Idaho Incubation Fund Program

Bi-Annual Progress Report Form

Proposal No.	**IF13-004**
Name:	**Dr. Jon Van Gerpen**
Name of Institution:	**University of Idaho**
Project Title:	**Ultrafast Fermentation**

1. Summary of project goals/milestones for the period just completed, accomplishments for the period just completed, and plans and goals for the coming quarter:

Fermentation is a process in which yeast is used to convert sugars to ethyl alcohol for the fuel and alcoholic beverage industries. The fermentation process usually takes 3-7 days to reach completion. Newly developed biocatalyst beads (BioEx beads) significantly accelerate the fermentation process and produce ethanol six to nine times faster than current fermentation procedures. These BioEx beads are a product created at the University of Idaho and are the subject of a patent application that has been submitted through the University's Office of Technology Transfer. Utilization of the BioEx beads technology has the potential to revolutionize the ethanol and alcoholic beverage industry as they reduce the time required for fermentation while overcoming various difficulties of fermentation. These difficulties include, for example, excessive foam formation, yeast recovery and reuse, and mutation of yeast strains.

The BioEx beads can be dried and stored. The dried beads have a shelf life of around six months. The beads contain around 86% water, which can be reduced to 10% by drying. After drying, the hydrated beads shrink to around 1/3 of their original size. Figure 1 shows a photograph of the hydrated and dried beads.

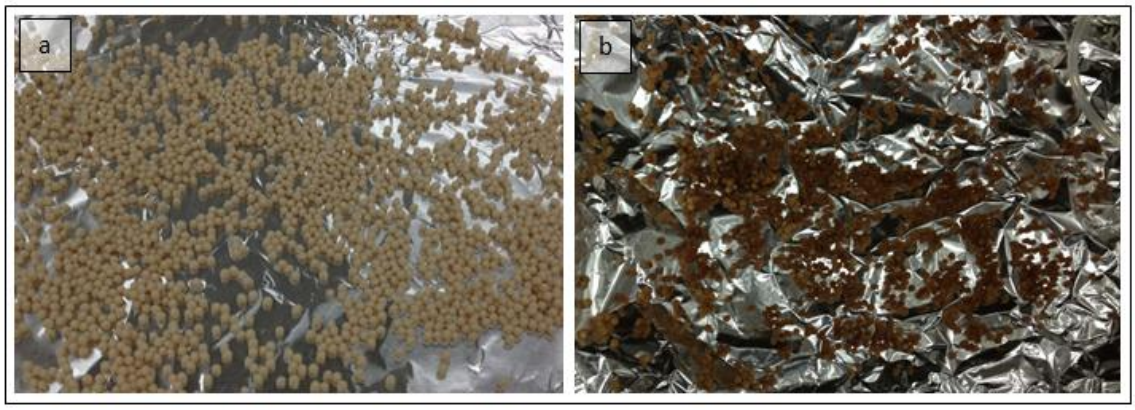

Figure 1: (a) Hydrated beads and (b) dried beads.

Three companies (Allard Research, e-Fueler, and Summit Natural Energy) have shown interest in incorporating the BioEx beads technology into their fuel production equipment and processes. Several tests have also been conducted with local breweries, which have shown good results for commercial use of the BioEx beads in that industry. To commercialize this technology a pilot demonstration ethanol plant that uses the BioEx beads was built at University of Idaho. An

automated machine that will produce dried BioEx beads in commercial quantities was also fabricated.

Quarter 1 Goal and Achievement: The goal for the first quarter of the project was to design and build a larger scale fermenter for the use of biocatalyst beads (BioEx beads) for fermentation and to design and build a commercial BioEx beads maker.

The larger fermenter was built and tested with the use of BioEx beads (Figure 2). The prototype of the commercial BioEx beadmaker was made (Figure 3). It was successfully tested in a commercial environment at a brewery at Ketchum, ID.

