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Pure Sensor Solutions

CORPORATE

February 2010

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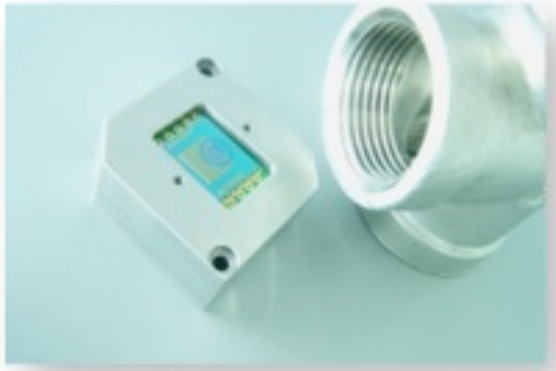
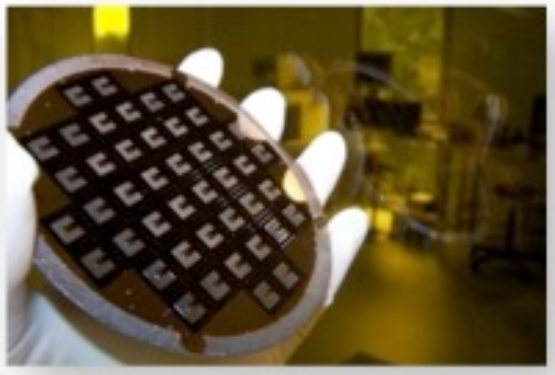
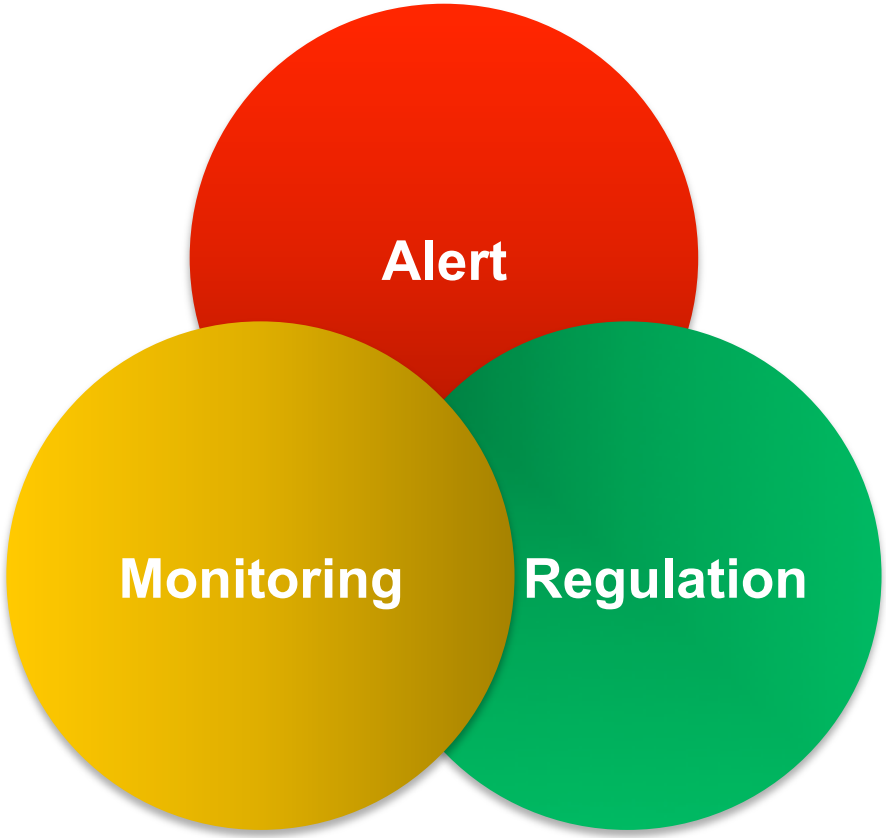
What we do

MEMS sensors for **in-situ**, **real-time** & **continuous** **water & liquids quality** monitoring


Mission & Activities

Needs of new tools & solutions for alerting & preventing *...not for "analyzing" !!*



