

ACCEPT

Advanced LCO₂ cleaning as an ecological process technology in the EU

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1. INTRODUCTION

ACCEPT is the acronym for **ADVANCED CO₂ CLEANING AS AN ECOLOGICAL PROCESS TECHNOLOGY.**

EU project ACCEPT no. 222051 will be started in September 2008; it has duration of 2 years and will be completed in September 2010.

Project ACCEPT will investigate the use of LCO₂ with respect to **cleaning effectiveness and hygiene ability on pliable and hard surfaces (textiles, leathers, medical devices, implants and fine metal parts)**.

The research continues earlier laboratory and pilot research, but will expand this to full scale industrial sized LCO₂ cleaning units. In order to remove surface residuals, a CO₂-precision cleaning step is required for fine parts.

It is the ultimate goal of the project to promote and introduce a competitive, sustainable, hygienic, environmentally and labour friendly cleaning technology to replace hazardous (non) halogenated hydrocarbon solvents and use the LCO₂ as a final cleaning step (after aqueous cleaning).

The high cleaning efficiency of LCO₂ with respect to soils and its disinfection ability makes it a **highly innovative procedure** that has the potential to replace many conventional cleaning processes in the near future. No other solvent has this potential.

Project coordinator **Chemische Fabrik Kreussler & Co. GmbH**, Wiesbaden-Biebrich, Germany has submitted the project proposal. It is targeted for SMEs in the Theme FP7-SME-2007-1.

The Consortium of the project consists of **11 project participants from 8 EU Countries** (Germany, France, UK, the Netherlands, Denmark, Sweden, Slovenia and Switzerland): **6 individual SMEs** (small and medium enterprises), **2 LEs** (large enterprises) and **3 RTDs** (research performers); see Table 1.

The project has a **well-planned management structure** for the cooperation of these EU project participants.

The project management team (PMT) consists of **Ing. Walther A. den Otter and Prof.dr.ir. Foppe B. de Walle**.

Table 1. Participants EU project ACCEPT

Participant type	Participant name	Country
1. SME 1 (Coordinator)	Kreussler & Co	Germany
2. SME 2	Pyramides	France
3. SME 3	Kymi Rens	Denmark
4. SME 4	Etiquette	UK
5. SME 5	Amsonic	Switzerland
6. SME 6	SMP	Germany
7. RTD 1	wfk-CTRI	Germany
8. RTD 2	ITEK-UM	Slovenia
9. RTD 3	PROMIKRON	Netherlands
10. OTH 1 (LE)	Fred Butler	Sweden
11. OTH 2 (LE)	Instruclean	Germany

2. PURPOSE

It is the **purpose** of the project to further improve and promote a competitive, sustainable, hygienic, environmentally and labour friendly carbon dioxide based cleaning technology to replace the conventional hydrocarbon and halogenated organic solvents.

The cleaning of pliable (textiles and leathers) and hard surfaces (medical devices, medical implants and fine metal parts) requires solvents to remove dirt and soils before the materials can be (re-)used in their final applications. These solvents can be organic solvents (halogenated and non-halogenated hydrocarbons) for a-polar soils or water with chemicals for polar soils. Each type of liquid has environmental and hygienic drawbacks. The cleaning and hygienic efficiency of these solvents and aqueous systems is not sufficient as small amounts of residual cleaning agents and/or soil impair the quality of the cleaned surface.

The (non) halogenated hydrocarbon and aqueous systems can be replaced by liquid carbon dioxide (LCO₂) as a clean, hygienic and environmentally sound solvent. LCO₂ has shortcomings at present and needs improvement of its cleaning performance and quantification of its disinfecting/sterilisation potential.

The earlier research will be extended to other hygienically demanding materials to be cleaned. The project further **improves LCO₂ for cleaning and hygienic quality** of these materials. This will lead to **replacement** of (non) halogenated hydrocarbon solvents such as hazardous perc and toxic trichloroethylene. The LCO₂ is non-toxic, non-flammable, has disinfecting/sterilising properties, is produced as an off-gas in almost pure form in the oil refining and ammonia production, causes no groundwater contamination, and is very sustainable and environmental friendly.

3. OBJECTIVES AND WORK PACKAGES

Project ACCEPT has three general **objectives**:

- 1) To **achieve an improved LCO₂ cleaning performance** of pliable (textiles and leathers) and hard surfaces (medical devices, implants and fine metal parts), and **reach a higher end-product quality, a more secure low temperature hygiene / disinfection / sterilisation and lower economic costs**, at full-scale level. The end result is expected to be better than that of the current conventional cleaning technologies.
- 2) To **plan and design the integration of the LCO₂ technology** into the total processing chain for future on-site implementation in the EU cleaning sector.
- 3) To **disseminate the research findings** on an EU scale, to develop training materials suitable for the EU cleaning sectors and to assist the introduction of the LCO₂ technology in actual practice.

ACCEPT will be executed in **11 Work Packages (WPs)**:

- WP1 Baseline
- WP2 LCO₂ Detergents
- WP3 Hygiene/germicides
- WP4 Hygiene/no-residuals
- WP5 Improvement of cleaning performance
- WP6 Filtration during cleaning step
- WP7 Coating and impregnation
- WP8 Spin-off applications
- WP9 Up-scaling methodologies
- WP10 Information transfer and dissemination of project findings
- WP11 Project management

The exploitation of the developed technologies is outlined in the exploitation plan. The future EU economic gains from ACCEPT are estimated at 12-21% per year for the growth of the participant cleaners and sustain an otherwise threatened EU cleaning sector with annual sales of EUR 21 billion EUR. Calculations showed that LCO₂ replacement costs are similar to organic solvent units

4. CONTACT

Further details can be received by contacting the **Project Management Team**:

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Figure 1. Kick-off Meeting of the ACCEPT Consortium at wfk-Cleaning Technology Research Institute in Krefeld (D)