Bacteria power

A new twist on the established technology of using bacteria to treat wastewater could make the bugs work harder by using them to generate electricity at the same time. Developed at Pennsylvania State University, these microbial fuel cells produce pollution-free power without the drawback of having to generate and store hydrogen. The medium of the cell is a cylinder, containing eight grapefruit-sized and a hot/cold central cathode. The bacteria attach themselves to the anodes, and feed off a steady supply of waste water flowing over them. As they digest pollutants, they produce a stream of electrons which flow around an electrical circuit between anodes and cathode, and release positively-charged hydrogen ions (protons) into the wastewater (which reduces the water’s oxygen demand). A proton-exchange membrane allows these protons to reach the cathode, which is exposed to air inside its tube. The oxygen in the air reacts with hydrogen ions from the wastewater and electrons from the electrical circuit, creating electricity at the cathode to create water. The technology works, but needs refinement to make it useful, says environmental engineer Bruce Logan, who is leading the project. It power generation in these systems can be increased, microbial fuel cell technology may provide a new method to offset wastewater treatment plant operating costs, making advanced wastewater treatment more affordable for both developing and industrialized nations. He says, "Part of the challenge is reducing the cost of the equipment. This fact that fuel is domestic wastewater is an advantage — we're using something that, to be completely useless, Logan says — but the experimental rig uses expensive materials, for the cathode, anode and membrane. "But we're already making progress on that," says Logan. "Substantially cheaper systems are just around the corner."  

Swing votes

Cambridge-based valve specialist Camson Technology has won an Innovation Award from the East of England Energy Group for a magnetic rolling swell valve. Notable for its high-speed operation and low energy consumption, the valve is designed for unfettered fluids, and is likely to find uses in the offshore oil and gas industry. The valve uses a linear actuator developed by Włodzimierz Wagosiak, who founded Camson in 2000 to exploit the technology. The actuator uses permanent magnets and a spring-loaded armature to switch the valve between two possible positions. Opening or closing the valve requires only a very short electrical pulse, and no current is needed to maintain the valve in the off or on position. This allows complex multiple valve systems to be run from a boost battery, the company says, and makes it attractive for industries where power consumption is a major issue. The BEEG selected the valve as the winner in its category from 12 entrants. "We felt the Camson entry demonstrated a valve configuration in a different way with applications not just in the oil and gas industry, but in other sectors as well and was truly innovative," said Pat Howlett, chairman of the awards judges.