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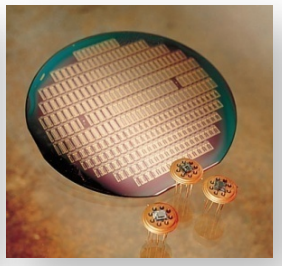
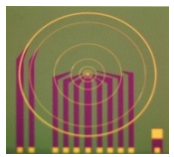
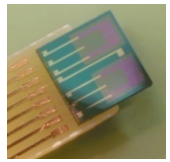
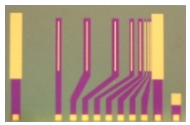
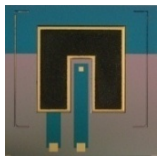
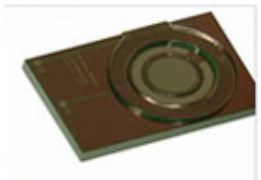
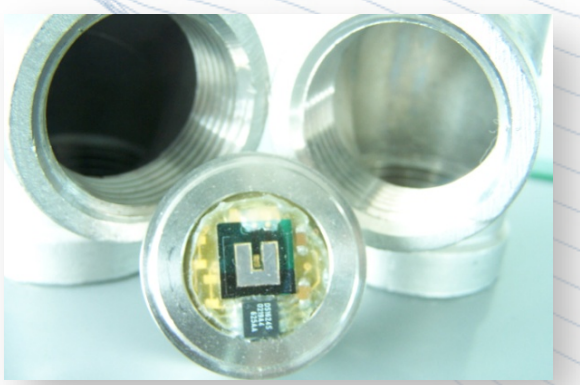
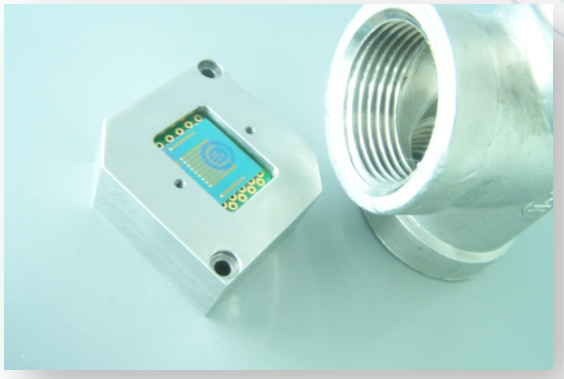
MEMS Technologies

MEMS PLATFORM

PACKAGING (Application)

MEMS key-benefits:

- **Production** → consistent quality & reproductibility
- **Features** → high precision & sensitivity, robustness, easy replacement, …
- **Innovative functionnalities** → biofilm, bacteria, pesticides, …

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MEMS Roadmap & know-how

PTC

ELECTROCHEM.	THERMAL	CHEM-FET	SAW	OPTICAL
Dissolved Oxygen ORP Conductivity	Fouling Slime Scales	Nitrates Pesticides Heavy metals	Bacteria VOC HAP	Chlorine Turbidity Drugs

MEMS PLATFORM

…is a tool to serve markets !!

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Monitoring Solutions
for Water and Industrial Liquids

Fouling Monitoring

- ✓ *Legionella* risk-assessment
- ✓ Chemical discharges optimization
- ✓ Quality of products
- ✓ Industrial efficiency and competitiveness
- ✓ Increase of process uptime
- ✓ Reduction of energy consumption
- ✓ Waste reduction

Dissolved Oxygen Monitoring

- ✓ *Extended life of industrial equipment*
- ✓ Water quality
- ✓ Reduction of operating cost
- ✓ Increase of process uptime
- ✓ Reduction of energy consumption

…Ask us for what's next !

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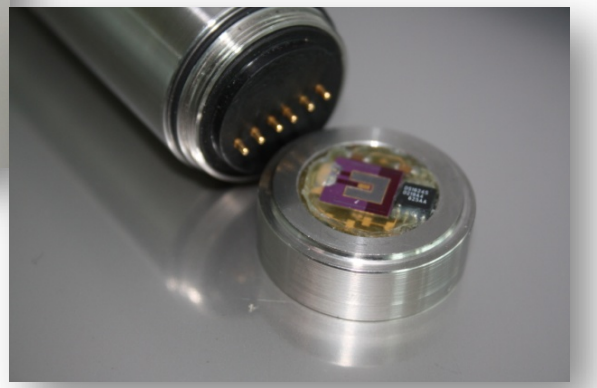
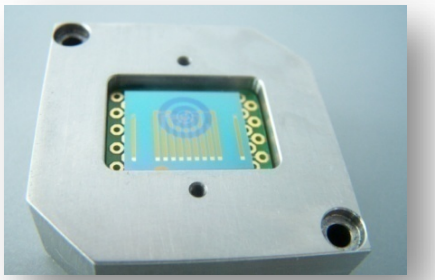
Industrial Solutions
DO-series





- DO-series product-range
- Measurement range : 0…100ppb
- Resistant to harsh environments
- High-temperature compatible and hygienic
- Operational in all liquids (aqueous and non-aqueous)
- Mounted sensor by waterproof screwing IP68

- ¼ VGA screen with backlit graphic LCD
- Industrial grade (IP56)
- 2 analog outputs
- Metal box enclosure
- up to 10 days calibration history

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ONLINE BIOFILM & SCALE MONITORING THROUGH *MEMS* TECHNOLOGY

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Industrial Solutions
FS-series

