Publishable Final Activity Report

Project no.	COOP-CT-2003-508 490
Project acronym	Aerosol Reduction
Project title	New Hygienic Cleaning Technique – for food production – reducing aerosol problems and water consumption
Instrument	Cooperative Research - Craft

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Period covered	from June 1, 2004 to Nov 1, 2006
Date of preparation	January 12, 2007
Start date of project	June 1, 2004
Duration	30 months

Project coordinator

Name	Magnus Elmblad
Organisation name	Lagafors Fabriks AB

1. Project Execution

1.1 Summary description of the project objectives

Food-, pharmaceutical- and agricultural-industry all over the world use high pressure water cleaning to get rid of contamination, micro-organisms and bacteria. Enormous amounts of water and energy are used every day for different cleaning purposes. Still many people get serious ill / poisoned every year, due to hygienic problems - contamination. Investigations show that a huge problem is contamination of already cleaned equipment. This contamination is a result of aerosols, spread all around the plant.
The wish from authorities in EU and other parts of the world is to assure the cleaning process – avoid contamination and to reduce the water consumption.
In this CRAFT co-operative project we have worked with solving the technical problems, which have arisen when developing dry cleaning systems.

Overall Technical and Industrial Objectives

The ***commercial objective*** of this project was to provide European food and medical industry with a dry pre-cleaning system as a replacement for today's water wasting system.

The ***operational targets*** set for the concept system included:

- High degree of effectiveness of the vacuum pump and by that low energy consumption
- High degree of effectiveness of the nozzles and usage instructions and by that time efficiency
- The ability to regulate vacuum with frequency control and by that minimize energy consumption
- High degree of mobility, cordless and easy to manoeuvre.
- A system durable over time with a minimised need for maintenance
- A full automatic hygienic cleaning system to prevent bacterial growth in the system
- Detect and measure aerosol and to use electrostatic particle collectors

To achieve this, a number of ***technical objectives*** had to be met. These included the requirements to:

- Minimise energy losses in pump system due to friction and flow resistance
- Minimise energy losses due to vacuum flow only when needed
- A pump principal that makes it possible to keep up the flow despite resistance
- A nozzle which either is adjustable itself or easy to switch for different needs
- A pump system with very short reaction time for changes in the usage and/or a system with energy reservoirs ready to fill in during the switches
- A vacuum cleaner equipped with state of the art battery technology

1.2 Contractors involved

SME contractors

Lagafors Fabriks AB	Sweden
Vald Nielsen Maskinfabrik AS	Denmark
Hygienteknikk A/S	Norway
Faitech OY	Finland

Other contractors

Procordia Food AB	Sweden

Performer contractors

Innovation Team AB	Sweden
Institute for Product Development	Denmark
Chalmers Industriteknik	Sweden
Nowegian Food Research Institute	Norway

1.3 Co-ordinator contact details

Lagafors Fabriks AB
Box 5
312 21 Laholm
Sweden

Contact: Magnus Elmblad
Phone: +46 (0)430 781 00
E-mail: magnus.elmblad@lagafors.se

1.4 Work performed – summaries

Work package 1: Pre-wash

This comprehensive work package consisted of two main parts, one theoretical part with studies and tests on vacuum capacity and energy needed and one more practical part. The later has incorporated the development of a manufacturing frame of a mobile system, equipped with pump unit, drive unit, batteries, nozzles etc.

The practical parts have however been conducted in a research manner with investigations and tests in order to find the most suitable technologies to approach efficient equipment. We have also done investigations and development of a separator and filtration technique and tested the quality of the air in the vacuum system.

Tests have been performed in order to challenge the idea that adding water is necessary to reduce the friction enough to enable the residuals to be lifted. The test concluded that no water was needed, which is very good for the system due to the aerosol problem.

Our main ***achievements*** are that we have a working vacuum cleaner including many of the functions we wished for. Field tests have shown very promising results and involved end-users have great expectations about this product.

Work package 2: Aerosol reduction

This work package was aiming at researching the upcome of and occurrence of aerosols in food processing plants and develop a system for minimizing the aerosols. The amount of aerosols found were much higher than we had anticipated and the different methods we investigated to collect the aerosols could not be used for these large volumes. The results are however interesting for smaller applications, such as filter units. Due to the results the consortium concluded not to continue the work of this work package, but to increase the scope of work package 1 and develop a system that minimizes the upcome of aerosols.

Work package 3: Analyses, tests and field tests

The overall objective of the third work package was to test the results of work package 1 and 2 to verify:

- The reduction of aerosols – and if we have any principles of how to collect them
- The performance of the vacuum technique
- The usability of the system
- The water reduction
- The performance during different circumstances – in different applications

The solutions and products should also be tested by end-users to collect their impressions and opinions.

Technical objectives:

- Design and production of prototypes for laboratory and field-tests
- Testing and verifying of the functions
- Tests and verification of hygienic aspects performance
- Verification of end user acceptance

The prototyping was made in several steps with two functional prototypes for early tests and verification of functions and then the production of a third prototype that is close to the design and function of the final product we are aiming for.

1.5 Results achieved

WP 1 Achievements made with reference to planned objectives:´

- Mobile system realized
- Required vacuum capacity and suction force determined
- Several principle solutions of nozzles tested and evaluated
- Verified and validated low occurrence of microbial growth in the vacuum system
- Different fans tested to get required flow/pressure capacity
- Determined that extra water is not needed to enable suction of residuals
- Finalized manufacturing frame after several rounds of concepts.

WP 2 Achievements made with reference to planned objectives:

- Our studies showed that the amount of aerosols is very high and that they exist all over the plant, giving very high volumes. Every usage of water creates aerosols and they can be airborne for several hours, which means that they can land and contaminate critical surfaces a long time after the cleaning procedure is finished.
- The studies on electron particle collectors showed that this is very hard to realize on the large volumes in a plant, but the techniques can be used for smaller applications such as in an air filter unit.
- The best way to approach the aerosol problem is to minimise the upcome by decreasing the usage of water in the cleaning process.

WP 3 Achievements made with reference to planned objectives:

- The principles of how to collect aerosols could not be applicated in the food processing plants, but can be interesting for smaller applications.
- The performance of the vacuum technique is tested and verified with success.
- The usability of the system is fulfilled according to our requirements apart from the fully automatic hygiene cleaning system of the machine.

- The water reduction will compared to the current methods be great
- The performance have been tested and verified with good results.

1.6 Intention for use and impact

The intensions are to sell the new cleaning system for food and pharmaceutical industries. The SME proposers will start by selling the system in north Europe and UK. SMEs in other countries will be able to buy production / sales licences. The market for this new cleaning system is very large.

2. Dissemination and use

The consortium is not ready to publicise the results as the field tests are not ready and the IPR not protected. According to our plans we will be ready to publicise the results during 2008 and launch the product in the beginning of 2009.