

MEMO

From: F. Baneyx
Subject: Fin Efficiency

The main ethanol/water distillation column in our new Everett plant has been equipped with an air-cooled condenser. We have been having problems achieving design production. It appears that the bottleneck is the limited reflux in this column. The process engineers have proposed to add a small condenser in parallel with the original. The new condenser will be equipped with external fins for cooling with ambient air, but in warm weather it will be necessary to blow air over them with a fan.

Since the correct design of this unit is critical, we ask that you carry out a set of experiments to validate existing methods for prediction of fin efficiency and effectiveness. You have at your disposal a lab unit with three types of cylindrical fins. Please evaluate their performance under natural and forced-convection conditions, and determine how well efficiencies and heat-transfer coefficients agree with the literature. We are particularly interested in determining how the calming section affects velocity profiles and heat dissipation at various flow rates.

Your report should include a propagation of error analysis and a discussion of the sources of error in the measurements and design.