IfS Presents Student Sustainability Project Award

AIChE's Institute for Sustainability (IfS; www.aiche.org/ifs/) took part in the U.S. Environmental Protection Agency's (EPA) National Sustainable Design Expo, held in Washington, DC, Apr. 18–20, 2009. A highlight of the annual event is the EPA's People, Prosperity, and the Planet (P^3) Awards — a student design competition for sustainability, in which teams of cross-discipline undergraduates demonstrate projects that apply technology in innovative ways to address global environmental challenges. Chemical engineering students contributed to several of the team projects.

The Expo showcased alternative energy technologies; water distribution, collection and purification systems; advanced agricultural practices; new technologies for green buildings; and other approaches to improving sustainability. Winners receive funding of up to $75,000 to commercialize their designs.

In addition to the major prizes, the IfS — through its Youth Council on Sustainable Science and Technology (YCOSST), and in collaboration with SustainUS — presented its own award at the Expo. The YCOSST P^3 Award was presented to a team of students from the Univ. of Pittsburgh that developed a system for removing arsenic from groundwater in Inner Mongolia by using iron oxide particles as an adsorbent.

Pittsburgh won the $1,000 prize for its project's interdisciplinary collaboration, innovative use of locally available materials, and direct benefit to youth.

With a rural population of over 1 million, residents of Inner Mongolia suffer serious health problems as a result of drinking water contaminated with arsenic concentrations as high as 1,800 µg/L, which is 180 times the World Health Organization's (WHO) drinking water guideline of 10 µg/L. With limited access to clean surface water and electricity, safe drinking water can be supplied only by effective removal of arsenic from groundwater.

In the Pitt students' design, magnetic iron oxide particles are separated using a magnetic drum separator that doubles as a tool to prepare the iron oxide particles created by grinding local and naturally occurring iron ores. The magnetic particles are dispersed in water in a powder or sludge to remove arsenic, and are then separated from the water and recovered by the magnet drum separator after the treatment. The device is designed to operate by human power, and can produce one gallon of water in five minutes.

Each pound of iron oxide particles is able to provide 30 gal of safe drinking water with arsenic concentrations reduced from about 1,800 µg/L to below 10 µg/L.

The students estimate that each device will cost less than $5, and have a lifespan of at least 20 years. Because the process can be done by one person without the use of electricity or gasoline, and with the price of iron oxide particles in Mongolia about 1.3¢/lb, the operational cost is estimated to be less than 0.05¢/gal of water.

This research may provide millions of households with affordable arsenic removal systems to gain access to safe drinking water.

Research team members included chemical engineering students Brian Novicki and Liangliang Cao, along with civil engineering student Bradley Harden and international affairs student Allison Hahn. Principal Investigator on the project was Univ. of Pittsburgh professor Di Gao, who also serves as the school's AIChE student chapter advisor.

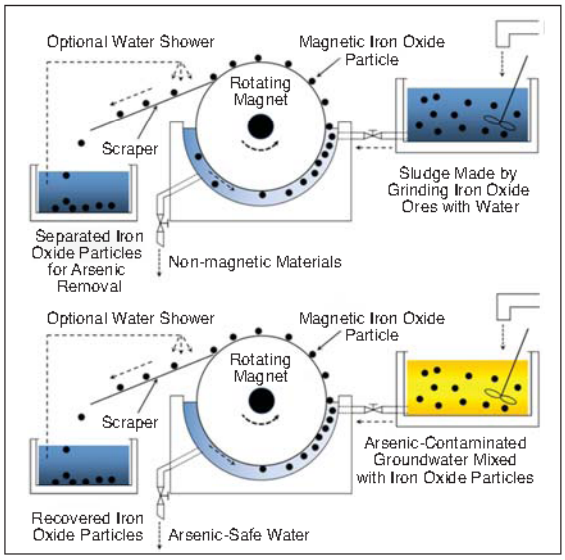
Among the winners of the major P^3 Awards were several projects that incorporated chemical engineering principles:

• Massachusetts Institute of Technology students created a novel solar-thermal combined-cycle power generator for distributed power generation in developing countries. The generator employs cogeneration to provide both power and hot water. Excess energy is stored as heat in rocks for later use.

• Columbia Univ. students implemented a multifunction energy platform for rural Uganda by retrofitting existing diesel generators to run on jatropha biodiesel. Jatropha is a vegetable oil that is widely available in the region. The fuel is preheated to lower its viscosity to a suitable level for a diesel engine.

• A team from Drexel Univ. developed near-infrared-scattering architectural coatings to reflect and scatter radiant energy from the sun. The low-cost glass microsphere coatings improve on TiO_2 coatings by reflecting near-infrared wavelengths of light in addition to visible light.

More than 40 organizations in government, industry, and scientific and technical societies supported the P^3 competition. For more information visit www.epa.gov/p3/.



▲ Pittsburgh's magnetic drum separator impressed the IfS judges.