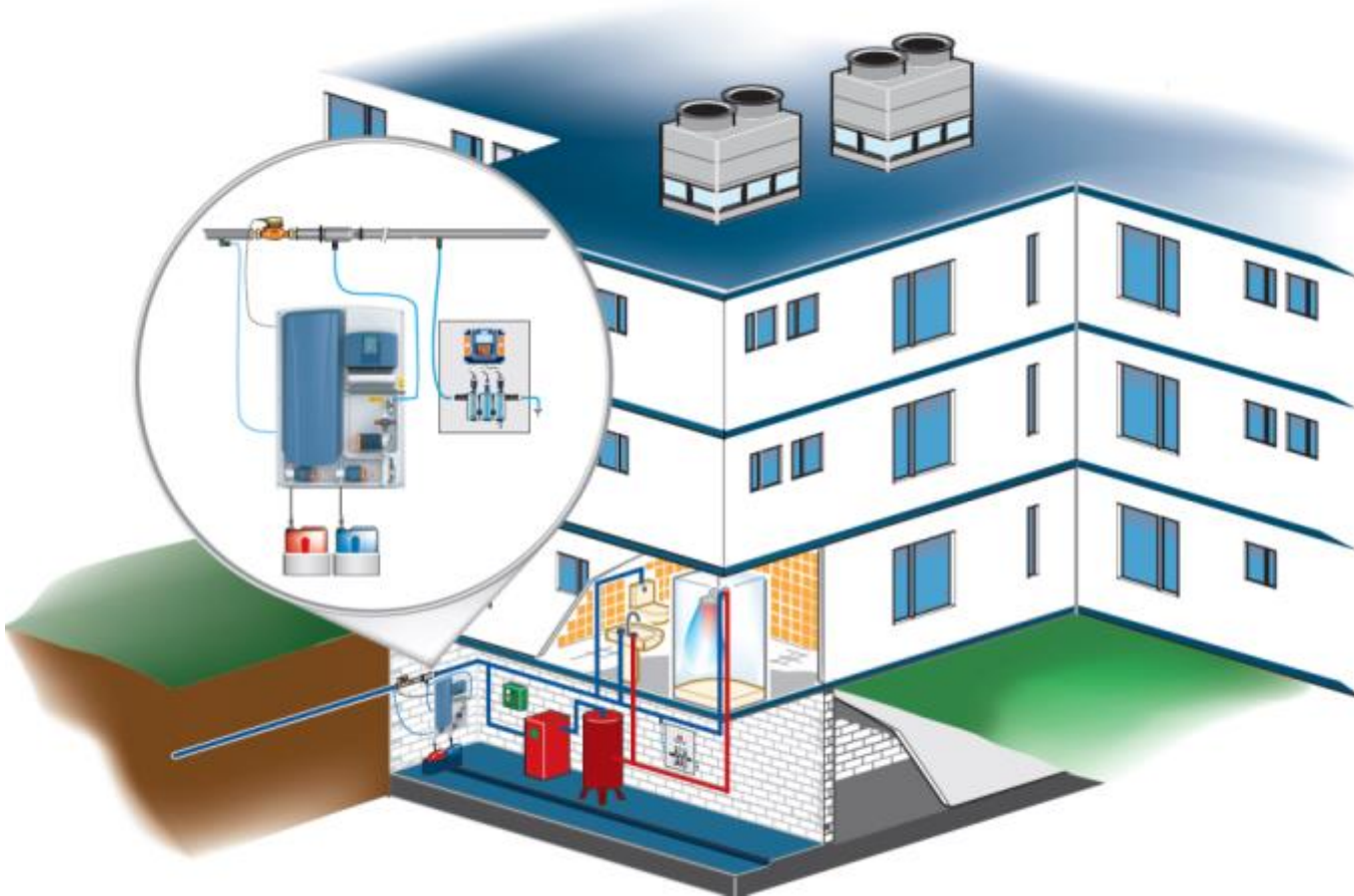**Cooling and waste water treatment**
10 mg/l

Legionella control by ClO2

Treatment of total amount of cold water

- preventive disinfection of complete piping

Typical regime of legionella control

- Temporary increase of measured contamination through detachment of old layers of biofilm.

