Oct. 20, 2009 ***What It Takes to Be Green***

Guest Expert: Eric Steimle, Ph.D., environmental consultant and owner of Aeos and research professor in the Environmental Science and Policy Program at University of South Florida St. Petersburg

Notes from the Conversation

1. Green chemistry and engineering is a major change from traditional chemistry and engineering approaches to:
    - Preventing use and/or creation of hazardous chemicals
    - Chemistry that promotes environmental sustainability
    - Preventing pollution from occurring in the first place so there is no hazardous waste to clean up.

2. Why should you care? Just about everything man-made is produced using chemicals including electronics, cars, medicine, plastics, insecticides, cleaners, carpeting, clothing and much more. You should want these materials, the stuff of life, made in a "greener" way.

3. Green chemistry and engineering has resulted in new technologies that have eliminated more than 460 million pounds of hazardous chemicals and solvents, saved more than 440 million gallons of water and eliminated more than 170 million pounds of carbon dioxide releases in the air.

4. Green chemistry and engineering has developed using renewable building blocks, such as corn, glucose or wheat gluten, to make high performance synthetic fibers that turn into fabric for clothes or upholstery and packaging materials for foods.

5. Other green chemistry innovations:
    - A dry cleaning process that uses recycled carbon dioxide as a substitute for toxic organic solvents

    - A new biodegradable soap made from plants

- A biological process for treating raw cotton that replaces harsh chemical treatments
- A wood preservative without arsenic and other common toxic materials for decks and fencing
- New pest control products that target insects and weeds without harming people, pets and the environment.

Principles of Green Chemistry (based on the 12 Principles defined in: Anastas, P.T.; Warner, J.C. *Green Chemistry: Theory and Practice*, Oxford University Press: New York, 1998, p.30)

1. Prevention: it is better to prevent waste than to treat or clean up afterwards.
2. Atom economy: maximize the incorporation of all materials used in the process into the final product.
3. Less hazardous chemical syntheses: use and generate substances that are not toxic.
4. Designing safer chemicals: chemical products should be designed to achieve their desired function while minimizing their toxicity.
5. Safer solvents and auxiliaries: the use of solvents should be made unnecessary wherever possible and innocuous when used.
6. Design for energy efficiency: energy requirements should be minimized.
7. Use of renewable feedstocks: a feedstock (building block or starting material) should be renewable.
8. Reduce derivatives: reduce the number of steps in a process.
9. Design for degradation: products should be degradable at the end of functional life.
10. Real-time analysis for pollution prevention: chemical processes should be as streamlined as possible using sophisticated, real-time, in line processing technology
11. Inherently safer chemistry for accident prevention: chemical processes should be inherently safer to minimize chemical accidents.