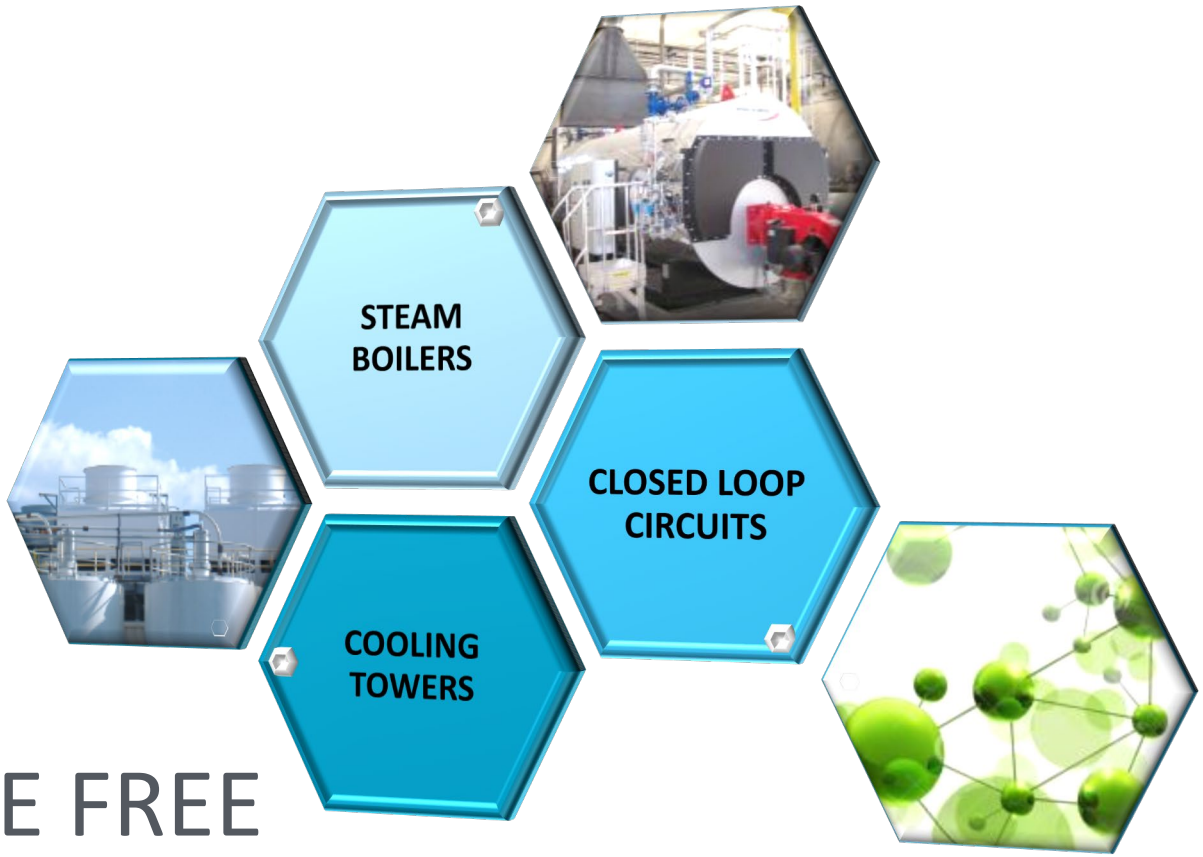
JUTZI WATER TECHNOLOGIES

French Filming Amines

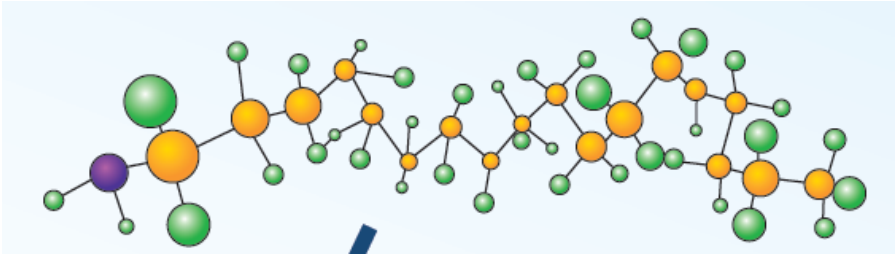
ALL ORGANIC FORMULATIONS



PHOSPHATE FREE
BIODEGRADABLE
SAFE TO SEWER

FILMING AMINES : INTRODUCTION

Filming amines **:** are organic compounds which coat the boiler metal surfaces providing corrosion and scale protection



