ECO3CIP: Industrial validation of an ozone based CIP in a dairy industry

ECO/09/256045/SI.564671

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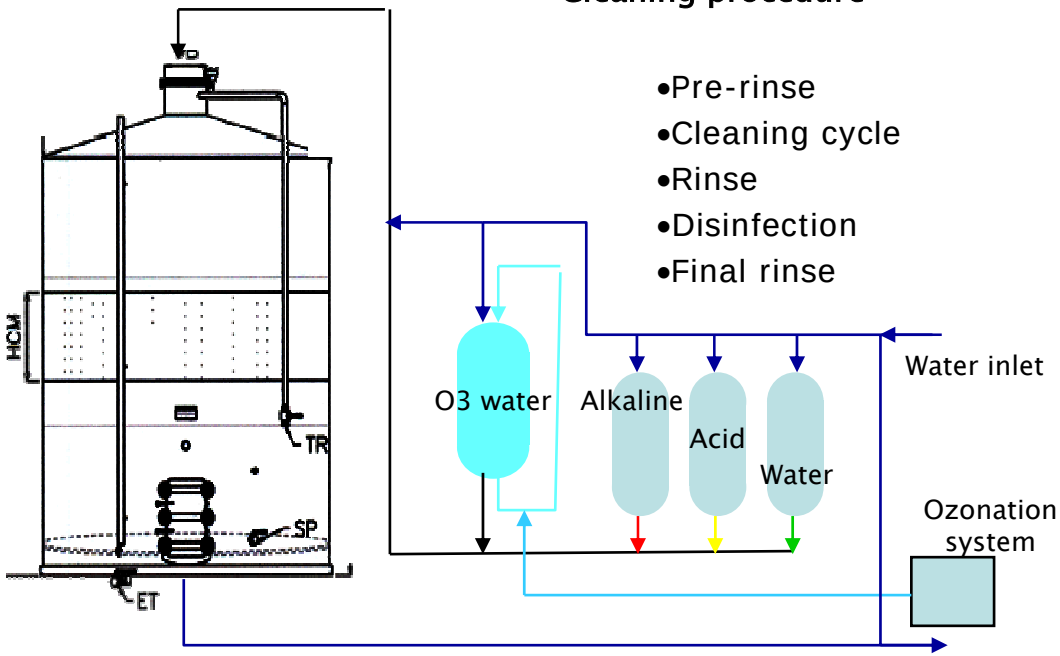
IOA & IUVA Congress 24th May 2011

The ozone based CIP alternative

Cleaning procedure



- Pre-rinse
- Cleaning cycle
- Rinse
- Disinfection
- Final rinse

Operational conditions
Contact time
Temperature
Concentration of chemicals
Mechanical force

Factors
Water quality
Properties of food soil (quality and quantity)
Chemistry of chemicals employed:
OZONE

Compatibilidad Materiales
Toxicidad y medidas de prevención de riesgos

Benefits

- Operation costs reduction
- Reduction in water consumption, wastewater volume and organic load discharged, and toxicity.
- Generated in site on demand, no storage needed
- Wide spectrum disinfectant

Risks and doubts

- Compatibility with materials of existing equipment
- Economic balance including investment
- Need for additional work safety measures at industrial scale (destructors, O3 ambient…)

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eco-innovation

Financing

- Eco-innovation means all forms of innovation reducing environmental impacts and / or optimising the use of resources throughout the lifecycle of related activities

- Bridge the gap between research and the market, CIP Eco-innovation contributes to the implementation of the Environmental Technologies Action

- First application or market replication of eco-innovative techniques, products, processes or practices, which have already been technically demonstrated, but due to remaining risks need incentives to penetrate significantly the market

The project

Industrial validation of an ozone based CIP system for dairy industries

AGREEMENT NUMBER- ECO/09/256045/SI2.564671

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First Application and market replication projects

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Objectives and partners

Objectives

•Hygienic and environmental **validation at industrial scale** for a dairy industry

