



Simulation of Heat Pumps applied to a Distillation Column

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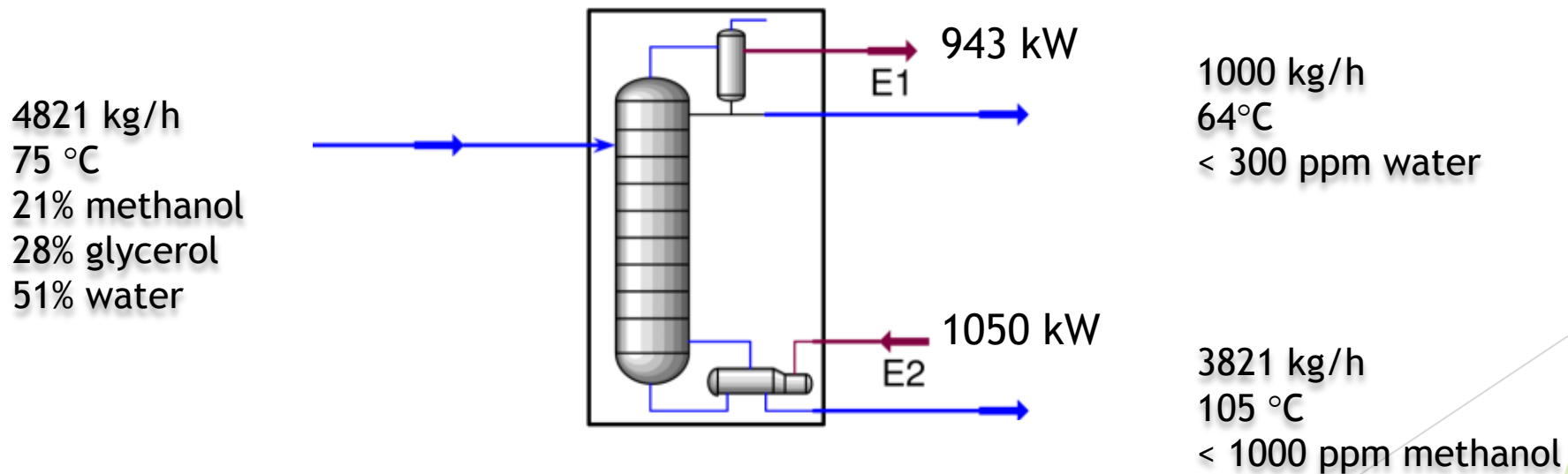
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Problem definition

- ▶ In a biodiesel plant the recuperation of methanol by distillation can represent more than 40% of the hot utility needs
- ▶ The use of high temperature Heat Pumps can be a solution in a near future



Heat Pump Systems - case study

- ▶ Available utilities:
 - ▶ Cold water at 25°C
 - ▶ Saturated steam at 3 bar
- ▶ Assumed ΔT_{\min} of 10°C - working fluids in condenser at 54°C and in reboiler at 115°C
- ▶ Two heat pump systems were simulated in this study
 - ▶ Vapor Compression Heat Pump (VCHP)
 - ▶ Mechanical Vapor Recompression Heat Pump (MVRHP)

Heat Pump Systems - case study

- ▶ Main results:
 - ▶ Vapor Compression Heat Pump (VCHP)
 - ▶ simulated results showed potential reduction of 78% in Hot utility and 71% in Cold utility
 - ▶ COP of 5.6
 - ▶ Mechanical Vapor Recompression Heat Pump (MVRHP)
 - ▶ 5 working humid fluids tested (butane, isobutane, pentane, isopentane and ethoxyethane)
 - ▶ Best results for ethoxyethane (R610).
 - ▶ Substitution of 100% Hot utility and reduction of 88% of Cold utility
 - ▶ COP of 4.5
 - ▶ For the tested dry fluid (methyl formate - R611) the results are equivalent to the best humid fluid.
- ▶ Conclusions:
 - ▶ Good potential to application of Heat Pumps to this system
 - ▶ It is necessary to develop high temperature heat pumps