SUBJECT:	Ph.D. Proposal Presentation
BY:	Ulf Andresen
TIME:	Tuesday, May 30, 2006, 10:00 a.m.
LOCATION:	Love Building, Room 311
TITLE:	Supercritical Gas Cooling and Near-Critical-Pressure Condensation of Refrigerant Blends in Microchannels
COMMITTEE:	Dr. Srinivas Garimella, Chair (ME) Dr. Mostafa Ghiaasiaan (ME) Dr. Samuel Graham (ME) Dr. Tom Fuller (ChBE) Dr. Don Webster (CE)

SUMMARY

The proposed study addresses the need for zero ozone-depletion-potential (ODP) refrigerants or refrigerant blends with properties similar to CFCs (Chlorofluorocarbon) and HCFCs (Hydrochlorofluorocarbon). The azeotropic refrigerant blend R410A (equal parts of R32 and R125 by mass) has zero ODP and has properties similar to R22, and is therefore of interest for vapor compression cycles in high-temperature-lift space-conditioning and water heating applications.

This investigation focuses on experimentally determining *local* heat transfer coefficients and pressure drops for R410A during condensation at 0.8, $0.9\times P_{critical}$ and gas cooling at 1.0, 1.1, $1.2\times P_{critical}$. All experiments will be conducted for flow through three different round tubes (D = 3.048, 1.524, 0.762 mm) over a mass flux range of $200 < G < 800$ kg/m^2-s. An innovative thermal amplification technique will be used to accurately determine the heat duty while ensuring low uncertainties in the refrigerant heat transfer coefficients.

The experimental results will be compared with the limited literature for similar conditions. Flow regime maps from the literature will be used as the basis for developing models of the measured pressure drop and heat transfer during condensation. Similarly, in the supercritical states, the models will account for the sharp variations in the thermophysical properties near the critical point.

The models and physical understanding resulting from this investigation will provide the information necessary for designing and optimizing new components that utilize R410A for air-conditioning and heat pumping applications.