•set a user's **guideliness**

•cost analysis and determination of **pay back time**

Partners

ainia centro tecnológico

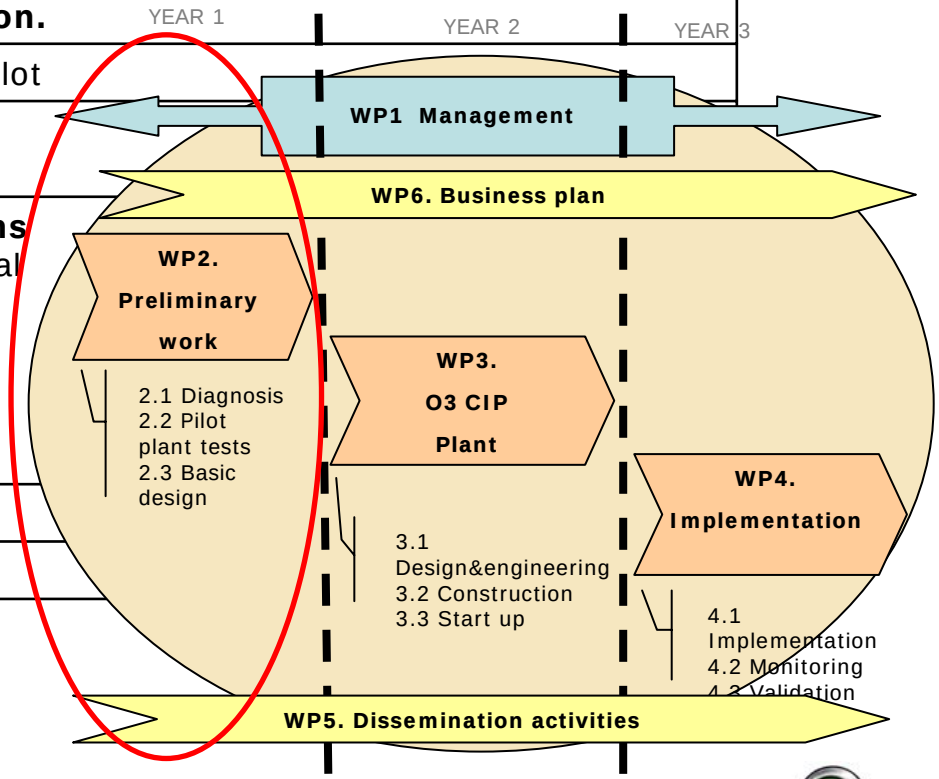
ITT

GRAU INSTALACIONES INDUSTRIALES

Iparlat

Methodology

WORK PLAN (3 YEARS) June 2010 to June 2013
WP 1. Management
WP 2. Preliminary work
Task 2.1 Environmental and hygienic efficiency initial diagnosis in the dairy company Task 2.2 Pilot scale trials Task 2.3 Evaluation of results, Basic design and specifications, scaling-up settings
WP 3. Design and construction of the installation.
Task 3.1. Design and engineering of the industrial pilot
Task 3.2. Construction of the industrial pilot Task 3.3 Start up and tuning of the installation
WP 4. Implementation and industrial validations Task 4.1 Definition of protocols and operation manual Task 4.2 Implementation Task 4.3. Evaluation of results and conclusions *4.4.1 Technical evaluation* *4.4.2 Environmental evaluation* *4.4.3 Economic evaluation*
WP 5 Dissemination (including web site)
WP 6 Business plan



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Methodology

The performance indicators to be obtained are:

a) Environmental indicators

- Water consumed and waste water discharged per cleaning cycle
- Organic load discharges per cleaning cycle
- Toxicity of cleaning waste waters

b) Hygienic performance indicators

- Microorganism count and ATP on the inner surface of the tanks
- Microorganism count in the last rinse water
- TOC in the last rinse water

c) cost indicators

- running costs per cycle
- installation cost and payback period

EXPECTED RESULTS

Objective	Expected Result	Economic impact
Reduction of the water consumption and wastewater volume	25% reduction	Savings in costs for water consumption.
Reduction in the consumption of chemicals	10% reduction	Reduction of expenditure in chemicals
Reduction of the organic load in wastewater	15% reduction	Reduction in environmental taxes
Reduction in toxicity of wastewater	reduction to be determined	Reduction in environmental taxes

-Reduction in water consumption / wastewater volume by 25%. This result should be obtained via the reduction in the volume of water needed in the final rinse as, all or at least part, of this step should be achievable in a closed loop.