- Period needed to disinfect the system depends on total condition of a system

ClO$_2$ concentration

contamination [KBE]

time
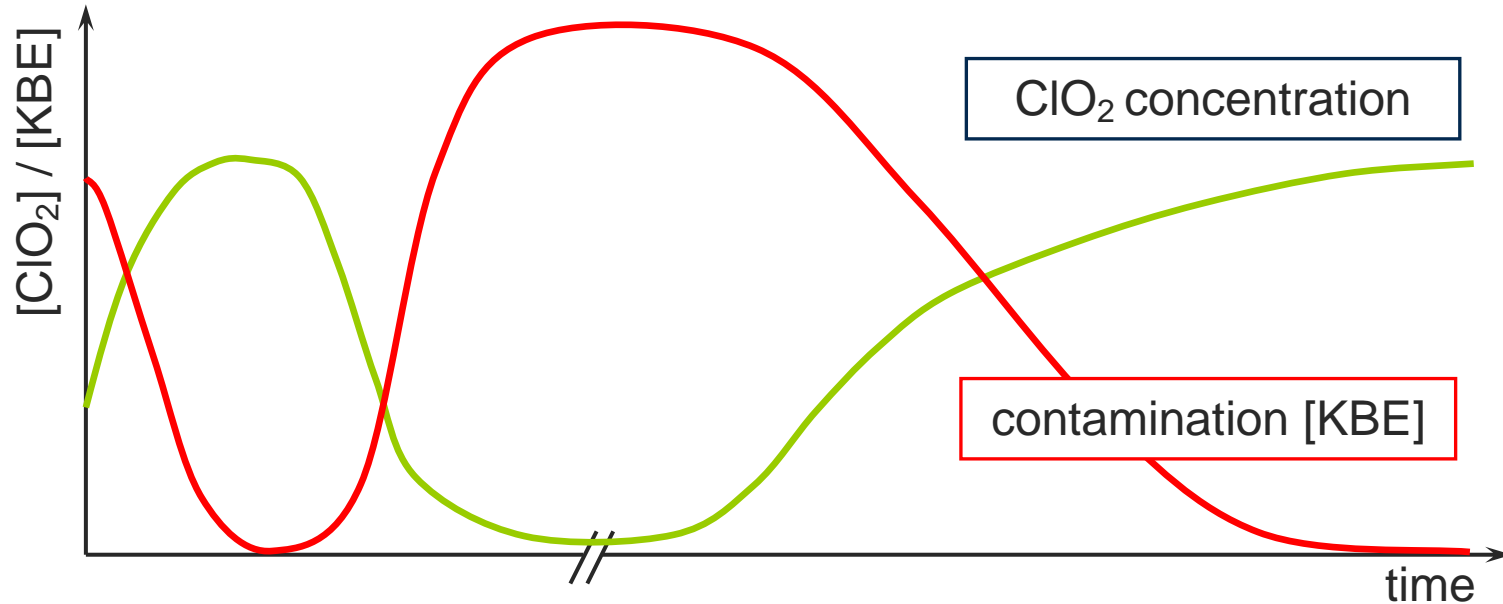
Biofilm and chlorine dioxide

Fig. 2 Biofilm Interaction

ProMinent®
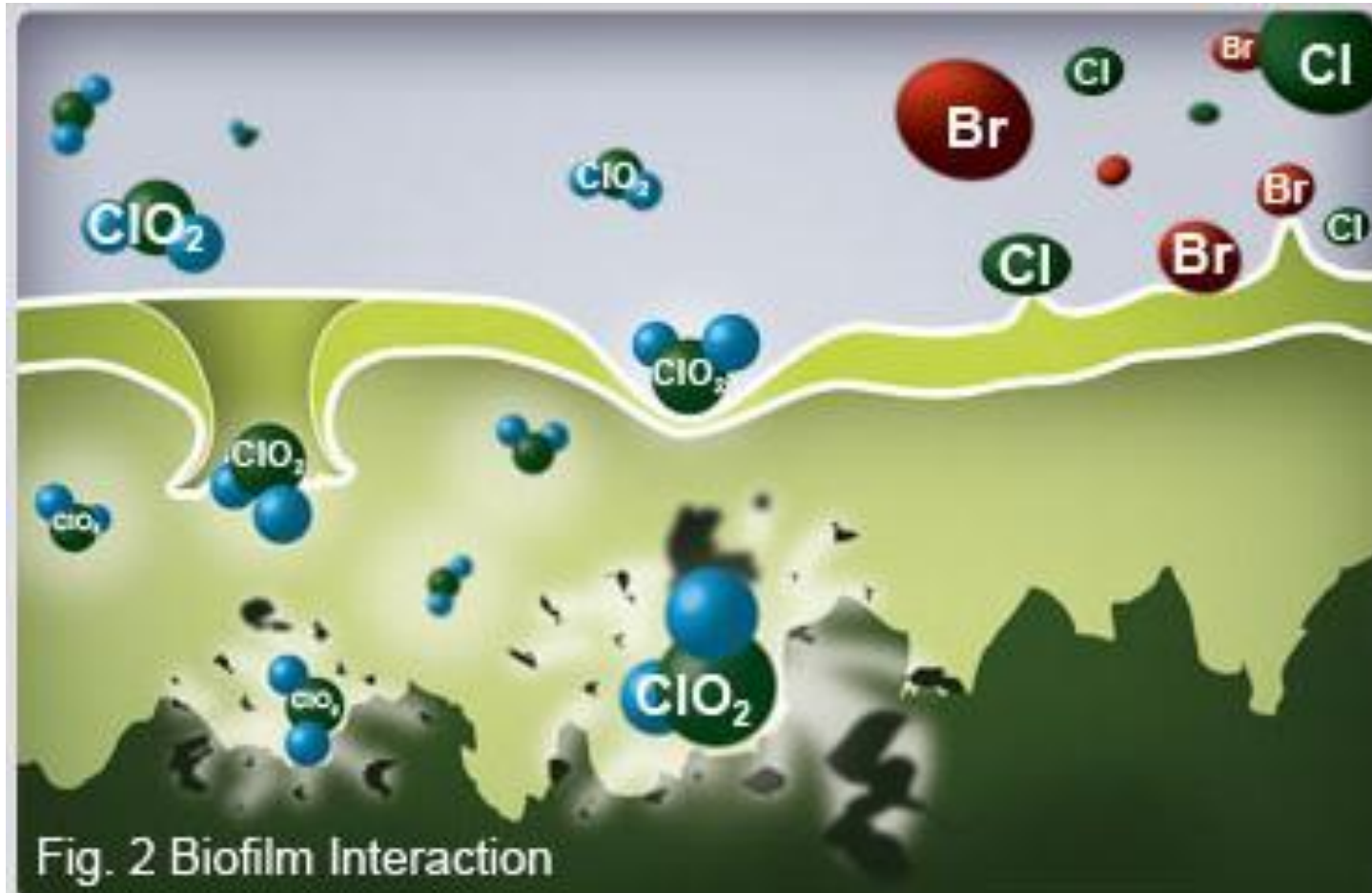
Power plant near Rome, Italy

- 432.000 m³/h sea water used for cooling purposes

- temperature 8 – 20 °C

- circulated directly back