New stand-alone MEMS based FS-1000

Cooling Low Stress or sea water

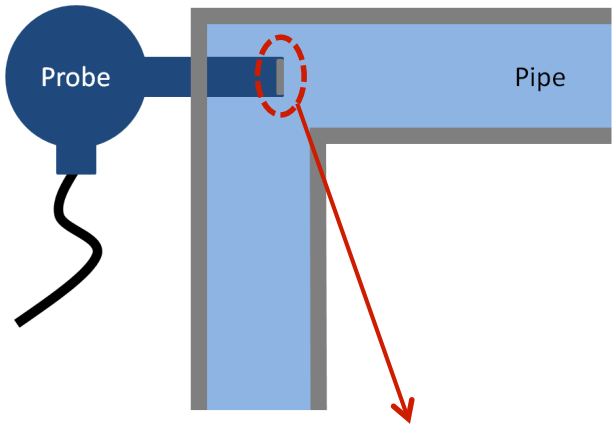
Cooling High Stress or Pulp & Paper

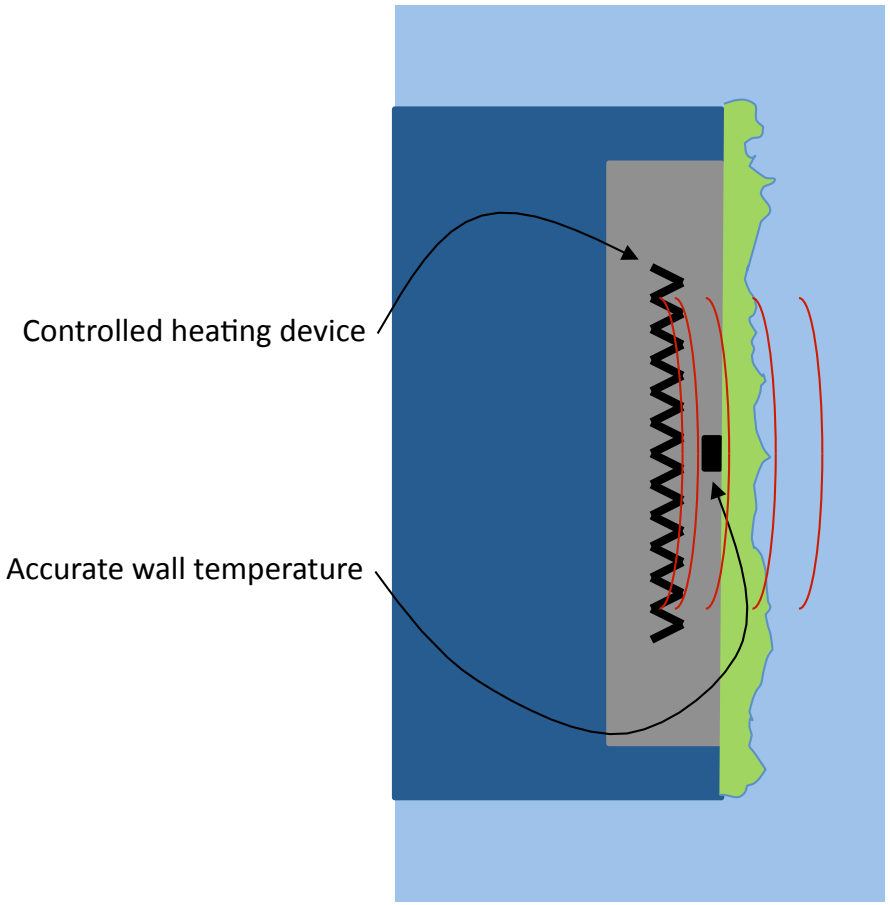
Food & Beverage

Explosion Proof

Low Temperatures (water)

High Temperatures (process)





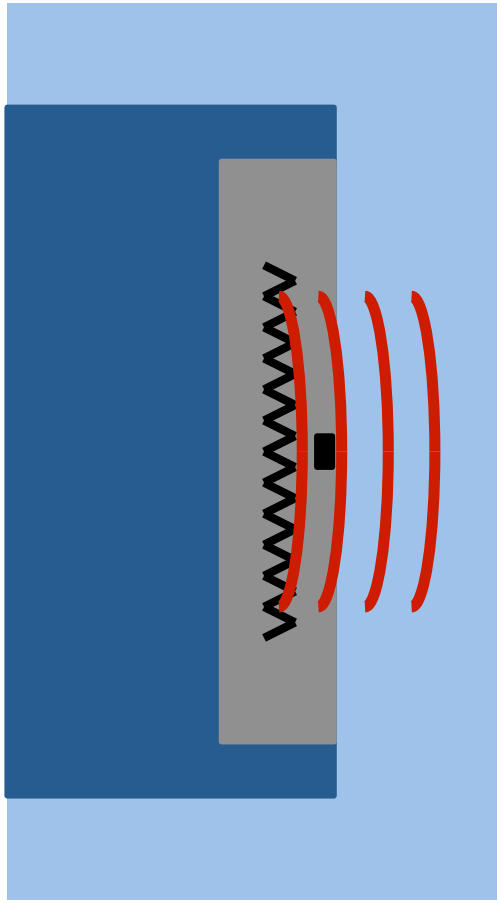
What is the measurement principle ?

- Measurement is based on ***thermal*** principle (4 patents) :
  - Unique ***technology design*** and ***realization*** (MEMS) allowing to integrate both heating device and accurate temperature sensor in a specific arrangement where temperature sensor is (i) precisely located in the center of thermal flux (homogeneous, no side-effects) and (ii) very close to fluid interface (just behind a very thin metal layer of 316L SS for example),
  - Both emitter (heating device) and receptor (wall sensor) are embedded closely into a ***thermal insulator packaging*** in order to drive 99,9% of thermal flux to the water side.

Detection principle is based on the fact that any kind of deposit (fouling, biofouling, biofilm, slime, scales, …) is instrinsically a thermal insulator, more or less. The thermal barrier effect of the deposit is increasing with its thickness.

