

**MEMORANDUM**

**DATE: October 7, 2009**

**TO: Laboratory Group D**

**Brett Christensen, Carolina Oliveros, Harley Hoskins**

**FROM: Tony Butterfield**

**Engineering Training Supervisor**

**SUBJECT: CO2 Absorption**

Our gas absorber has been offline for about 6 years and, after some modification, has been brought back to working order. Thirteen years ago my team characterized this piece of equipment using the column packed with the ceramic Berl saddles. Your project will focus on characterizing the gas absorber’s current capabilities with the Berl saddle column, using our data for comparison.

The liquid in your experiments should be an alkaline solution of 0.1 M NaOH. The gas should be air with CO2 added to reach approximately 2.5 mol% CO2. Because the CO2 reacts with the base as it enters the liquid phase, the concentration driving force will be elevated.

With measuring devices inferior to those now available on the equipment, my team reported the following raw data, all at room temperature and with a gas flow rate of 16 scfm:

|  |  |  |  |
| --- | --- | --- | --- |
| Liquid Flow  (gal/min) | CO2 Out  (mol %) | CO2 In  (mol %) | Gas Pressure Drop  (Pa) |
| 2.0 ± 0.1 | 2.13 ± 0.01 | 2.30 ± 0.01 | 1916 |
| 2.5 ± 0.1 | 2.05 ± 0.01 | 2.50 ± 0.01 | 2588 |
| 3.7 ± 0.1 | 1.99 ± 0.01 | 2.75 ± 0.01 | 4200 |

Your first task (one that does not require you to use NaOH) will be to determine the flow conditions under which flooding of the column occurs. We found, at a gas flow rate of 16 scfm, flooding occurred at a liquid flow rate of 3.8 ± 0.1 gal/min.

Finally, please determine the mass transfer coefficients and interfacial area for each flow rate you use and compare your findings to theory and our old data. You will also need to calibrate the CO2 meters before you begin, and include that information in your report. While you are only to compare your results to the old findings with a gas flow of 16 scfm, please use at least two gas flow rates in your analysis.

Describe any differences you find in the column’s performance compared to the same column 13 years ago. Is there any evidence of fouling, or more compact packing of the Berl saddles? The new system has primarily been altered within the last decade to have new piping and pumps and so it is also desired to know the new flow capabilities of both the liquid and gas.

Be vigilant to notice any leaks, considering you will be using a corrosive liquid and that the absorber is positioned over a grate, exposing the levels below. Also, you will end up with a significant volume of base in need of disposal; come prepared to discuss this at our preliminary lab conference.

Please contact me with any questions you may have, and I look forward to meeting with you regarding this project on or before Monday, October 19, 2009.