Formula : $R\text{-}(\text{-}NH\text{-}(CH_2)_3\text{-})_n\text{-}NH_2$

(With R representing a hydrocarbonated fatty chain with at least 12 atoms of carbon and more often 18 (octadecyl) and N can represent values greater than or equal to 0 and generally less than 7.)
These amines are very soluble in water and are injected as an emulsion. They cannot be diluted.

FILMING AMINES : INTRODUCTION

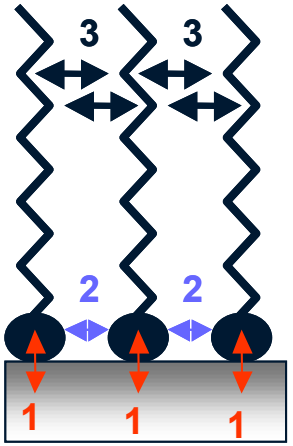
The amines adhere to the boiler metal surface forming a barrier to oxygen which prevents corrosion. There is continued protection even if feeding stops.

The amines also provide corrosion protection in idle boilers

They will slowly remove existing deposits such as scale or loosely adhering iron oxide.

The major benefit is an improvement

in heat exchange due to clean surfaces.

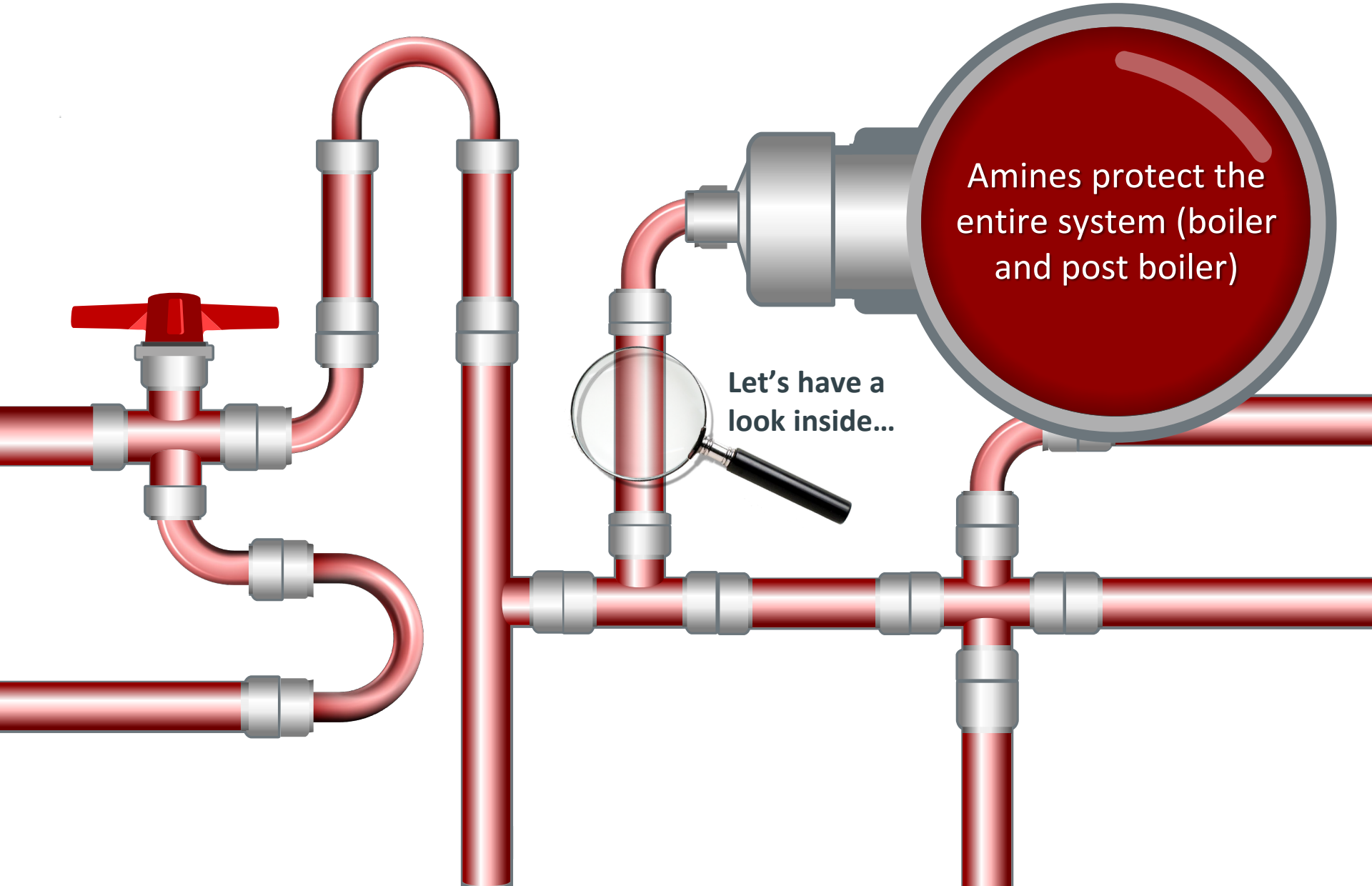


1. Chemisorption

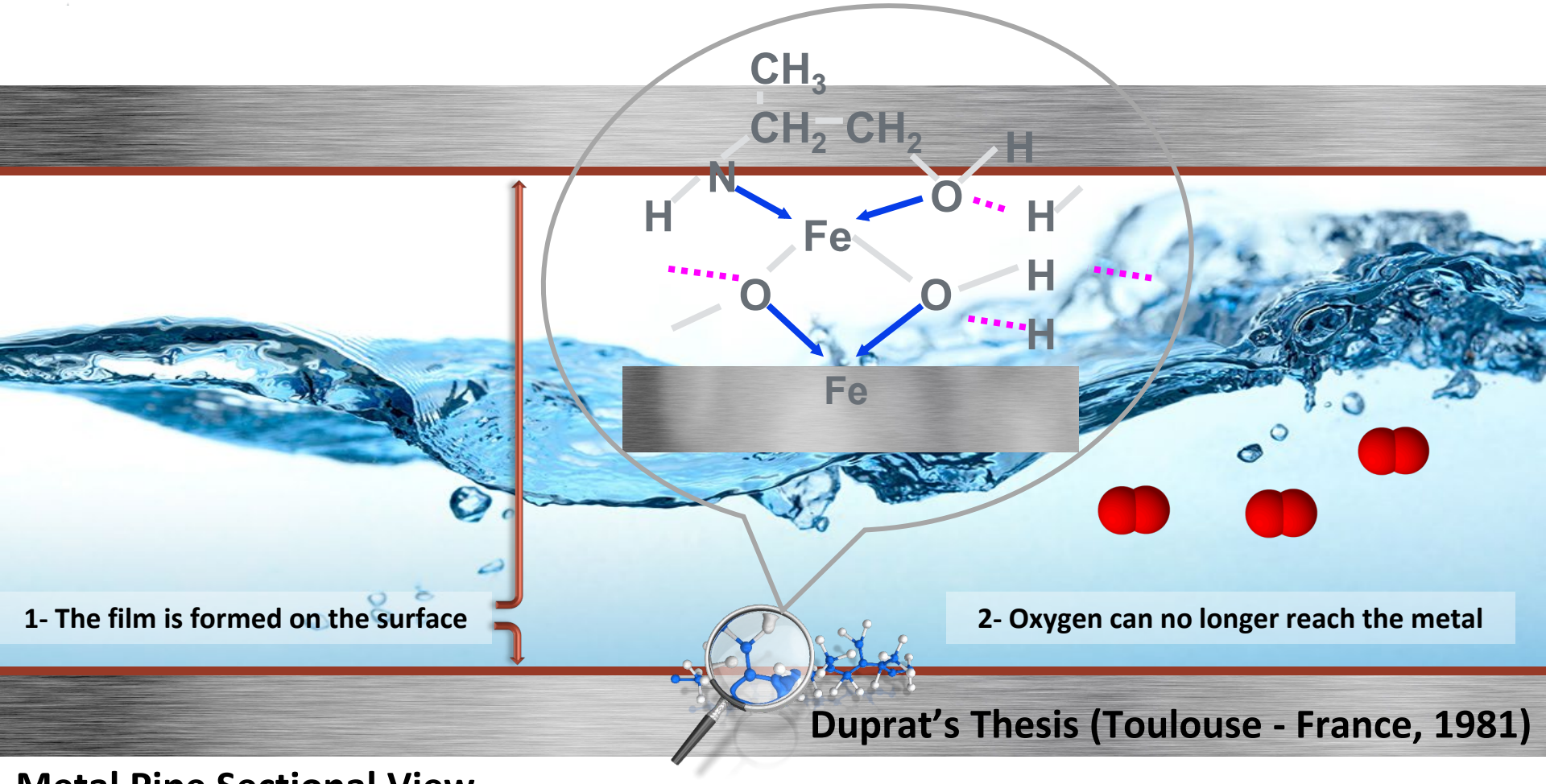
2. Ion - ion

3. Hydrophobic link

TREATMENT PRINCIPLE



TREATMENT PRINCIPLE



