Particulate Emission Abatement for Krakow Boiler Houses

Quarterly Report
July 1 - September 30, 1997

Work Performed Under Contract No.: DE-FC22-94PC94111

For
U.S. Department of Energy
Office of Fossil Energy
Federal Energy Technology Center
P.O. Box 880
Morgantown, West Virginia 26507-0880

By
LSR Technologies, Inc.
898 Main Street
Acton, Massachusetts 01720
Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.
Abstract

Environmental clean-up and pollution control are considered the foremost national priorities in Poland. The target of this cleanup is the Polish coal industry, which supplies the fuel to generate over 78% of Poland's primary energy production. This project addresses the problem of airborne dust and uncontrolled particulate emissions from boilerhouses, which represent a large fraction of the total in Poland. In Kraków alone, there are numerous uncontrolled boilers accounting for about half the total fuel use. The large number of low-capacity boilers poses both technical and economic challenges, since the cost of control equipment is a significant factor in the reduction of emissions.

A new concept in dust collection, called a Core Separator, is proposed for this important application. The Core Separator is an advanced technology developed through research sponsored by the Department of Energy. It utilizes a highly efficient collector, which functions on the principle of inertial separation. The system is able to control fine particulate matter, as in the PM10 regulations, which limit the emission of dust particles below 10 microns in diameter. Its dust removal performance has been shown to be comparable to that of a medium-efficiency electrostatic precipitator (ESP). Yet, its cost is substantially lower than that of either an ESP or fabric filter. While the Core Separator achieves high efficiency, its power consumption is just slightly higher than that of a cyclone. It functions dry and without the aid of energy-consuming enhancements. It is simple, reliable, and unlike the ESP and fabric filter, easy to maintain. This combination of features make it ideal for the small boiler market in the City of Kraków.

A highly qualified team has been assembled to execute this project. LSR Technologies, Inc., a technology-based company located in Acton, Massachusetts, is the developer of the Core Separator and holder of its patent rights. LSR has sold many of these units in the U.S. and Europe. EcoInstal, a leading supplier of environmental equipment in Poland, is licensed to sell the Core Separator, and is supporting LSR as a subcontractor. The Polish Foundation for Energy Efficiency (FEWE), located in Katowice, is a consulting organization with extensive expertise in the Polish economy and natural environment. FEWE is also a subcontractor to LSR.

This project is divided into two major phases. Phase I is called "Infrastructure Studies" and includes business planning, and site-selection of a full-scale Core Separator Demonstration Unit. Phase II, called "Commercial Development," includes the first Demonstration Unit in a local boilerhouse, followed by several Core Separator installations collecting flyash from different Polish coals. Also, a manufacturing facility is to be equipped to accommodate the projected sales volume. If the goals of this project are met and the Core Separator can be successfully marketed, there is a potential to significantly reduce particulate emissions in Kraków.
Table of Contents

Title Page........................................................................................................ 1
Disclaimer........................................................................................................... 2
Abstract.............................................................................................................. 3
Table of Contents.............................................................................................. 4
Introduction......................................................................................................... 5
Results and Discussion.......................................................................................... 6
Work Scheduled for Next Quarter.......................................................................... 7
Appendices:

   Foreign Travel Report.................................................................................. 8
   Federal Assistance Management Summary Report....................................... 9
Introduction

This project involves the implementation of a new particulate control technology called a “Core Separator” for low-emission sources (LES) in Kraków. With several hundred boiler sites in the city burning low-grade coal, existing pollution control equipment consists primarily of low-efficiency cyclones. Such equipment cannot meet the emission standards of most industrial nations. More importantly, these conditions have been the cause of low ambient air quality in Kraków from suspended particles. The Core Separator can be retrofitted onto these boilerhouses to substantially reduce particulate emissions, particularly those consisting of the fraction classified as PM10.

In this project, Core Separator technology is being demonstrated for boilerhouse applications in the Kraków region of Poland. Phase I entailed business planning and infrastructure studies to determine the market for this equipment. In the second phase, the technology is being demonstrated in several boilers of different capacity and firing various grades of coal. Later, a joint venture company (JV) was to be established with the capability of manufacturing and supplying this equipment in Kraków and throughout Poland.

The contract between DOE and LSR began April 1, 1994, although DOE permitted some work to commence prior to that time. This report documents work completed during the fourteenth quarter, i.e., July 1 - September 30, 1997.
Results and Discussion

The last remaining milestone for this project is to find one or more sites in Kraków for the installation of Core Separator units. The sites which have been pursued by EcoInstal include:

1. Zorza Cooperative Heating Plant -- 4 WCO-80 Boilers
2. Rzaska Boilerhouse -- 2 WR 2.5 Boilers
3. Armatura -- 1 WR 10 Boiler

EcoInstal has reported that they visit Kraków every week with the intent of finalizing a contract for the DOE-supported dust collectors. They also have indicated a high degree of pessimism that either Zorza or Rzaska will go ahead even with a 50 percent subsidy. It is believed, however, that Armatura is the best hope, and that a contract might be possible before the end of the 1st quarter of 1998 (note: this Cooperative Agreement is scheduled to end March 31, 1998).

