**Background Information**

The purpose of this project is to find a procedure that puts the bacteria into a dormant dry state for storage, and ensure that when rehydrated enough cells survive unharmed to carry out the reaction. Our goal is to find a method that will produce dried bacteria capable of ethanol/acetate production levels at least as high as 20-27% of fresh undried bacteria.

A number of experiments were carried out using a variety of drying techniques, different storage conditions, different mechanisms for keeping the bacteria away from oxygen, and various additions of chemicals. Bacteria were grown in cultures prior to the experiments. Samples taken from the same culture were put through the different experimental drying and storage designs. After storage the bacteria were then rehydrated in separate tubes filled with a small amount of cell medium, where the atmosphere in the rest of the tube has been replaced by argon. Hydrogen and carbon dioxide were then added to the tubes and the bacteria are allowed to carry out anaerobic respiration. The tubes were agitated during this process to ensure the gasses are available in solution for the bacteria. After a period of time (20-30 minutes) a sample of the head space (the part of the tube without liquid in it) was taken. This sample was run through a gas chromatograph to determine the composition of the sample. The more bacteria that survive the process the less carbon monoxide we would expect to see. The quantity of carbon monoxide (CO) is our response variable, and an indicator of the success of the drying process.

The response variable is continuous, and since the overall consumption is the sum of millions to billions of individual cell consumptions it is expected to be (and has been) normally distributed. The goal is to find out if there are significant differences and if so, at which level of the factor is the CO consumption maximized.