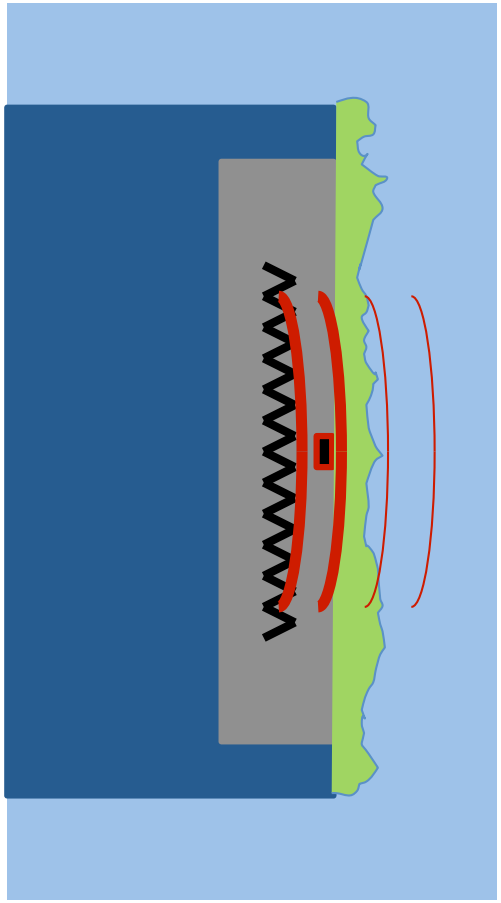
- For **detection** to be made :
  - Very small and controlled thermal flux is created by electrical way in the heating device,
  - Thermal flux is spreading through the sensor, interface and to be dissipated into the fluid,
  - With no deposit onto the surface, no barrier to thermal dissipation, and so, no increasing wall temperature appears,
  - If deposit has been formed onto the sensor surface, then, as it acts like a **thermal barrier**, dissipation is lowered and a thermal resistance appears onto the sensor surface generating an increase of wall temperature !

What is the measurement principle ?



No fouling…

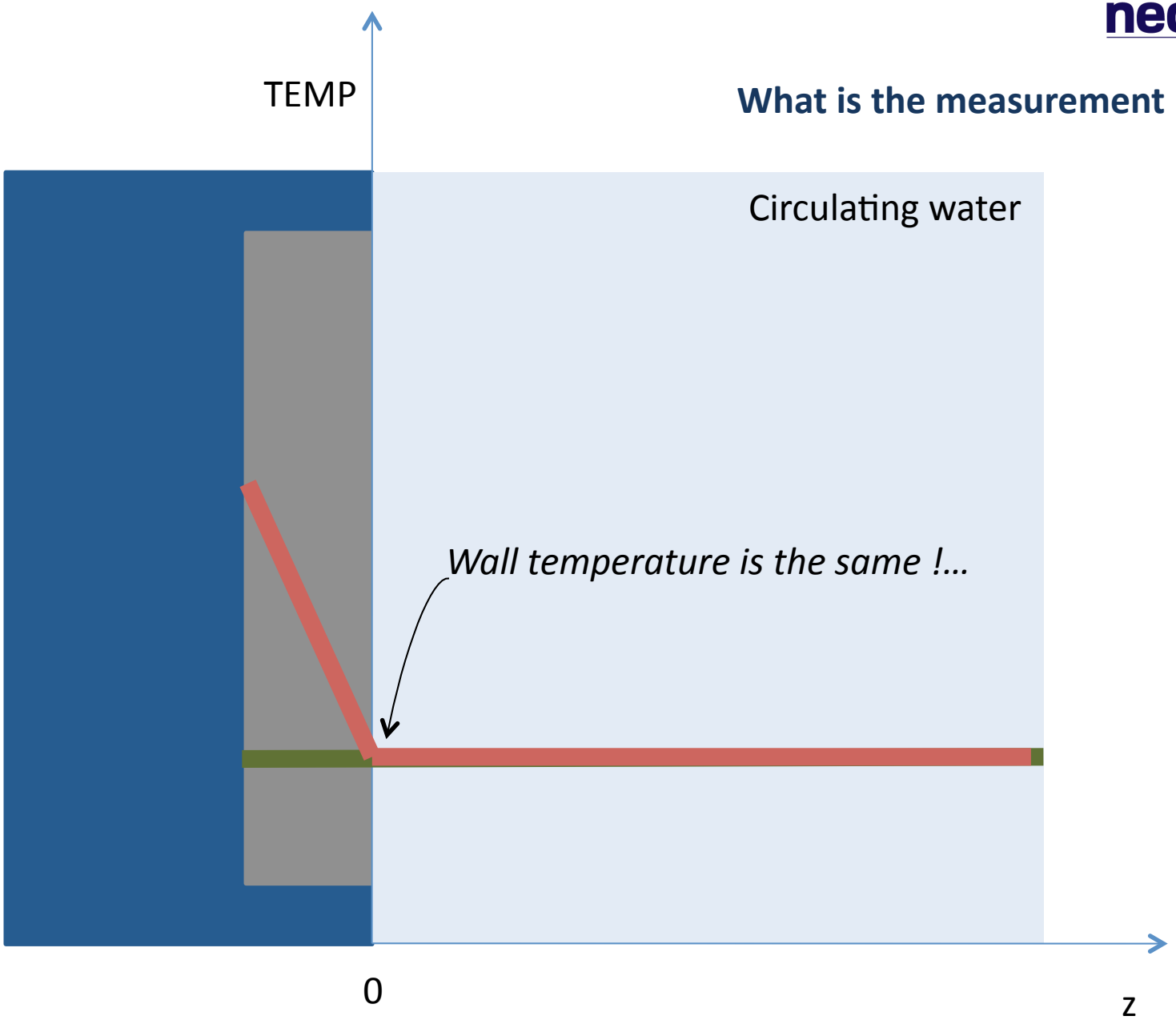
…no resistance to thermal transfer !



