Syracuse Center of Excellence Technology Application & Demonstration Awards (TAD 2009)

Principal Investigator: Lawrence Wetzel, P.E.

Co-PI(s): Andrea R. Ferro, Ph.D., P.E., Clarkson University; Philip K. Hopke, Ph.D., Clarkson University; Suresh Raja, Ph.D., Clarkson University; Dr. Alan Hutson, University of Buffalo; Raf Magar, Applied Healthcare Resource Management, Inc.; Amy Hayward, Applied Healthcare Resource Management, Inc.; Christopher Purdy, Applied Healthcare Resource Management, Inc.

Lead Organization: Air Innovations

Project Title: Demonstration and Commercialization of the Air Innovations, Inc. HEPAiRx Integrated Energy Recovery Ventilation and Air Purification System

Award Amount: $150,000

Project Term: 5/18/2009 - 05/17/10

Project Summary: Elevated levels of indoor particulate matter are believed to be responsible for tens of thousands of additional deaths per year. Air Innovations (AI), through a combination of competitively awarded matching grants, has designed, built, and tested a new HVAC unit that combines ventilation with air purification. This unit, called HEPAiRx®, has been tested by Clarkson University (CU) in a controlled study of more than 30 bedrooms of asthmatic children and has been found to significantly improve the indoor air quality (IAQ) as well as reduce the markers and symptoms of asthma. Now that the concept has been proven, a more commercially viable product needs to be produced, as well as justification for reimbursement by insurance companies. The HEPAiRx® system addresses four of the six SyracuseCoE focus areas for air quality of this TAD: Fans, Filters, Health, and Productivity. The benefit from this product will be lower costs to dealing with asthma, millions of dollars of new revenue for our community, and the creation of hundreds of local manufacturing jobs.

The innovation of the HEPAiRx® system was validated by the application for a US patent that has also been cleared for international registration. It is a unique combination of a ventilator with energy recovery, an air purifier, and a heating and cooling unit. The system is designed to take complete environmental control of a room, such as a bedroom, as well as reduce airborne particles and gaseous contaminants. By doing so, the HEPAiRx® unit isolates the bedroom from the rest of the house, where contaminants are being generated and distributed, to allow the occupant relief at night. Although the CU study demonstrated the effectiveness of the unit, additional studies are needed to prove the economic viability of the HEPAiRx® in lieu of or in conjunction with other medical interventions.

The first objective will be to redesign the HEPAiRx® to be smaller, lighter, less costly, and more efficient, as well as more user-friendly, quieter, and easier to install. The second objective is to demonstrate the effectiveness of the new design at improving indoor air quality. Finally, the third is that the use of a HEPAiRx® will result in lower incidences of asthma and associated costs.

AI and CU will collaborate to analyze the results of the previous studies to optimize the operating performance parameters of the unit. AI engineers will incorporate these into a more user-friendly packaged HEPAiRx®. Prototypes will be built and tested. Production units will later be built for the economic and commercial viability study to be conducted by University at Buffalo (UB) and Applied Healthcare Resource Management, Inc. (AHRM).

Initially HEPAiRx® units will be targeted to the high-end consumer through various distribution systems, including direct web-based sales. Once insurance reimbursement is available, higher production volumes and broader distribution will be initiated. Children and adults suffering from asthma will obtain relief from the symptoms, and live healthier and more productive lives. The costs to society to medically treat asthma and its affects will be greatly reduced, and jobs and wealth will be created in Central New York.

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Funds made possible through a grant from the US Environmental Protection Agency.

Syracuse Center of Excellence Technology Application & Demonstration Awards (TAD 2009)

Principal Investigator: Dr. Marek Podgorny

Co-PI(s): Dr. Edward Lipson, SenSyr LLC & Syracuse University; Dr. Roman Markowski, CollabWorx & Syracuse University

Lead Organization: CollabWorx, Inc.

Project Title: Open Web Services-based Indoor Climate Control System, Phase III

Award Amount: $144,998

Project Term: 5/1/2009 - 04/30/10

Project Summary: In close collaboration with SyracuseCoE, CollabWorx started in 2005 to work on the concept of open building-automation systems. Results of this work have been published and have received international acclaim. As the system employs architecture and methodologies well beyond the industrial state of the art, the results of this effort have been summarized by Syracuse University in a patent application (filed, pending). The project, continued under a TAD 2007 award, has been successfully completed. The results provide the SyracuseCoE-led consortium with a powerful tool for research and development of applications that require rapid implementation of new sensors and fast integration of such sensors and actuators into complex systems geared toward solutions of problems in air and water quality that SyracuseCoE focuses on. Project results will be added to the existing patent application.

The main goal of the project is actual implementation of the technology in laboratories and buildings. We also plan a number of technology extensions, but, since the existing system is already quite advanced, the extensions are modest — mostly related to new sensor integration—and the project now focuses on deployment and on application development. The project addresses energy conservation in buildings while maintaining individualized comfort levels that improve employee efficiency and productivity. Our project will also address indoor air quality. The specific issues addressed by the project include:

- System optimization and control technologies, using the expert system capabilities provided by the system. This technology provides groundwork for research in topics such as energy cost and availability; air quality related to global climate change; and human health, performance, and comfort. All these topics are central to the IEQ methodology. The efforts build on the improvements of the open BAS implemented under our TAD 2007 effort.
- Whole-building-control integration and networks, using Internet Protocol (IP) technology that enables the design of systems to monitor individual responses to IEQ factors.
- Diverse sensor technologies further extending the list of supported sensors. This effort benefits from the significant progress made in improving our IP-based sensor platform under TAD 2007 support.

As a result of the cost-sharing under TAD 2007, CollabWorx and SenSyr invested approximately $130,000 into development of the framework. In the new TAD project, we will invest a similar amount using profits from our core business activities. The intellectual property ownership is shared with Syracuse University. The basic economic rationale remains unchanged: the creation of an open-source movement for "green technology" equivalent to the processes so successfully spawned in other industries. With this business model, SyracuseCoE and local companies would form the nucleus of the movement, and provide a new platform for other business growth in the Green Technology sector. The already implemented process of intellectual property protection establishes legal defensibility of the initiative. We believe the results of this project will help SyracuseCoE win major industry sponsors and attract funding for and investment in new software, hardware, and service companies located in the SyracuseCoE area of operation.

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