

# CASE STUDY

## Innovative Dual Distillation Skid Column Design Enables 91% Ethanol Extraction

[www.epicmodularprocess.com](http://www.epicmodularprocess.com) | (314) 310-1549

### JOB OVERVIEW

#### Key Features

- Two distillation columns, comprised of five spools each, rated for 15psig at 250 degrees Fahrenheit
- Reflux loops to achieve higher concentrations of ethanol
- FEA analysis on skid frame and load bearing members
- Hydrotesting for entire system to check for leaks

#### Challenges

- Restricted space for skid and a difficult delivery path including several 90 degree turns
- Distillation column was designed as two separable pieces for individual placement, but worked together to complete the distillation process. Precise measurements for diameter & height and piping & equipment placement were key.
- Time constraints - distillation system was fabricated as part of a larger system that was simultaneously built through EPIC's modular process multi-timeline schedule

#### Impact

- 91% ethanol mixture required by client was achieved
- Distillation system was successfully installed in a difficult-to-access area of plant
- Two-piece skid design allowed for safe transportation and installation
- Overall project timeline shortened due to on-site upgrades and skid fabrication progressing in tandem

### THE EPIC SOLUTION

A ternary ethanol mixture is fed into the first column and is heated as it falls. Water and ethanol rise to the top of the column and leave as distillate. The remaining ternary solution falls to the bottom of the column and is circulated through a heat-exchanger loop. Fresh solvent is pre-heated before entering the column and reject solvent is cooled before heading to a holding tank.

Water and ethanol are separated, based on boiling point, in the second column. Ethanol leaves the second column as distillate at the top of the column and enters a condenser. Condensed ethanol is sent to a holding tank and leaves the distillation skid.

Reflux loops are used in both columns to cycle the mixture through several intervals. This creates a higher concentration of ethanol in the condenser at the end of the process. Both columns operate under a vacuum to lower the temperature requirements and use less energy to achieve separation. The distillation module was fabricated and assembled in the EPIC Fabrication Shop. This ensured the skid was assembled under ideal conditions, the project was kept on timeline and construction costs are reduced. Off-site skid fabrication prevented onsite upgrades and skid fabrication from interfering with each other. The time required to build the skid and OSHA exposure hours were both greatly reduced, saving the client money. EPIC functionally tested all equipment before shipment. Hydrotesting was completed on the entire system to double check for leaks and verify the vacuum in the columns.

The client completed three walkthroughs of the skid during fabrication/assembly. On the final walkthrough, a P&ID check was performed.

The finished "plug and play" skid was delivered as two separate framed pieces to the client site and successfully navigated to the installation spot. The two pieces were re-united and start-up was successfully completed.

