Distillation as a Method of Wastewater Treatment

McIntyre, Kathryn (School: Bartlesville High School)

When an oil well is drilled, water must be injected to provide easy access to the crude oil in the shale. After, when the oil is pumped, wastewater is produced. This wastewater must be treated by the oil company, and can be costly, negating the profit of the business. This project tests the efficiency of distillation using a wastewater model of NaCl and distilled H_2O. The equipment for the experiment includes an alcohol burner, distillation apparatus with Graham condenser, and vacuum. Marble boiling chips are helpful during vacuum distillations. The materials include distilled water, NaCl, and denatured ethanol. Safety precautions should be taken around open flame and glass. Mix 15%, 10%, and 5% saltwater solutions by weight. Place each of these in the boiling flask and perform a distillation. Review data and calculate joules per liter and electric energy used by the vacuum pump. In the results, the vacuum distillations used more energy, since they needed both heat and electricity. When calculated, the treatment costs for the 10% and 15% solutions were $3.76/barrel, and the cost for the 5% solution was $4.25./barrel Distillation could be a useful way to treat wastewater if all sources of inefficiency, such as a failing burner and a reflux condenser, were improved.