PROJECT TITLE: Simulation of Adhesive Jets used to Create Consumer Products at High Manufacturing Rates

Urmila Ghia
683 Rhodes Hall
Department of Mechanical and Materials Engineering
Cincinnati, OH 45221
ghiau@ucmail.uc.edu
Phone: (513) 556-4612

Co-Mentor: Joe Grolmes
UC Simulation Center
Email: grolmes.jl@pg.com

Co-Mentor: Rakesh Gummalla
UC Simulation Center
Email: gummalla.rr@pg.com

Project Description

a. Background: Hot air spraying of adhesives to moving substrates is often used to create consumer products. Adhesives present significant challenges associated with high viscosity and non-newtonian flow characteristics which are sensitive to equipment geometry, temperature, adhesive type, adhesive throughput and air jet characteristics. The hot air spray typically accelerates the adhesive jet, reduces the adhesive jet diameter, and "applies" the adhesive jet to the moving substrate. As such, engineers need methods and models to design and trouble-shoot "air-assisted" adhesive spraying processes.

b. Research Area: Characterization and simulation of adhesive sprays (a.k.a adhesive jets).

c. Research Tasks:
   i. What is the viscosity of the adhesive in a heated nozzle?
   ii. What is the viscosity of the adhesive when it encounters an air jet external to the nozzle?
   iii. What is the temperature and diameter of the adhesive jet when it touches down on a substrate?
   iv. Will the adhesive filament break after it encounters an air jet external...
to the nozzle?

d. Training/Support:
i. Mentors will provide nozzle geometries and operating conditions.
ii. Mentors will provide access to software packages to assist in the research tasks.
iii. Mentors will meet weekly with students (preferably at UC Sim Center).

e. Additional Expectations:
i. Conduct literature searches to help answer the research tasks.
ii. Provide brief weekly summaries of progress.
iii. Provide final summaries of each research task.

Desired Student Major: Engineering Student interested in polymeric materials.