

Fuel for the Future:

Mechanical Engineering Student Becomes Ohio Coal Research Center's First Co-op Employee

By Jon Martin



Mechanical engineering senior Jon Martin shares his experience as the first cooperative education employee for the Russ College's own Ohio Coal Research Center. Martin, who hopes to work in the alternative energy field and possibly pursue graduate study, is currently starting fabrication of a pilot bioreactor wherein algae feeds off the carbon dioxide produced by power plants, ultimately producing oil that can be used for biodiesel fuel.

The last weeks of my sophomore year as a mechanical engineering student were spent debating between accepting a co-op position for a corporate company or working as the first co-op employee for the Ohio Coal Research Center in the basement of Stocker Center. I chose the latter. In my opinion, I made the right decision.

The Ohio Coal Research Center (OCRC) is a grant-funded affiliate of Ohio University that conducts research in state-of-the-art energy conservation technology. Employing about 50 faculty, staff, post-doctoral research associates, graduate students, and undergraduate lab assistants, the center is currently conducting research on coal gasification, bioreactor technology for converting greenhouse gases into biofuels, extracting toxic gases through electro-static precipitation, reducing the amount of carbon dioxide produced by power plants through carbon sequestration, and my main focus—using flue gas from coal-fired power plants as fuel for solid-oxide fuel cells (SOFC). What makes SOFCs unique is that they are made entirely of solid-state materials that can withstand high power plant temperatures.

My milestone projects were to set up, practice, and operate a tape caster and screen

printer, which are two fundamental machines used for SOFC production of SOFCs.

The tape caster is a large, heavy platform constructed of granite, steel, and aluminum that forms the fuel cell's electrolyte by pouring a "slurry" through a blade and forming a long, very thin tape. Once the desired shape is carefully cut out of the tape, it is dried and sintered in a furnace, creating a ceramic (solid oxide) electrolyte.

The screen printer in the production lab could technically be used to print T-shirt designs, but in this case, its sole purpose is to print a conductive layer of ink onto both sides of the electrolyte, forming the anode and cathode of the fuel cell.

The first three months of my work involved planning, researching, and preparing the tape caster, screen printer, and other necessary equipment. My final three months gave me experience in preparing the equipment for student research and writing safety documentation for the approval of operations.

During my co-op term, I had the privilege of visiting and working with scientists and engineers from three different companies who research and develop SOFCs. This experience taught me helpful production techniques and gave me insight into constructing Ohio University's

very own fuel cell production facility.

In particular, I learned the importance of venting the tape caster and screen printer, because many of the chemicals in SOFC production are toxic. Ultimately, I constructed an exhaust system that enabled us to regulate and monitor the flow of negative pressure to meet safety standards.

My experience as the "guinea pig" co-op employee for the Ohio Coal Research Center was challenging, exciting, and interesting on many different levels. One day I would be welding a steel frame, while the next day I would be researching safety concerns or even wearing a lab coat and making fuel cells. The hands-on experience I gained from daily work with the knowledgeable technical staff is irreplaceable, and it was great to work with faculty outside the classroom and see them work as engineers rather than teachers.

Today, watching students perform research in the lab that I constructed gives me a great sense of accomplishment and "fuels" my interest in alternative energy technology even more. 🧪

Ohio Coal Research Center cooperative education employee **Jon Martin** prepares the screen printer to form the anode of a fuel cell in the Coal Center's solid oxide fuel cell production lab.