Fouling…

…wall temperature is increasing !!

What is the measurement principle ?



TEMPERATURE PROFILE DURING A NON-HEATED PHASE and HEATED PHASE WITHOUT ANY DEPOSIT

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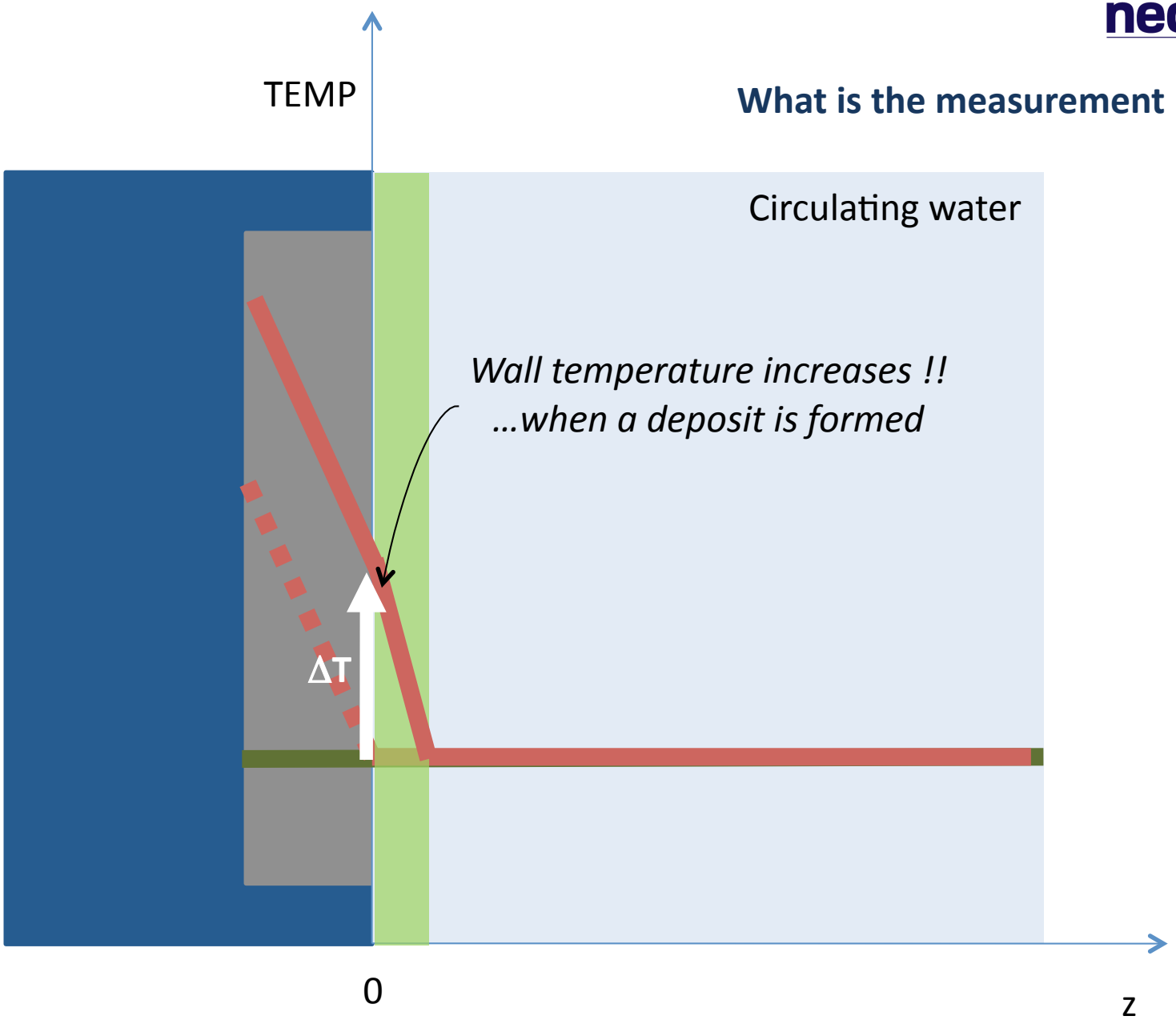
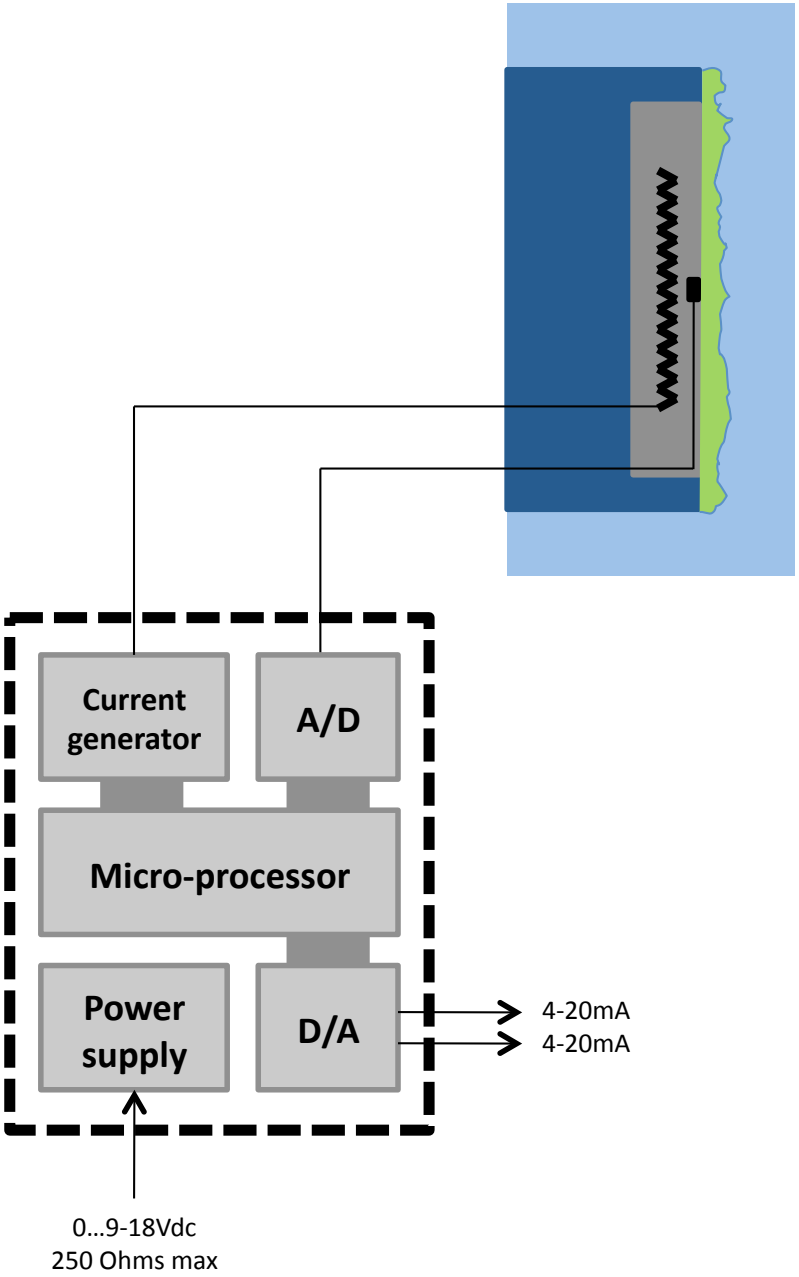
What is the measurement principle ?