Metal Pipe Sectional View

ANTI SCALE EFFECT

Calcium carbonate crystals without filming amine treatment - The deposit is hard and adherent (enlargement x 35)

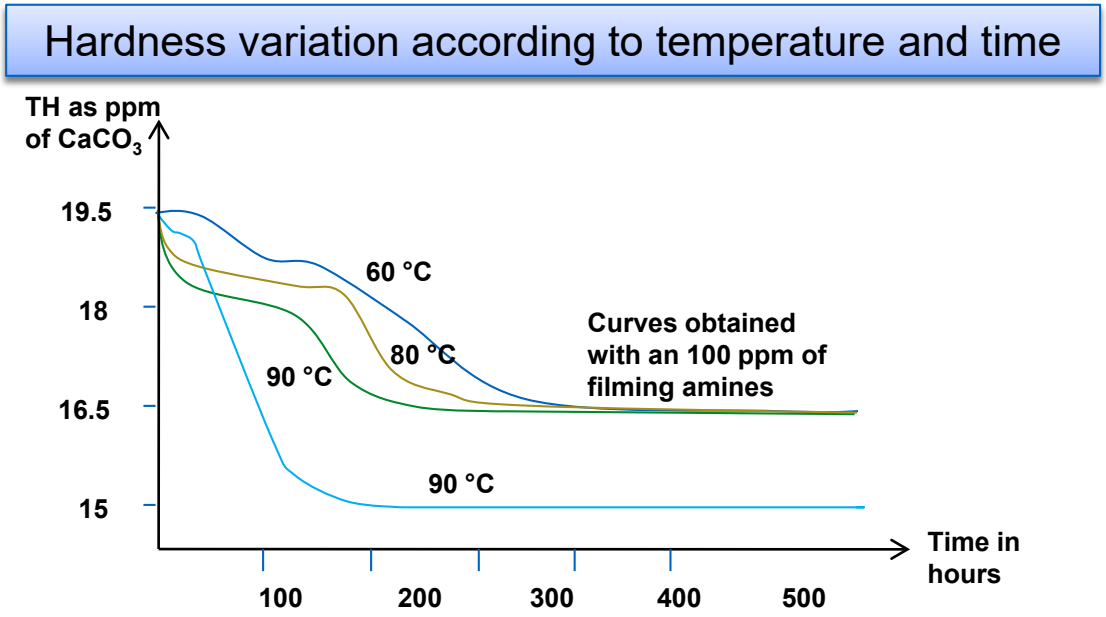
Calcium carbonate crystals with filming amines - The deposit is non adhering and can be removed easily (view x 35)

ANTI SCALING EFFECT

With filming amines, the calcium carbonate deposit becomes a non adherent white powder.

The filming amines interfere with the crystallization of calcium carbonate (Aragonite).

