GA number: **315068**

Acronym: **L4CW-Demo**
Title: **Demonstration of a novel system to breakdown hazardous substances in wastewater streams into harmless bio-friendly compounds using multi-chromatic UV light**

Publishable Summary

Project Context and Main Objectives

Many industrial processes create a significant volume of polluted waste water streams, which need to be cleaned prior to return to the environment to ensure the sustainability of the water supplies and the environment. This is reflected in a significant body of legislation, including the European Water Framework Directive and the IPPC directive.
The Light4CleanWater Research for the benefit of SMEs (R4SMEs) project (FP7-SME-2008-01-232073) resulted in a pilot system that was able to safely and cost effectively treat toxic organic waste streams; breaking down hazardous substances into harmless bio-friendly compounds, using an advanced oxidation process based on multi-chromatic UV source (AOP-UV), without generating any secondary toxic by-products. To be able to commercially exploit the developed water treatment technology, the project L4CW-Demo was initiated and completed.

The project objectives were:

1) To industrialize the manufacturing process to enable volume production and economies of scale to be achieved.
2) To validate a commercially viable process that can be marketed with a reasonable return on investment (RoI) for customers.
3) To demonstrate the technology over extended periods in industrial locations
4) To compare the results with relevant potential customers needs
5) To collate the feedback from demonstrations in a format that enables iterative system enhancement to continuously improve the the process.

Work Performed and Main Results Achieved

Since the beginning of the project the industrial partners have worked towards an industrial manufacturing process of the lamp system and associated glass technology.

SICO and Fraunhofer in-house simulation tools of glass stability were refined to deliver reliable predictions of mechanical stability with less than 30 min of calculation time.

Over 50 glass sub-units were fabricated and tested on mechanical stability. Sub-units were tested on UV-emission and artificial wastewater degradation.

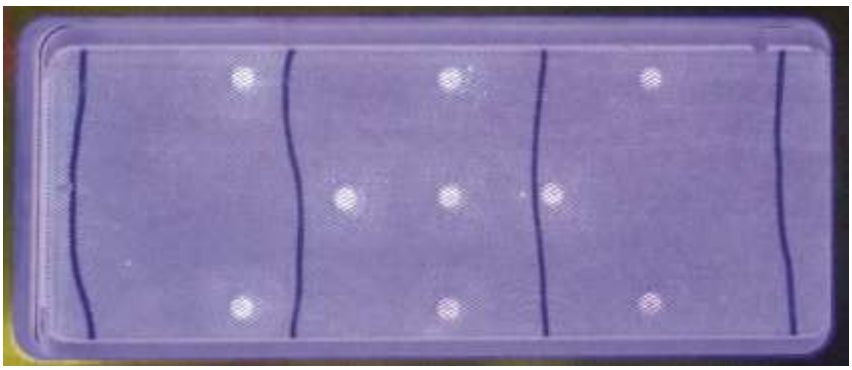

Fig. 1: L4CW-Demo quartz-glass sub-unit showing energy optimal, homogeneous irradiation

The production process has been developed in its general steps including among others: the shaping of the glass process, including flexibility on geometric configurations against specific application requirements; the technique to fill the quartz cavity with gas to the specific pressures needed with negligible leakage; ensuring amenability to automated production; ensuring safety in production and operation; testing protocols to meet quality assurance.

The energy input to the UV-reactor was further optimized to the gas and reactor geometry yielding increased power efficiency.

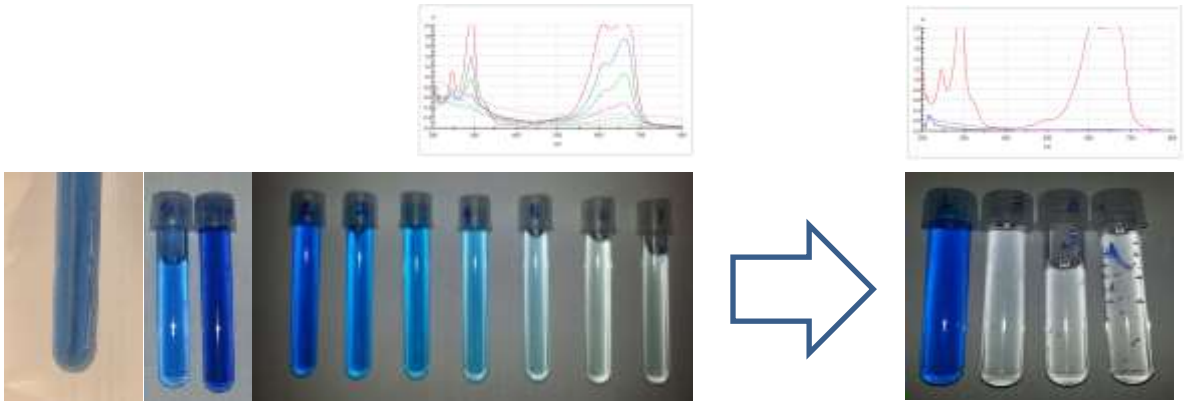

Fig. 1: Re-optimization of process parameters from low efficiency with particulate and by-product formation to high efficiency and clean solutions

The database of wastewaters likely to be treatable with economic benefit was updated. Several industrial wastewaters were evaluated at laboratory scale.