  into the Mediterranean Sea

- anti-fouling treatment with
  4 plants BelloZon® à 10 kg/h

- dosage designed: 0.1 ppm

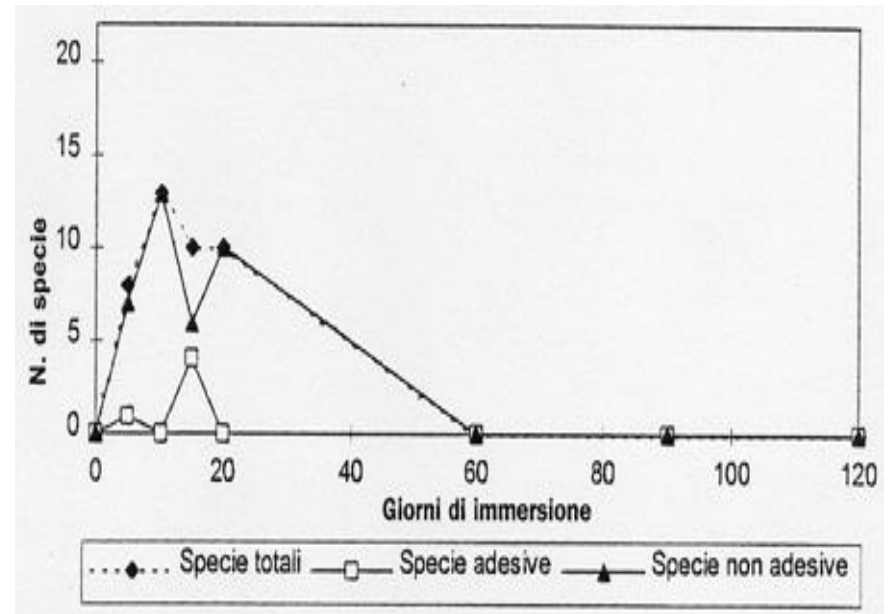- dosage practised: 0.05 ppm

Results of project

- 0,2 ppm Cl_2 dosage
- reduction of biofouling
- residual adhesive species still present
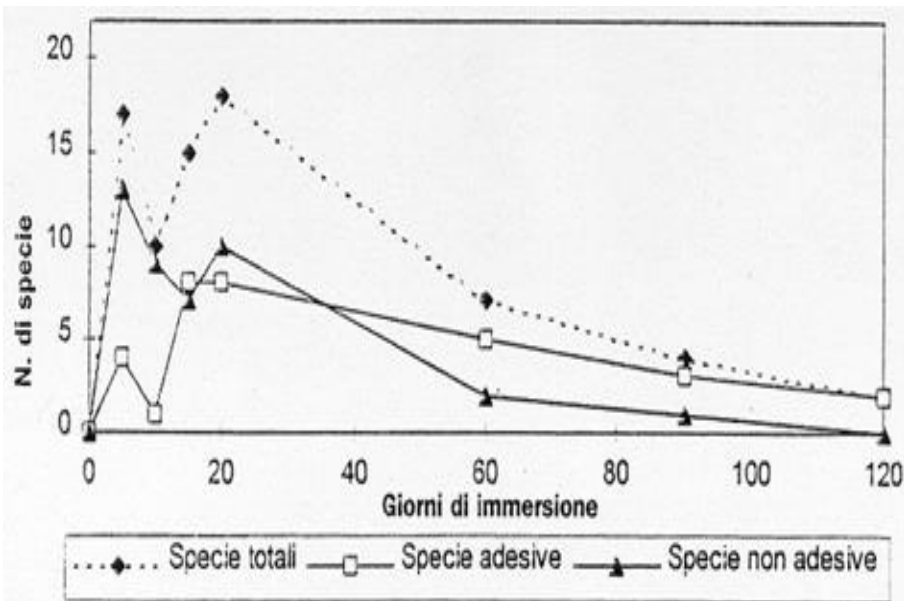
- 0,1 ppm $ClO2$ dosage
- removal of biofouling
- no adhesive species present after 20 days

Numbers of different bacterial species after 0 – 120 days of treatment

Algae in the Cooling Tower, before treatment with ClO2

Virgin Active

- 115 clubs 85 being treated with Bello Zon chlorine dioxide in South Africa.

- 5-6 g/h Bello Zon units to prevent Legionella and Biofilm in the clubs

- Main incoming water treatment

- Running since 2005

- Yearly serviced by PM SA

Risk of Corrosion?

