Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Near-Critical CO2 Flow Measurements and Visualization[1]
FARZAN KAZEMIFAR, DIMITRIOS KYRITSIS, University of Illinois at Urbana-Champaign — Carbon dioxide capturing and sequestration is one of the proposed solutions for reducing greenhouse gas emission. This technique will be used in big industrial plants with very high CO2 emissions. Handling such large flow rates requires high pressure and low temperature (in order to maximize density and minimize volumetric flow rate) which brings us close to the critical point of CO2 at approximately 74 bar and 31 $^\circ$ C. This necessitates studying near-critical CO2 flows. In our experiment setup CO2 is compressed to supercritical pressures using a hydraulic accumulator. Pressurized CO2 then flows through the test section, which is a 2-ft long stainless steel tube with ID = 0.084 in. The flow rate is controlled by a needle valve downstream of the test section and the mass flow rate is measured using a coriolis mass flow meter. Temperature and pressure are monitored using two K-type thermocouples and pressure transducers at the inlet and exit of the test section. The pressure difference across the pipe is measured separately using a differential pressure transducer. In another set of experiments, the aforementioned test section is replaced with an optically accessible test section. In this setup high-speed imaging is used to visualize the flow inside the test section. We studied the recorded data in order to identify distinct flow regimes based on pressure drop as a function of pressure, temperature and mass flow rate.

[1]Acknowledgements: International Institute for Carbon-Neutral Energy Research (I2CNER)

Farzan Kazemifar
University of Illinois at Urbana-Champaign

Date submitted: 01 Aug 2012 Electronic form version 1.4