UV-Reactor parts (housing, flow guides and connectors) were redeveloped ensuring amenability to automated production.

The process control and sensing system developed at a prototype level in the R4SME Light4Clean Water project was further optimized.

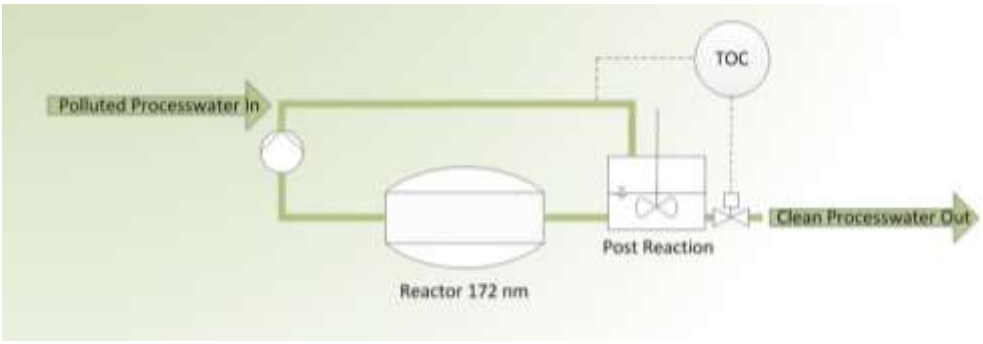

Fig. 2: L4CW-Demo Process Scheme

Two demonstration units containing 8 UV-reactors for 172nm-irradiators of 150 W each and online TOC-analysis were build and tested.

Fig. 3: L4CW-Demo Unit 1 and L4CW-Demo Unit 2

Long term test at an industrial site in Germany were performed for several month and are ongoing.

Data for product life cycle analysis was collected in line with the defined goal and scope of the intended life cycle analysis.

The project goals were reached with relatively minor deviations caused by technical optimization.

Expected Final Results and Their Potential Impact

The consortium reached the project goals, automated production of UV-reactors and optimized the treatment unit as to sensing and control. It demonstrated the new UV-wastewater treatment technology for extended time periods. This allowed them to generate base data for product life cycle analysis and customer ROI calculation.

At the end of this L4CW-DEMO project the viability of: the “advanced AOT treatment of hazardous organic materials in wastewaters into bio-friendly compounds using multi-chromatic UV light process”, has been proven and is ready for commercialization in less than six months.

Through the adoption of the L4CW-Demo technology there could be a significant societal benefit through the reduction of organic pollution from industrial sites prior to discharge into sewage works. Discharge charges to the enterprises will be lowered and in certain applications water reuse will be enabled. More economic and environmental wastewater treatment technologies also help water scarce regions to attract new industrial activity without having to invest in additional water sourcing and wastewater treatment sites.

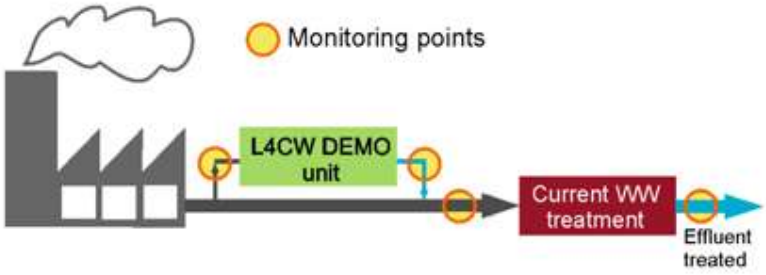

Fig. 4: Scheme of demonstration of L4CW-DEMO plant in parallel to existing treatment.

Project website: http://www.l4cw.eu

Contact

Project Coordinator:
Walter Nadrag
E-Mail: office@sico.at
Phone: +43 4244 51510

Sico Technology GmbH
Bleiberg-Nötsch 176
9531 Bleiberg-Kreuth, Austria
Internet: www.sico.at

Project Partners:

Uvasol Ltd
E.R.S.-Steuerungstechnik GmbH & Co.KG
LFE Laboratorium für industrielle Forschung GmbH &Co. Entwicklungs KG
Bamo Mesures SAS
Fraunhofer Institute for Interfacial Engineering and Biotechnolgy IGB

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