Researchers propose ag uses for power plant waste heat

NEWARK, Dela. — A University of Delaware Agricultural Experiment Station researcher says waste heat generated by power plants could be recycled for grain drying and greenhouse heating.

Kenneth Lomax, an agricultural engineer, says there are two power plants on Delmarva that might be able to supply waste heat for agricultural purposes — one proposed for Vienna, Maryland, and the other in operation at Indian River, Delaware.

Lomax and research associate Robert Gray studied the Vienna Power Plant under a grant from the State of Maryland Power Plant Siting Program. They concluded waste heat, in the form of warm water, might be an energy-saving alternative to conventional propane grain drying if arrangements were made for tapping the heat.

The two suggest the waste heat also could be used to heat greenhouses during the cold weather months when it would not be needed for grain drying.

Lomax has received a follow-up grant from Delmarva Power and Light Company to explore these possibilities further. University of Delaware plant scientists Charles Curtis, Wallace Pill, David Frey, and Charles Dunham are serving as horticultural consultants on the project.

Waste heat from electric power generating stations is a plentiful low-grade source of energy. Since power plants like the ones at Vienna and Indian River are located in rural areas, it's logical to look for agricultural uses for this waste heat. Harnessing this resource for agricultural purposes would benefit the power company, the farmer, and ultimately the consumer.

Lomax considered a number of possible agricltural uses for the warm water, but rejected some because they were either non-economical, or because they could make use of the waste heat during only a small portion of the year.

The beauty of using the waste heat for grain drying and greenhouse heating is: grain is dried from June through November when power plants generate peak electricity, and greenhouses need supplemental heat only during the cooler months — October through April at most. Integration of crop drying with greenhouse heating would allow use of the heat transfer equipment during most of the year.

Greenhouse heating has received more research effort than other uses of waste heat in the United States. That's because greenhouses are large users of energy, the crops grown in them are relatively high value and relatively dense, and the temperatures needed are in the range of warm water from the condenser cooling system.

The University of Delaware agricultural engineers and plant scientists are investigating appropriate greenhouse heating systems for the Indian River power plant, based on water temperature, distance, and water quality. The choice of heating system will in turn affect the crops that can be grown.

Greenhouse production of tomatoes, roses, or chrysanthemums all appear to have economic potential for Delaware, but each has its own temperature and humidity requirements. The researchers need to determine the most efficient and profitable combinations of heating systems and crops for local conditions.

Lomax and Gray have already developed a waste heat analysis procedure for evaluating the grain drying application. Their computer model uses grain production data, condenser cooling water characteristics, weather conditions and site information to plan an economically efficient grain drying system.

Instead of drying grain on their own farm using propane for heat, the nearby farmers might take grain to a waste heat drying facility.

Grain drying with waste heat instead of propane has the potential to reduce the cost of drying from about 2.5 cents to 1.6 cents per bushel per point of moisture. Although it takes gasoline to haul truckloads of grain to a central drying facility, farmers within about 15 miles of the central facility would still come out ahead in terms of energy costs because the LP gas they would save by waste heat drying would exceed their transportation costs.

Part of the Agricultural Experiment State project is to determine the proper size of a grain drying unit for the number of farmers who would use it. The facility would have to be designed in such a way that it would profit both the power company and the farmers.

Following the separate evaluations of greenhouse and grain drying operations using waste heat, the researchers will consider the advantages of trade-offs associated with shared equipment. Their economic and technical analysis will include cost sharing mechanisms, greenhouse temperature predictions, and physical arrangements.

Several heat exchanger equipment sharing options exist: a drying facility might rent the heat exchanger to a greenhouse operation; or they could own it jointly; or the power company might rent the unit to both waste heat users. If the heat exchanger is optimized for the drying operation, then the greenhouse air temperatures will be a function of that design, and the crops will have to be chosen accordingly.

Trade-offs in cost and efficiency will have to be evaluated. The result of the shared equipment analysis will be an economic predictor of the combined waste heat operations.

Whether one company or two share the cost of the equipment, the cost of energy transfer should be lower for both applications. Energy that would have been wasted would be put to productive use, the petroleum energy would be conserved for the future.

Franklin Co. offers solar water heater workshop

CHAMBERSBURG — Franklin County residents will have the opportunity to learn to build their own passive solar water heaters.

A "hands on" workshop where these solar water heaters will actually be built is scheduled for July 10 and 11, sponsored by the Franklin County Conservation District.

The type of water heater being built will be the "bread box" type. It consists of two heavy duty 40-gallon galvanized hot water tanks housed in a well insulated, foil-lined box, the southern face of which is covered with a special translucent plastic.

The system can function year round and acts as a pre-heater, raising the temperature of incoming water from the ground temperature of 55 degrees Fahrenheit to as high as 130 degrees Fahrenheit. This hotter water entering the regular water heater does not require as much energy to be brought up to the standard temperature of household hot water.

The unit requires no energy or controls other than the building's existing water pump. Water is moved through the tanks by normal line pressure when hot water is drawn inside. The unit is located on the ground, a southern wall, or porch.

Instructors for the workshop will be Mark Whitmoyer and Paul Swartz of Conservation Concepts, Inc., Hummelstown.

Whitmoyer is a consultant to the Bureau of Community Energy of the State Department of Community Affairs. He has had considerable experience in designing, building, and monitoring the performance of solar greenhouses. He also teaches various courses related to energy conservation at Dickinson College and Harrisburg Area Community College.

Swartz is the executive assistant to the Dauphin County Conservation District and has a broad conservation background.

Registration for the workshop is now open. A limited number of registrants will be "owner-builders." These people will purchase the materials to build the solar heaters and own them at the conclusion of the workshop.

Contact Beverly Kauffman at the Franklin Conservation District office, 550 Cleveland Avenue, Chambersburg, PA 17201 or phone 717/264-8074, for more information.