They essentially prevent precipitation due to adsorption of the filming amines



HEAT EXCHANGE IS NOT AFFECTED

Polyamines :

No influence on the heat exchange.

Conditions : Hot Closed Loop, New pipe.

Flow	DI Water	FFAs : 500 ppm	FFAs : 1,000 ppm
0.5	0.170	0.167	0.167
1.0	0.166	0.166	0.166
1.5	0.165	0.165	0.165

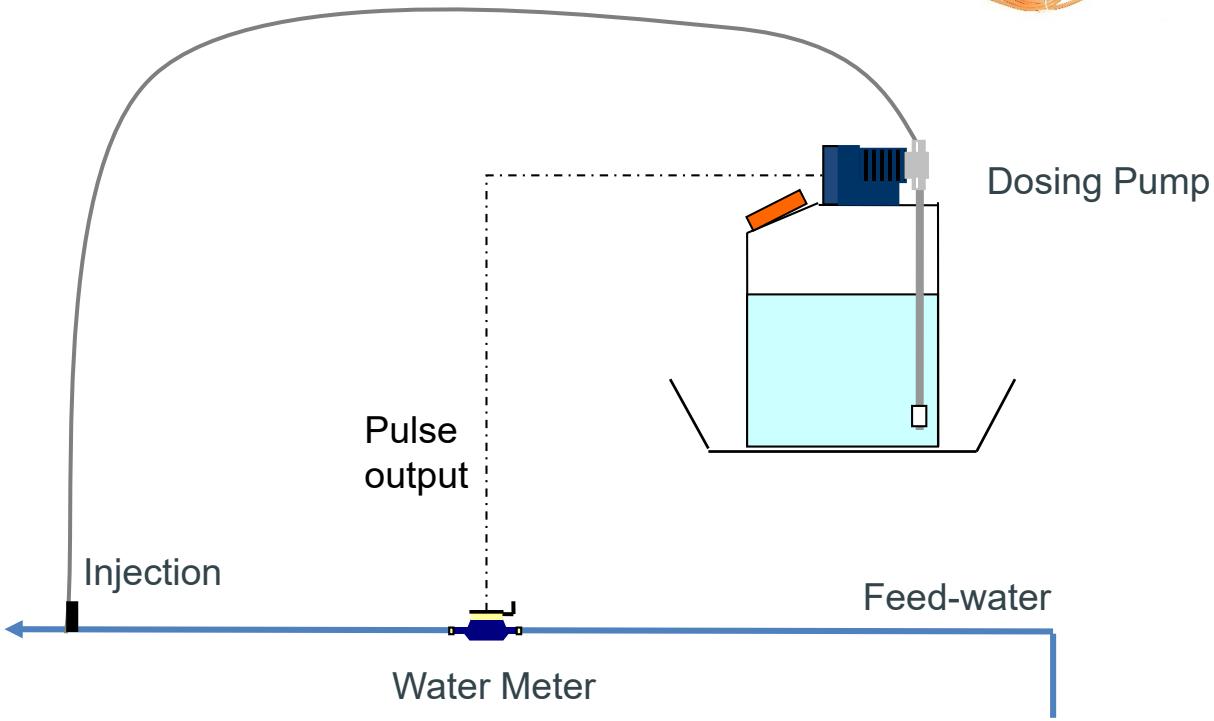
Heat Exchange λ ($w/cm^2.°C$)
Flow (m/s)

BOILER INSPECTION

- Clever Brooks Firetube
- 75 psig
- Top picture Dec 2017
- Bottom picture Dec 2018
- Bare metal, no pitting no change