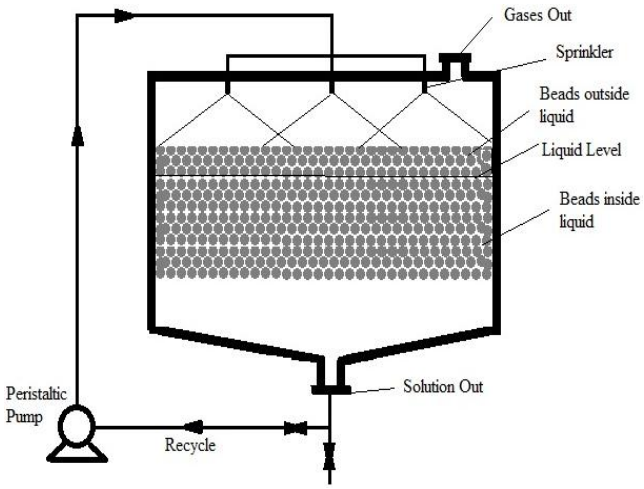

Figure 2: Flow sheet of BioEx beads fermenter

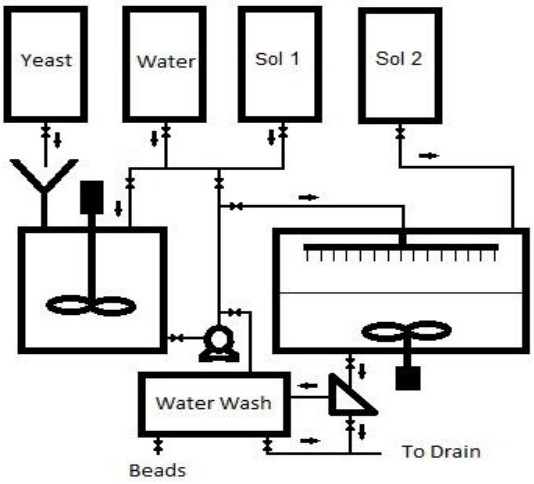

Figure 3: Flow sheet of automated BioEx beads maker

Quarter 2 Goal and Achievement:

The goal for the second quarter of the project was to design and build a BioEx bead dryer to produce dried beads. The conveyor belt drying system was developed which was tested for different parameters of drying (flow rate of beads, drying temperature, flow rate of air etc.). The flowsheet of the dryer is shown in Figure 3. Figure 4 shows a photograph of the prototype conveyer belt dryer.

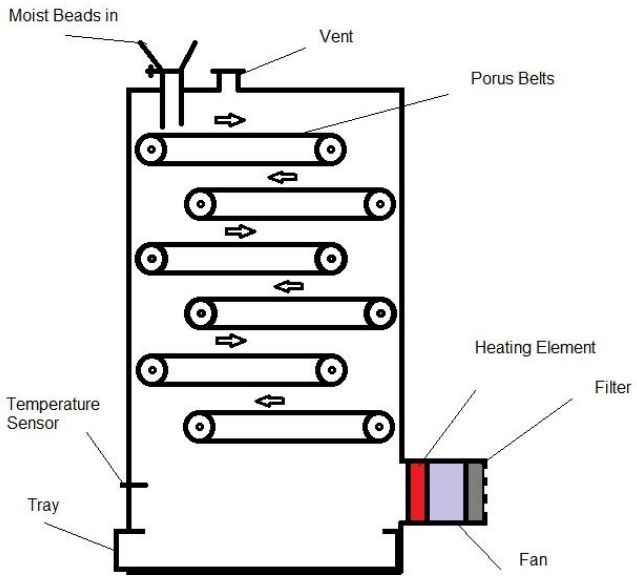

Figure 3: Flowsheet of conveyor belt dryer for BioEx beads drying

Figure 4: Prototype of conveyer belt type BioEx bead dryer.

A mathematical model has been developed to inform the design of the bead dryer. The mathematical model will help to calculate the amount of energy (heat duty) and flow rate of air required to dry the beads based on the input parameters of air.

2. **Provide a summary of budget expenditures for the period just completed:**

   As of the end of April, the latest period for which data are available, $40,438 has been expended of $45,100 allocated.

3. **List patents, copyrights, plant variety protection certificates received or pending:**

   None

4. ***4.*** **List invention disclosures, patent, copyright and PVP applications filed, technology licenses/options signed, start-up businesses created, and industry involvement:**

   Invention disclosure 1 "Concentrated Biocatalyst immobilization for ultrafast fermentation and other uses" was submitted to Office of Technology Transfer, University of Idaho on Feburary 21, 2012.

   Invention disclosure 2 "Bioreactor for Encapsulated Bead Fermentation" was submitted to Office of Technology Transfer, University of Idaho on May 1, 2012.

   Start-up business "MuPor Technologies" www.muportech.com created. The option agreement was signed with MuPor Technologies in October 2012

5. **Include funding burn rate:**

   10% of the funds remain with 17% time remaining. We are on target to complete the project on time and on budget.

6. **Any other pertinent information:**