

**STANDARD OPERATING PROCEDURE
STAN MAYFIELD BIOREFINERY PILOT PLANT**

TITLE: Ethanol Distillation

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APPROVALS: Process Change Committee

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A. Scope

This SOP describes the procedure to operate the Distillation and Dehydration System in order to separate ethanol from the dilute beer feed. The distillation system produces ethanol in the range of 170 – 190 proof, which can be used directly or further concentrated to anhydrous ethanol using the dehydration membrane system.

B. Safety and Training Requirements

Refer to UF lab safety policies regarding equipment listed in section D below before starting any process work.

Review the location of fire extinguishers, fire blankets, safety showers, spill cleanup equipment and protective gear before beginning any process work.

During operations in the plant, the following safety gear will be utilized at all times:

- Safety Glasses
- Protective Gloves
- Hard hat

CAUTION: Keep flammable liquid away from sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled.

NOTE: Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code".

In case of fire: Use dry chemical, CO₂, water spray or firefighting foam to extinguish

CELL PHONES ARE PROHIBITED FROM THE DISTILLATION AREA

C. Related Documents and SOPs

1. Beer Well SOP-4600
2. Decanter System Operation SOP-4900.
3. Refrigeration System Operation SOP-9210
4. Air System Operation SOP-9405
5. Steam Supply SOP-9305
6. Potable Water SOP-9705

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D. Preparation/Materials/Equipment

1. Ethanol Storage Tank

E. Detailed Procedure

1. Ensure Air System is ready according to Air System Operation SOP-9405
2. Ensure Refrigeration System is ready according to the Refrigeration System Operation SOP-9210
3. Ensure the Potable Water is ready according to the Potable Water SOP-9705.
4. Ensure the beer is ready for distillation according to the Beer Well SOP-4600.
5. Ensure the decanter feed tank has the space to receive the stillage according to the Decanter SOP-4900.
6. Open valve 4601-V-28, 4602-V-02 to start transferring the beer to the Distillation and Dehydration System.
7. Open valve 4602-V-01 to transfer stillage to the Decanter Feed Tank (TS-4901).
8. At the HMI, click the Distill button on the left hand side of the screen to select the distillation view and then click the Start button to start the distillation operation.
9. Locally monitor the flow rate to be around 4.2 GPM in FI-4601-10.
10. At the HMI, monitor the Distillation and Dehydration system to operate in the following startup sequences: Start, Setting Level, Heat Start, Preheat, Boiling, Beer Start, Run.
11. Once thermal equilibrium is reached, monitor control variables being at desired values :
 - a. Rectifier top temperature
 - b. Stripper level
12. Start decanting operation according to the Decanter System Operation SOP-4900 once the decanter feed tank level is above 15%.
13. At the HMI, monitor the Anhydrous Ethanol Tank (TS-4608B) level.
14. At the HMI, start Anhydrous Product Pump (PC-4608) to transfer the product to ethanol storage.
15. Continue processing the beer until the Beer Well level is below 10% and turn off the Beer Stripper Feed Pump (PC-4601) at the HMI.
16. Close valves 4601-V-28.
17. Close stillage transfer valve 4602-V-01.
18. Close beer feed line valve 4602-V-02
19. At the HMI, stop the Distillation and Dehydration System.