-Chemical consumption should be achieved in most cases by the substitution of the disinfectant employed by ozone. In the case tested under the ECO3CIP project a low value is set as objective as only a reduction in the use of NaOH in the alkaline wash is expected due to the effect produced by ozone in the first rinse should allows for such a reduction in the NaOH dose in the alkaline wash.

- A organic load reduction in wastewater by 15% is set as objective compared to current practice in the company in the target CIP

WP 2: PRELIMINARY WORK

2.1 Dairy company plant environmental and hygienic CIP diagnosis

The milk factory

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WP 2: PRELIMINARY WORK

2.1 Dairy company plant environmental and hygienic CIP diagnosis

Raw milk reception

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WP 2: PRELIMINARY WORK

2.1 Dairy company plant environmental and hygienic CIP diagnosis

The CIP system

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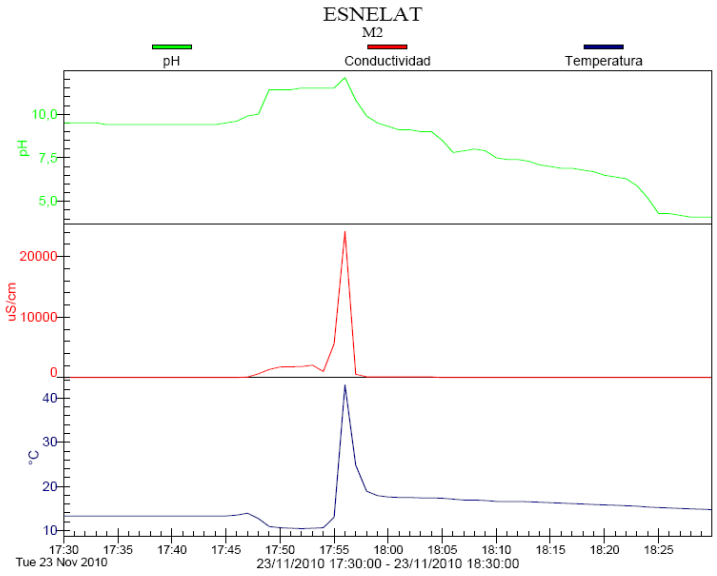
WP 2: PRELIMINARY WORK

2.1 Dairy company plant environmental and hygienic CIP diagnosis

The environmental diagnosis



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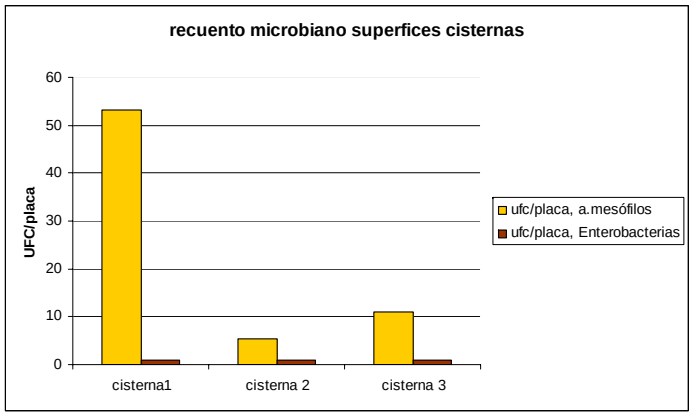
WP 2: PRELIMINARY WORK

2.1 Dairy company plant environmental and hygienic CIP diagnosis

The hygienic diagnosis



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2.2 Pilot scale ozone-CIP trials

