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FLUIDIZED BED LOW-TEMPERATURE GEOTHERMAL DRYING

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SUMMARY

EG&G Idaho, Inc., as part of its activities performed for the Department of Energy's Division of Geothermal Energy and under contract to DOE's Idaho Operations Office, is commencing a series of low-temperature geothermal drying experiments at the Raft River Geothermal Site. This paper will delineate the results from the initial test work, particularly as it pertains to the use of geothermal heat in drying operations on waste materials from potato processing operations.

The objectives of these experiments is to investigate the feasibility of using geothermal heat for waste material drying, recovery, and handling, food processing drying operations, or drying of agricultural materials. The experiment will initially investigate drying an activated sludge biomass slurry and drying waste potato solids from the J. R. Simplot Company potato processing plant located at Burley, Idaho. The J. R. Simplot Company is a participant in the experiment and other industry representatives have also been invited to participate. The biomass material is currently part of the treatment in Simplot's Burley, Idaho plant waste stream and poses problems of disposal. The material, when dewatered and processed, is expected to be a protein food suitable for animal and fish consumption. A companion experiment will involve feeding operations and diet studies using the dried materials at a commercial fish farm. The material will be partially dewatered by centrifuge at the Burley treatment plant prior to delivery to the Raft River experiment. The waste materials are expected to be received with a moisture content of 60 to 90%.

The dryer will be a fluidized bed system and the thermal energy for drying will come from geothermal water, with temperatures up to about 132°C (270°F), circulated through the tube side of heat exchange tube bundles. The bed around the tube bundles will be fluidized using air with a velocity of approximately 0.3 m/sec (1 ft/sec). Heat will be provided to the dryer from either one or two separate heat exchange bundles, each having a heat transfer area of 1.8 m² (19 ft²). Each tube bundle is capable of supplying 38 kW (thermal), or enough heat to vaporize 53 liters of water. The material to be dried will be passed through a colloid mill for uniform particle sizing of about 1.27 x 10⁻⁶ meters, atomized with an atomizing nozzle, and injected as an atomized slurry into the heated bed. Air will be used for the atomizing nozzle, but the use of flashed geothermal water to produce steam for the atomizing nozzle will also be investigated. The atomized material will dry almost instantly as it comes in contact with the heated bed. The characteristic of the fluidized bed will be isothermal and stabilized at the boiling temperature of water. After a bed of dried material is formed, the fluidizing allows the product to exit the system in a granular or pelletized form by using an overflow tube as the level of the bed rises. A pictorial of the system is shown in Figure 1. The apparatus stands approximately 2.74 m (9 ft) tall and is made from a piece of 0.25 x 0.25 m (10 x 10 in.) square structural tubing. The heat exchanger bundles are bolted into the side of the dryer in two places, as shown. The system is undergoing installation and checkout at the time of this summary. Results from the biomass and potato waste work are to be complete for reporting at Hilo.

The experiment has the potential for stimulating a more widespread direct use of geothermal energy since there may be numerous applications for a system of this type in food processing operations, agriculture, and waste management. Grain, sugar beet pulp, alfalfa, and onion drying operations are a few examples. Also for example, the participating J. R. Simplot Company has an interest in the use of geothermal heat in an existing potato processing plant located near Caldwell, Idaho, where a geothermal well exists on the plant grounds. Additional work is expected to follow the first series of tests, using other materials and process conditions from other industry.
Fig. 1 Geothermal Dryer Assembly