Conceptual Design of a Centrifugal CO₂ Cleaning Device

Federal Manufacturing & Technologies

J. N. Harrington

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OF A CENTRIFUGAL CO₂ CLEANING DEVICE**

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Project Accomplishments Summary

CRADA Number 95-KCP-1015

Date: 2/24/97

Revision: 0

A. Parties

The project is a relationship between

AlliedSignal FM&T
2000 E 95th Street
PO Box 419159
Kansas City, MO 64141-6159

The L.A.W. Group, Inc.,
2620 S. Oliver, #205
Wichita, KS 67278-2183

B. Background

The L.A.W. Group, Inc., Cryokinetics Division designs and manufactures cryogenic cleaning devices in their Wichita, Kansas, facility. The L.A.W. Group, Inc., Cryokinetics Division identified a market need for a new cryogenic cleaning device that would generate a high level of kinetic energy at a lower operating pressure and noise level. This market need is being generated because the existing products when operated at high kinetic energy levels create an excessive amount of noise and consume a very high level of compressed gases. The L.A.W. Group, Inc., Cryokinetics Division had begun some preliminary research in the development of this new product prior to the beginning of the CRADA effort.

The intention of this CRADA effort was to join AlliedSignal's expertise in knowledge of manufacturing processes, design, and capabilities in performing solid modeling together with The L.A.W. Group, Inc., Cryokinetics Division's knowledge of cryogenic cleaning design and manufacturing into a design team to create a prototype of a high-energy centrifugal cryogenic cleaning device.

C. Description

It was expected that the collaborative design team effort would result in the development of a prototype centrifugal cryogenic cleaning system which would generate high kinetic energy at low noise levels and low gas consumption.

Other desired results were to have a design that was easily and economically manufacturable, safe and easy for the operator to use and maintain, and easily adaptable to the rest of The L.A.W. Group, Inc., Cryokinetics Division product line.

The project began with collaborating with a group of Kansas State University College of Engineering seniors to help with a literature search and preliminary CO₂ discharge velocity calculations and measurements. FM&T high-speed video taping techniques were used to aide the KSU students in their evaluations.

Based upon some preliminary test results and several brainstorming sessions, a preliminary design was decided upon. The design was completed at FM&T with stereolithography and functional prototypes being delivered to Cryokinetics for evaluation. The prototype was evaluated. The test results were positive and gave credence to the prospect of developing a centrifugal cryogenic cleaning system.

D. Expected Economic Impact

The results attained from this project will provide The L.A.W. Group, Inc., Cryokinetics Division information to continue with their goal to develop a high kinetic energy CO₂ cleaning device. In addition, it is anticipated that with an improvement in the dry ice cleaning technology it would create a dramatic increase in world-wide demand for the dry ice cleaning technology, resulting in less world-wide pollution, export opportunities, and the creation of more U.S. jobs.

E. Benefits to DOE

The project has benefited DOE Defense Programs by presenting an opportunity to evaluate and characterize an environmentally friendly cleaning technique that could be used in manufacturing, fabrication, and disassembly of major assemblies. The impetus to study this technology would not have existed without the partnership. At this time the technology is not considered mature enough for widespread use. The specific benefits could involve such areas as cleaning castings and their associated molds, cleaning printed wiring boards, aiding in the disassembly of major assemblies that would normally require the use of solvents, removing paint from painted surfaces without the use of chlorinated and other environmentally harmful solvents, and other applications that would involve removing material from the surface of manufactured parts or assemblies.

F. Industry Area

The manufacturing industry would benefit from this technology in many cases where cleaning solvents are used, including automotive, aerospace, electronics, machining, and painting.

G. Project Status

The project was completed. A prototype was designed, fabricated, and tested. The test results demonstrated the feasibility of a centrifugal CO₂ cleaning device.

H. Point of Contact for Project Information

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I. Company Size and Point of Contact

The L.A.W. Group, Inc., Cryokinetics Division is a small U.S.-owned company with approximately six employees, located in Wichita, Kansas. The point of contact is:

Jay Armstrong
The L.A.W. Group, Inc.,
2620 S. Oliver, #205
Wichita, KS 67278-2183
(316) 681-0080.

J. Project Examples

None.

K. Technology Commercialization

Once a final design is complete, The L.A.W. Group, Inc., Cryokinetics Division expects to apply the technology to the other CO₂ cleaning products in their product line. The introduction of a high kinetic energy CO₂ cleaning device should create sales growth, and as the sales growth materializes, the number of its production personnel should increase to meet the demands in sales. A new high-energy/low-noise cleaning device would move them into a position to maintain and/or expand their foreign and domestic markets.

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