Protocols

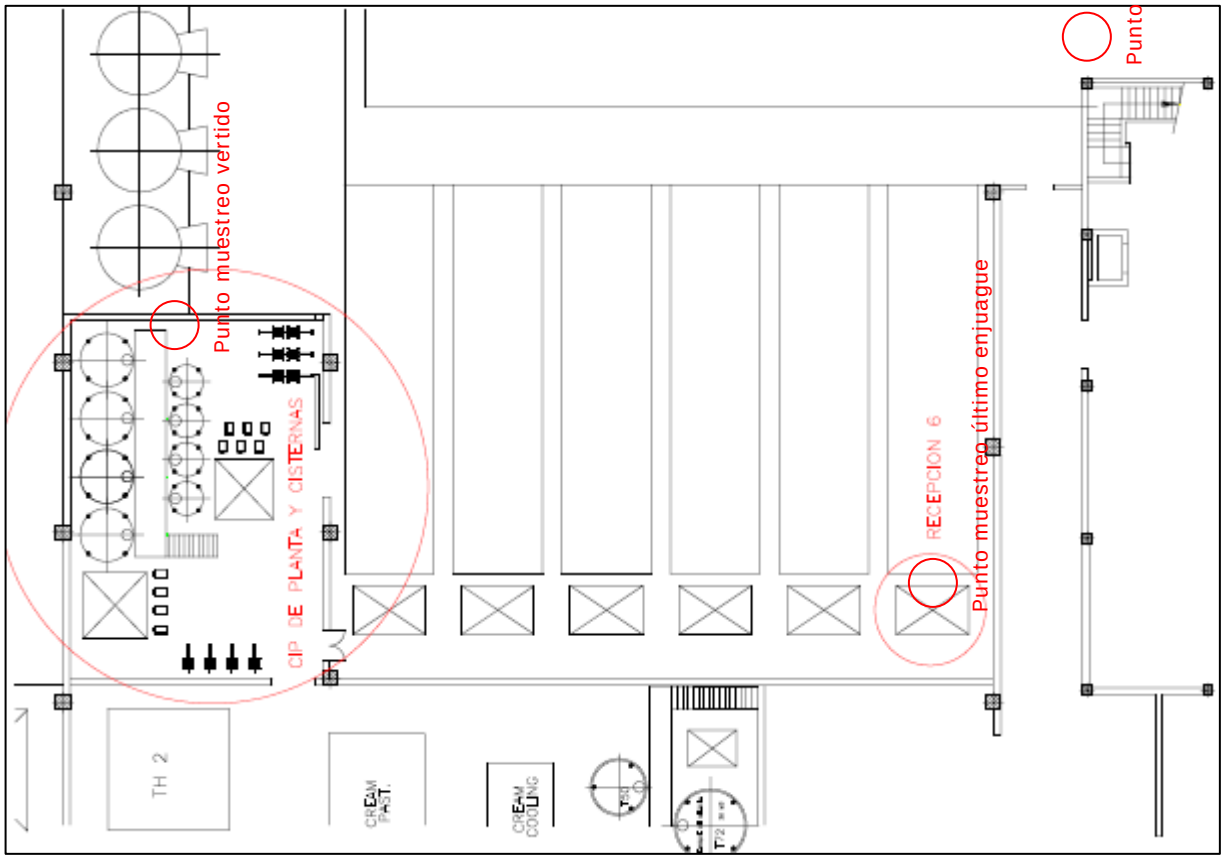
	ColdCIP	CIP	Cold CIP+O3	O3 + cold CIP +O3	CIP+O3	O3+CIP+O3	O3+lowCIP+O3
Initial water rinse to drains	1	1	1	0	1	0	0
O3 water rinse to drains	**0**	**0**	**0**	**1**	**0**	**1**	**1**
Caustic wash (closed loop)	2	2	2	2	2	2	2
Water rinse to drains	1	1	0	0	0	0	0
O3 final rinse in closed loop	**0**	**0**	**1**	**1**	**1**	**1**	**1**
Total time	***4***	***4***	***4***	***4***	***4***	***4***	***4***

Note: cold refers to caustic wash used at ambient temperature otherwise at 70ºC; O3 refers to initial or final rinse water enriched with ozone, in such a case O3 concentration in water of 1 ppm in all cases, low refers to a reduction of 25% in the NaOH dose in the caustic wash.

WP 2: PRELIMINARY WORK

2.3 Evaluation of results, basic design and CIP specification

Ongoing!



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ACKNOWLEDGEMENTS

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Thank you for your attention

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