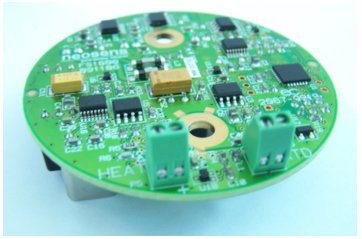


TEMPERATURE PROFILE DURING A NON-HEATED PHASE and HEATED PHASE WITH DEPOSIT

What is the measurement principle ?



- Besides *sensor technology*, **unique calculation and computational algorithm** are embedded into the system thanks to the probe electronics card.
- The embedded electronics card is able to deliver 2 active analog outputs (4-20mA) for both measurements : deposit thickness and process temperature.
- The microprocessor is containing specific calculation methods for both driving the current generator (related to thermal flux) and computing measurements from wall temperature evolution given by the miniaturised sensor.
- **Several methods** exist for achieving reliable measurements in different situations and industrial environments, such as:
  - Circulating media with small temperature process variations,
  - Circulating media with high amplitude temperature variation,
  - Non-circulating media,
  - High pressure, flow-rate and temperature,
  - etc…



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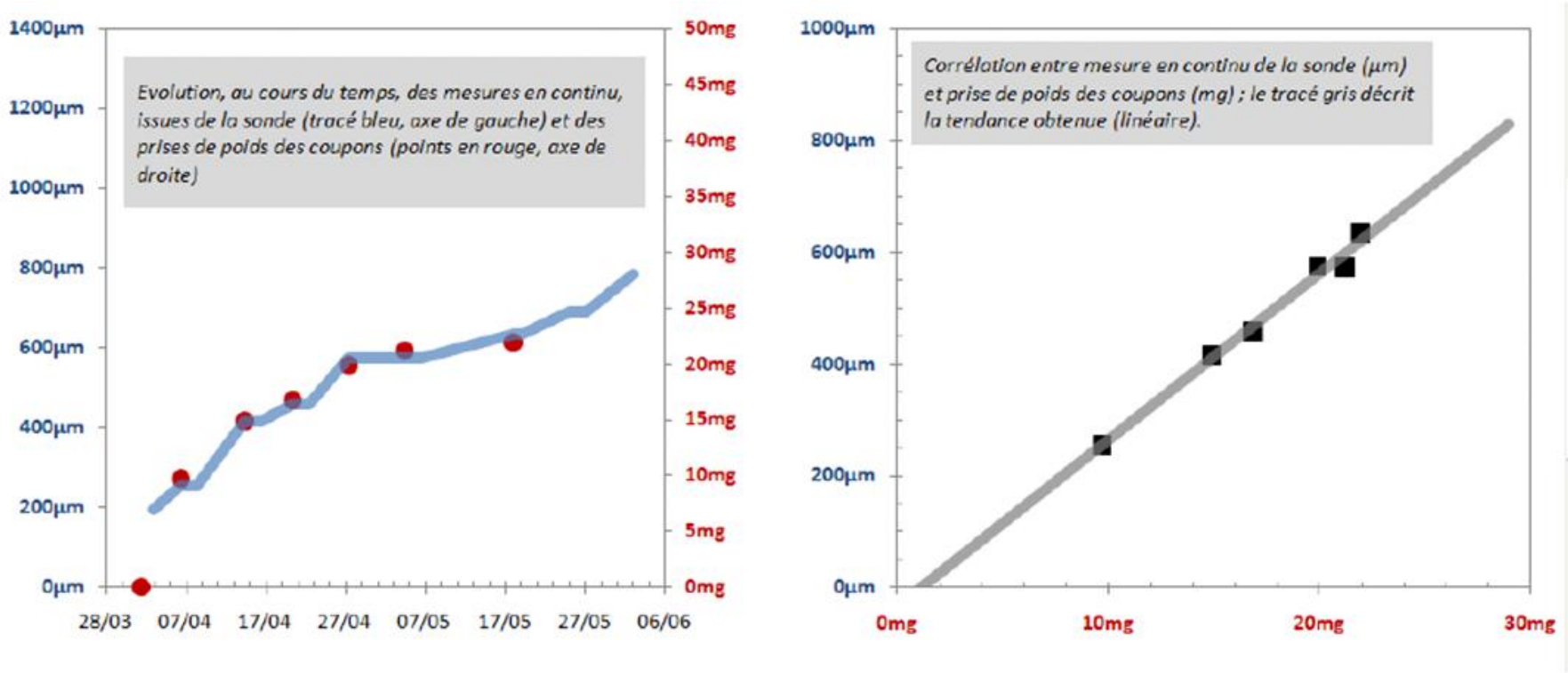
Some of our customers

	Cooling systems & Utilities	Process
Food & Beverage		DANONE, SODIAAL, SENOBLE, BONGRAIN SA, GROUPE LACTALIS
Power	CLIMESPACE, LABORELEC, EDF, CPCU	
Pulp & Paper	Kemira	Kemira, UPM, Buckman
Oil & Gas	TOTAL	TOTAL, ARKEMA

Application: Tertiary Cooling Systems

Scope: Biocide treatment efficiency monitoring on organic fouling

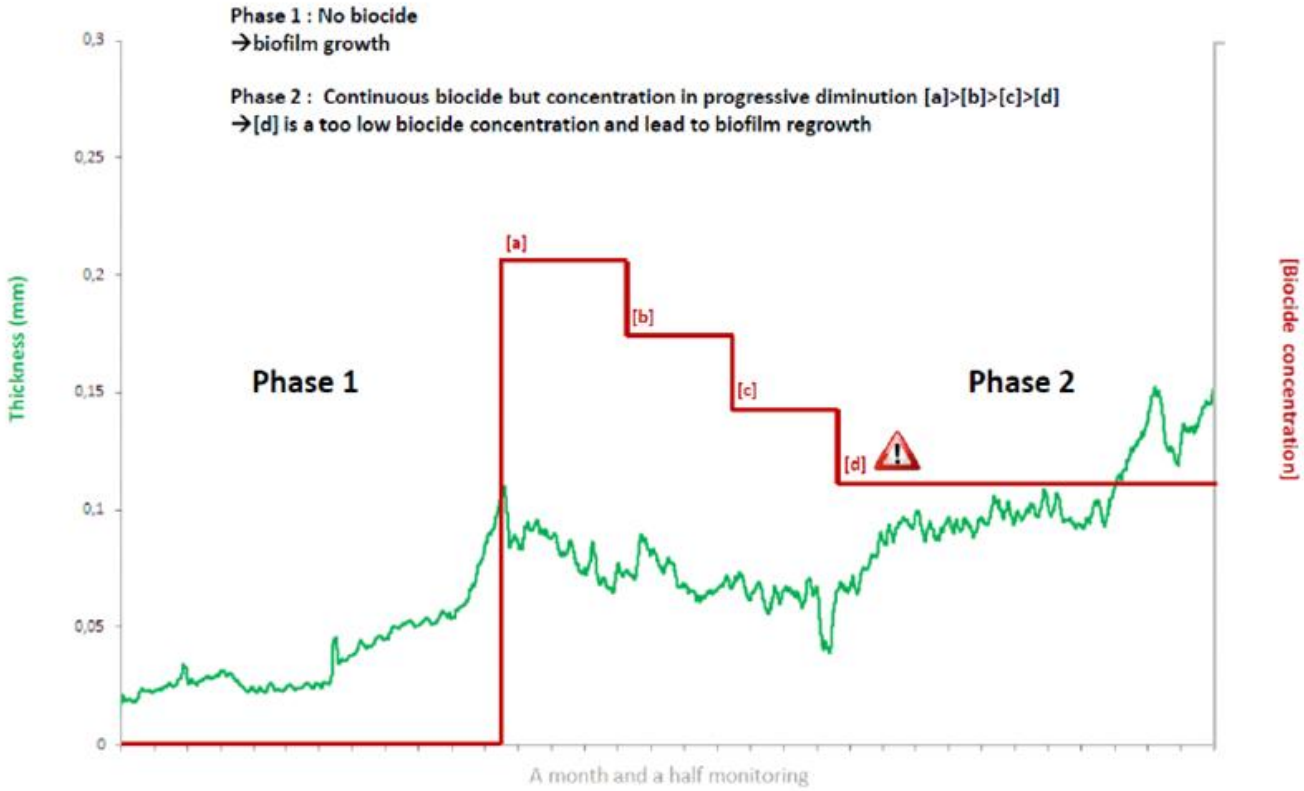


Results: Perfect correlation between coupons monitoring & Neosens measurement

Advantages: Biocide treatment optimization, reduced the use of chemicals & the environmental impact, production safety (Legionella), energy savings.