- Chloride limit values in drinking water:
  - EU 200ppm
  - UK 100ppm

- every 1ppm of ClO_2 (BelloZon) dosed, 2.5ppm of Chloride are added

- very important in corrosion is the pH value

Table 4: Potentiostatic corrosion test in simulated D-stage environment, pH = 6.5.

Alloy	Welding		Corrosion rate, mm/y
	Method	Filler	
S31254	-	-	0.01
S31254	SMAW	A	0.10[1]
S32654	-	-	0.004
S32654	GTAW	-	0.004
S32654	GTAW	B	0.01
S32654	SMAW	B	0.04
N10276	-	-	0.47
N10276	GTAW	C	0.47

Table 5: Potentiostatic corrosion test in simulated D-stage environment, pH = 2.

Alloy	Welding		Corrosion rate, mm/y
	Method	Filler	
S31254	-	-	0.23
S31254	SMAW	A	0.32[1]
S32654	-	-	0.24
S32654	GTAW	-	0.24
S32654	GTAW	B	0.25
N10276	-	-	0.39
N10276	GTAW	C	0.38
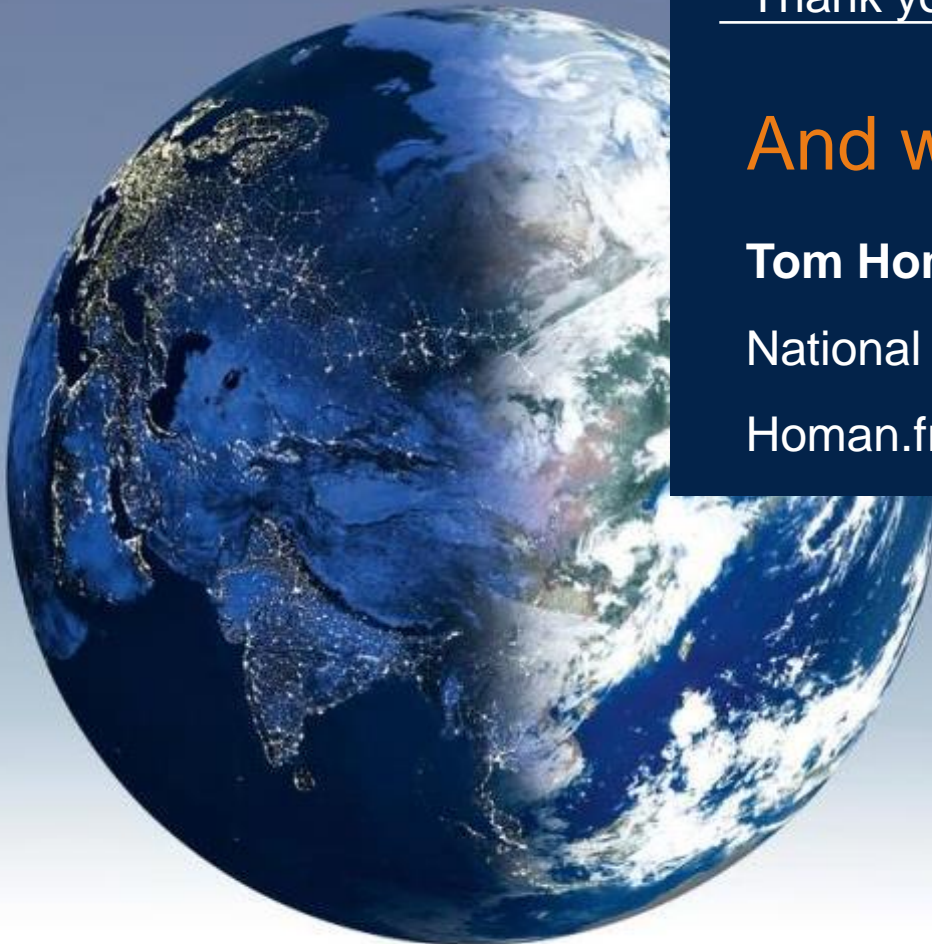
ProMinent®

Thank you for listening.

And what can I do for you?

Tom Homan Free

National Sales Team Leader

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