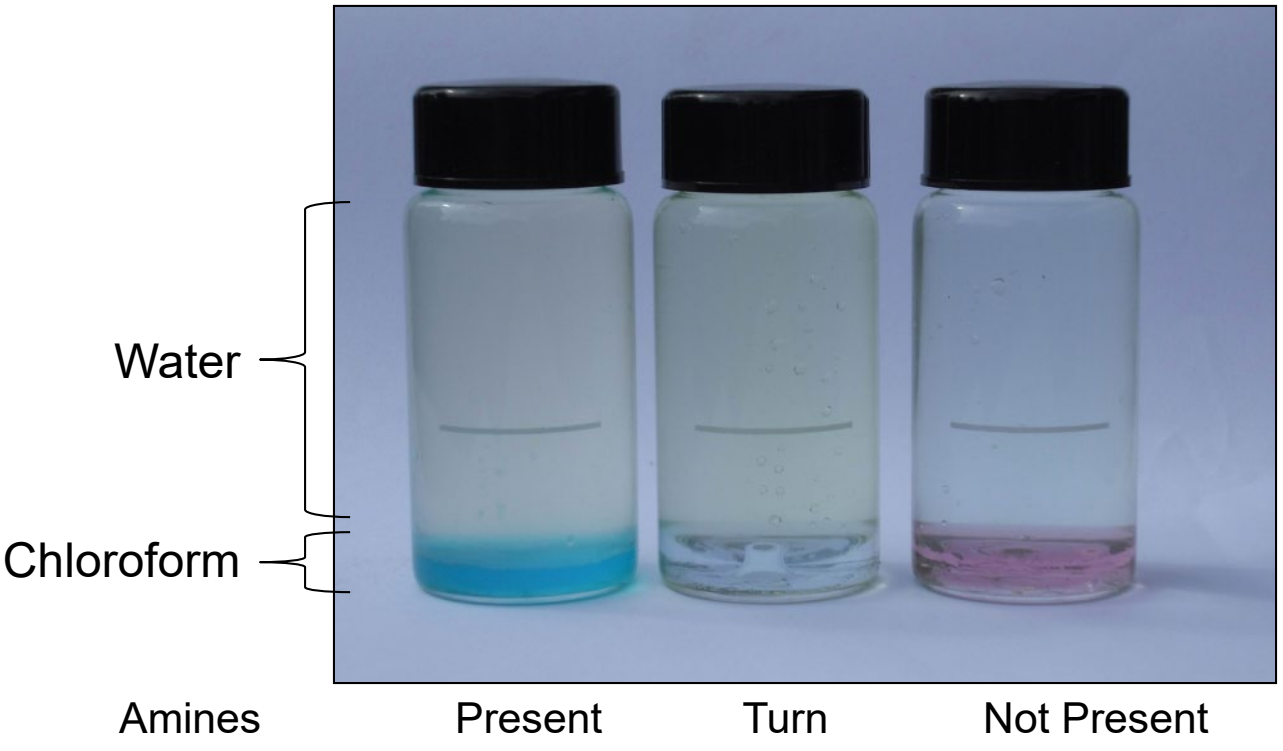
FEEDING OF FFA'S

Metering pump and water meter with pulse output on inlet water pipe.



ANALYSIS METHOD

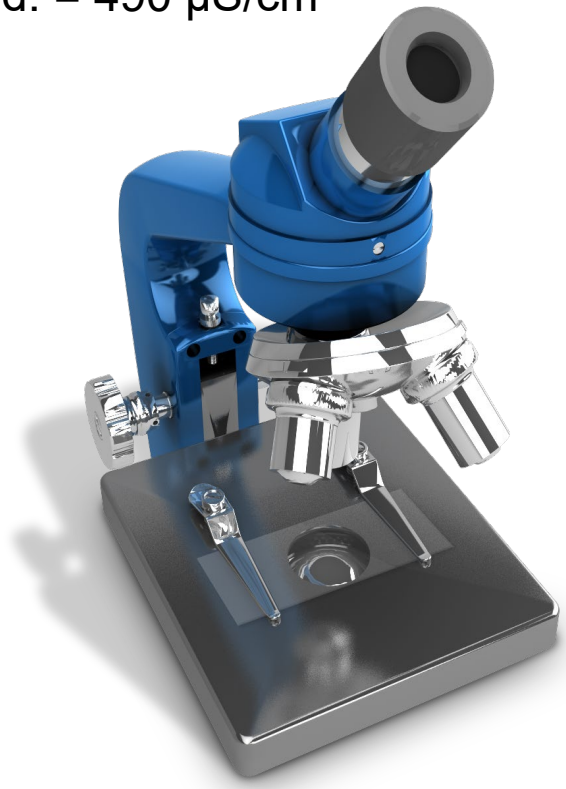
- Blue color : presence of filming amines in the water
- Pink color : absence of filming amines in the water