Application: Tertiary Cooling Systems

Scope: Biocide treatment efficiency monitoring on organic fouling



Results: Found the minimal biocide dosage in order to control biofilm growth

Advantages: Biocide treatment optimization, reduced the use of chemicals & the environmental impact, production safety (Legionella), energy savings.

phigenics

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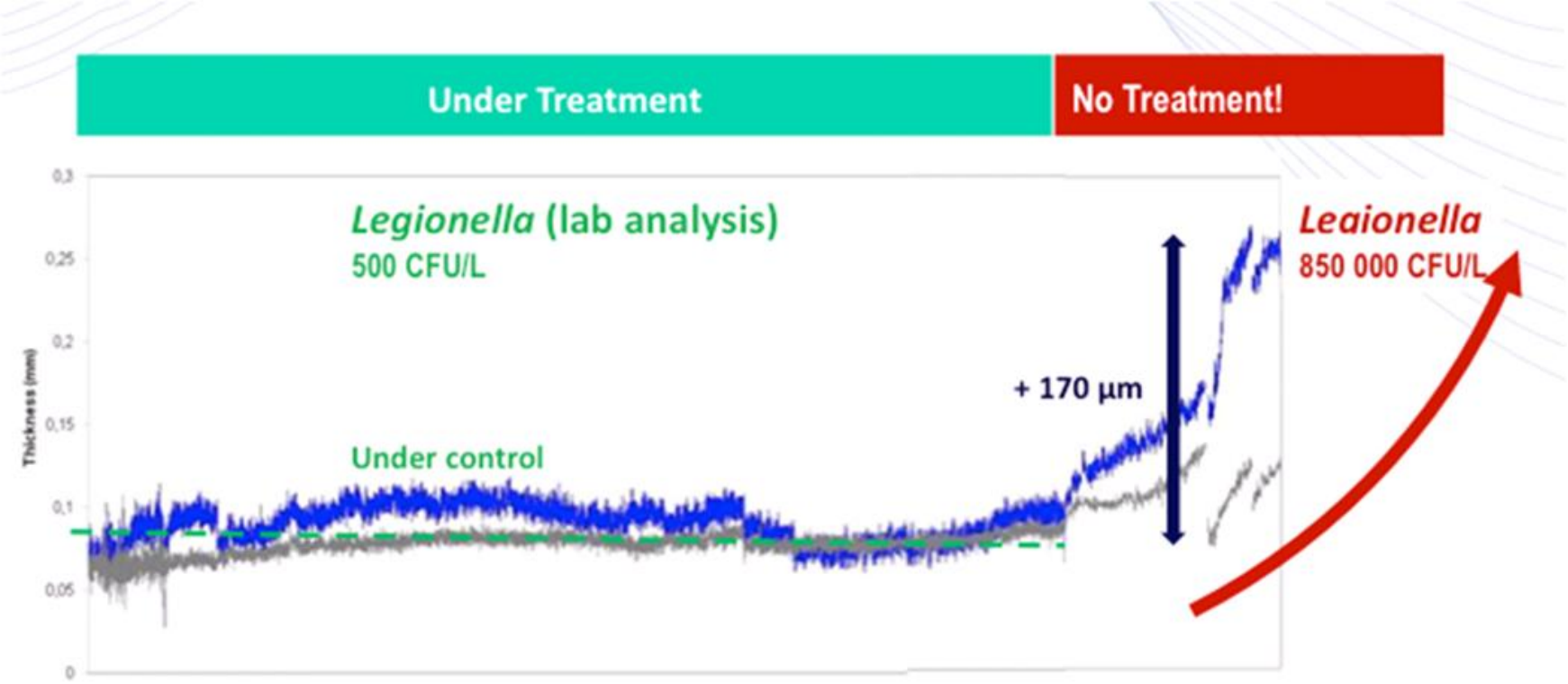
Application: Open recirculating cooling system
Scope: Biocide treatment optimization

Results: checked the efficiency of the new implemented biocide treatment
Advantages: Biocide treatment optimization, reduced the use of chemicals.

Application: Open recirculated cooling system
Scope: Legionella risk management



Results: Legionella risk assessment with biofilm thickness monitoring
Advantages: Legionella “insurance”, biocide treatment optimization, reduced the use of chemicals & the environmental impact, energy savings.

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Biofilm – Scale – Monitoring – Anticipation – Control – Alert – Optimization – Environment – Industry – Fouling – Dissolved Oxygen – MEMS – innovation – Know-how – Solutions – Sensors – **water** – liquids – Process – Industry

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