Thirteen Core Separator units have been commissioned in 1997 by EcoInstal as shown in the attached table. Regrettably, none are located in the voivodship of Kraków. This experience has led us to one inescapable conclusion: namely, that it is more difficult to sell Core Separator dust collectors in Kraków with a 50 percent subsidy than it is to sell the same equipment unsubsidized in other regions of Poland. This curious finding may be of interest to the members of the U.S./Polish Steering Committee.

One other event took place during this quarter that was related to this project. In July, EcoInstal was selected by the Environmental Ministry of Poland to receive a national award for its contributions to environmental restoration. Due in part to the large number of Core Separator installations in Poland (45 total units), EcoInstal is now recognized as a national leader for its achievements in this field. Since the agreement between LSR and EcoInstal began 2-1/2 years ago, the size of EcoInstal's workforce has tripled. It is safe to say that this project has been beneficial to all participants including LSR, EcoInstal, DOE, and AID.
Core Separator Installations in Calendar Year 1997

<table>
<thead>
<tr>
<th>Startup Date</th>
<th>Owner/Operator</th>
<th>No. Units</th>
<th>Capacity, ACFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/97</td>
<td>Fiat Auto Poland</td>
<td>1</td>
<td>82,400</td>
</tr>
<tr>
<td>2/97</td>
<td>Przed. Robot Drogowych</td>
<td>2</td>
<td>20,800</td>
</tr>
<tr>
<td>3/97</td>
<td>Kamax S.A. Kanczuga</td>
<td>2</td>
<td>64,000</td>
</tr>
<tr>
<td>4/97</td>
<td>PDM-Koscian</td>
<td>1</td>
<td>10,400</td>
</tr>
<tr>
<td>4/97</td>
<td>EkoBud-Grudziadz</td>
<td>1</td>
<td>1,200</td>
</tr>
<tr>
<td>4/97</td>
<td>ExBud-Tarnow</td>
<td>1</td>
<td>1,600</td>
</tr>
<tr>
<td>7/97</td>
<td>Skleja Eko-Ostrow</td>
<td>1</td>
<td>6,400</td>
</tr>
<tr>
<td>8/97</td>
<td>Zebiec</td>
<td>1</td>
<td>20,000</td>
</tr>
<tr>
<td>9/97</td>
<td>Landis &amp; Gyr-Warsaw</td>
<td>1</td>
<td>42,000</td>
</tr>
<tr>
<td>10/97</td>
<td>Moszczenica</td>
<td>1</td>
<td>36,000</td>
</tr>
<tr>
<td>11/97</td>
<td>Pniowek</td>
<td>1</td>
<td>44,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>13</td>
<td>328,800</td>
</tr>
</tbody>
</table>

Work Scheduled for Next Quarter

The last remaining milestone will be to negotiate a contract for one more dust collector unit in Kraków. EcoInstal has assured us that every effort will be made to complete this installation prior to March 1998. LSR has also committed to attend the next conference in June 1998 in Kraków and has submitted materials to Brookhaven National Lab for a paper and presentation.
October 29, 1997

Reports Receipt Coordinator  
Federal Energy Technology Center  
U.S. Department of Energy  
P.O. Box 10940  
Pittsburgh, PA 15236-0940

Re: Foreign Travel Report, “Particulate Emission Abatement in Kraków Boilerhouses,”  
DE-FC22-94PC94111

Dear Sir or Madam:

There was no foreign travel made during 3rd quarter 1997 in conjunction with this Cooperative Agreement. If you require additional information, please let me know.

Sincerely,

S. Ronald Wysk  
Managing Director
U.S. DEPARTMENT OF ENERGY
DE-FC22-94PC94111
Particulate Emission Abatement for Krakow Boiler Houses

1. Program/Project Identification No. 1910-0400
2. Program/Project Title
3. Reporting Period 7/1/97 through 9/30/97
4. Name and Address
   LSR Technologies, Inc.
   898 Main Street
   Acton, MA 01720-5808
5. Program/Project Start Date April 1, 1994
6. Completion Date 3/31/98

7. FY 1997 Months or Quarters
   J F M A M J J A S O N D

8. Cost Status
   a. Dollars Expressed in
      Thousands
   b. Dollar Scale

9. Cost Chart
   Quarter
   Cum to Date
   Total Plan
   Fund Source 1st 2nd 3rd 4th Date Plan 1997
   DOE P 80.3 80.3 40.15 40.15 924.5 240.9
   A 80.3 80.3 40.15 40.15 880.2 200.8
   LSR P 80.3 80.3 40.15 40.15 924.5 240.9
   A 80.3 80.3 40.15 40.15 880.2 200.8
   P 600
   A 400
   Total P 200
   Total A

10. Variance
   P = Planned  A = Actual

11. Major Milestone Status
   Units Planned
   Units Complete
   T2-1 Prototype Demonstration
      P 100%  A
      C
   T2-2 Commercial Units
      P 90%  A
      C
   T2-3 Establish JV
      P 100%  A
      C
   T2-4 Modernize Mfg. Facility
      P 100%
      A
   T2-5 Tech. Training
      P 100%  A
      C
      P

12. Remarks

13. Signature of Recipient and Date 10/29/97
14. Signature of U.S. Department of Energy (DOE) Reviewing Representative and Date