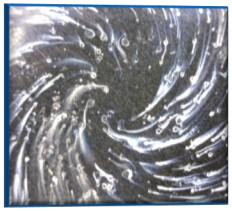


4TH GENERATION OF POLYAMINE TECHNOLOGY

Aluminum 7022 + raw water :

pH = 7,9 – TH = 216 ppm (of CaCO3) – M-Alkalinity = 179 ppm – Cl = 79 ppm – Cond. = 490 µS/cm





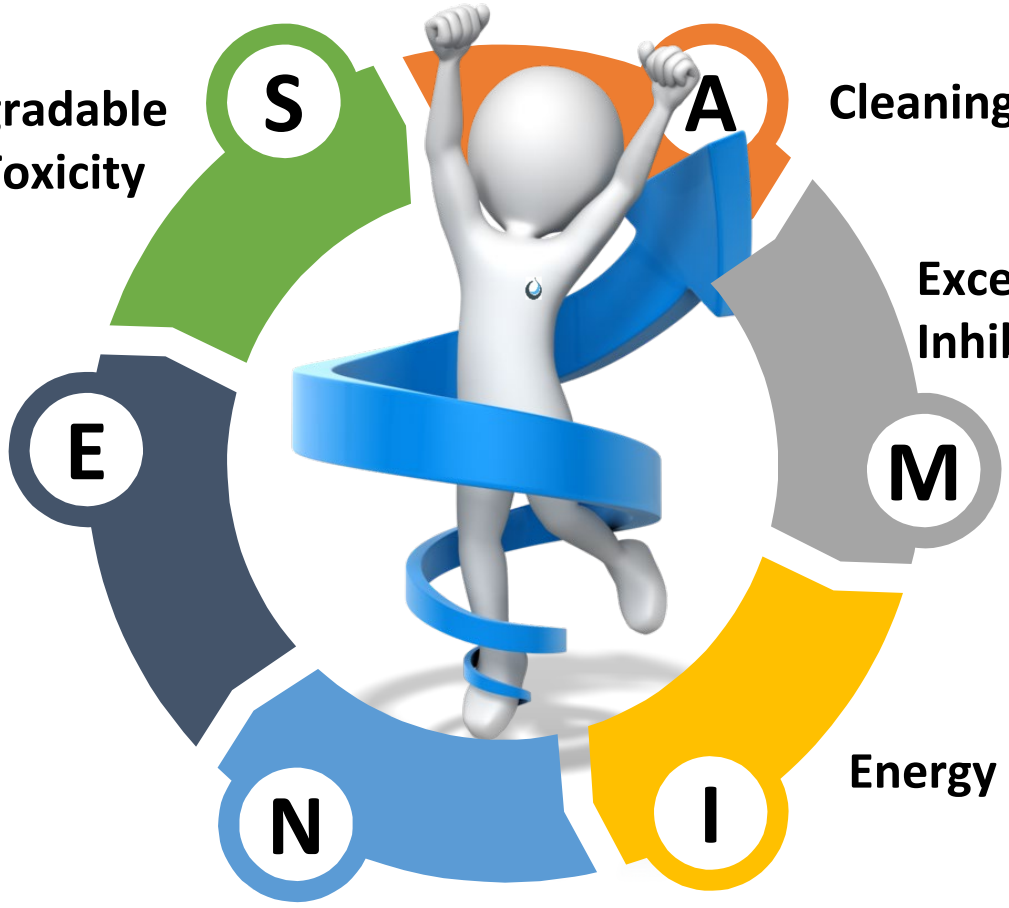
Raw water

+ FFAs 5,000 ppm

+ FFAs 5,000 ppm

+ Al inhibitor 1,000 ppm

FRENCH FILMING AMINES : BENEFITS



Biodegradable
Low Toxicity

Cleaning Effects

Excellent Corrosion Inhibition

Energy Efficient

Cost

Food Grade

FDA APPROVED NSF

COMPATIBLE WATER SYSTEMS

Boilers

Closed Loops

Cooling Towers

Questions???