

Chemical Engineering Newsletter

University of Iowa
Spring 2006



Advisor's Corner

By Professor David Murhammer

Greetings to Hawkeye Chemical Engineers!! The Spring 2006 issue of our AIChE Student Chapter Newsletter begins with an article about our participation in the 2006 AIChE North Central Regional Conference hosted by Purdue University. As noted in the article, we decided to attend this regional conference in the place of our home Mid-America Regional Conference due to the exceptionally long drive to Stillwater, Oklahoma and the extra day that the hosts decided to add to the conference. It was my opinion that these issues would severely reduce the participation level of our students. I was particularly proud of our students who presented their research results in the Paper Contest portion of the conference. The judges obviously agreed that their presentations were of the highest quality since our three students swept the three awards!

This newsletter issue also contains a profile of Professor John Wiencek, recent recipient of the Collegiate Teaching Award, and articles describing Lindsay Diercks' internship at Lawrence Berkeley National Lab and new faculty in our department. Furthermore, four "topical papers" written by students in my Chemical Process Safety course are included. I am quite impressed with the quality of the students' papers and anticipate you will be as well. The newsletter concludes with a list

INSIDE THIS ISSUE

Advisor's Corner	1
2006 AIChE Regionals	1
Dr. Wiencek Wins Award	2
California Internship	2
New Faculty Announced	3
Government Role in Worker Safety	3
100 Years Later	4
9/11 Commission Report	6
The Vulnerability of Chemical Plants	7
Faculty and Student Awards	8

of student and faculty awards received since our Fall issue.

Finally, I encourage our alumni to donate to the Endowment Fund that will be used to support our student chapter activities. The interest from this endowment will be used to support student participation in the Regional and National AIChE Conferences. If you are interested in contributing to this fund, please contact me via e-mail at murham@engineering.uiowa.edu to discuss specific details.

2006 AIChE Regionals

By Alex Conway

Spring is the time of flowers, rain, and AIChE regional conferences. This year the University of Iowa broke from the norm and attended the North Central AIChE conference instead of our home Mid-America region conference. The reason for the change was a combination of long drive time and the extra day added to the Mid-America Regional Conference. The North Central Conference was held at Purdue University in West Lafayette, Indiana. It was a great opportunity for chemical engineering students to meet ChemE's from other schools, as well as race ChemE cars, hear interesting presentations, and make presentations on research.

This year, fifteen University of Iowa students and their advisor attended the regional conference. Among those fifteen students, three presented their research at the paper contest. These students were Alexandra Olson, Katie Doherty and Tyler Kleene. This year, a ChemE car was not fielded by the University of Iowa. The weekend began with a go-kart social with pizza and all you could drive go-karts. The event was one of the best conference socials I have ever attended. The go-kart track was fun and exhilarating.

The conference consisted of several technical presentations by university professors and industrial representatives ranging from an introduction to fuel cells to advice on evaluating job offers.

Continued on page 2

I was able to attend the fuel cell presentation and was delighted to learn a wealth of information about a technology that could end up supporting this nation's energy needs. The last event of the day was the ChemE car competition. A record setting run was accomplished as the University of Minnesota was able land their ChemE car exactly on the specified distance, a first in the history of the event.

At the awards banquet we were delightfully surprised to win not just first place in the paper competition, but all three top honors. Alexandra Olson won first place with her presentation on "*Surfactant Screening for Lyotropic Liquid Crystalline Systems with Thiol-ene Monomers*", Katie Doherty won second place with her presentation on "*Isolation and Characterization of Insect Cells with Inactive Mitochondria*", and Tyler Kleene won third place with his presentation on "*Developing a cell line from *Drosophila simulans* eggs that maintain in vivo properties*". Overall, the regional conference was a great experience; lots of interesting talks, a fun ChemE car competition, and a sweep of the research paper competition by the University of Iowa.

Dr. John M. Wiencek Wins Collegiate Teaching Award

By Jackie Alcantar

Announced on May 1, 2006, Dr. John M. Wiencek is a recipient of a Collegiate Teaching award. Each year, nominations are made by students, faculty members, and department heads in each college. The winners are selected based on scholarly works, creative achievements, how their teaching enhances student learning, teaching materials, class activities, and student evaluations of the candidate's teaching ability. Dr. Wiencek joined the UI College of Engineering in 1995 and has since become a vital member of the Department of Chemical and Biochemical Engineering as a professor, researcher, and chair of the department.

Dr. Wiencek's father encouraged all of his children to finish college, something he did not get the chance to do. From all his years of hard work and holding various jobs, Dr. Wiencek's father encouraged him to go into a field that paid well, much like his older brother who had already graduated with his engineering degree. Given his interests in biology, physics, chemistry, and mathematics, chemical engineering fit that description. Dr. Wiencek's interest in teaching started at the University of Cincinnati where he had a confusing Process Control teacher and learned that he could explain concepts very well to his fellow classmates. From then on he knew he wanted to teach and ultimately chose to get his doctorate in Chemical Engineering at Case Western Reserve University.

Dr. Wiencek's first job as a professor was at Rutgers University. Fed up with the urban feel of New Jersey, when Iowa gave him a call he was all too glad to say goodbye to return the rural feel that he enjoyed growing up in Ohio. Dr. Wiencek says that the College of Engineering has a "nice size and feel," one that allows him to get one on one interaction with students. In addition, research is greatly valued here at Iowa as opposed to some smaller colleges where teaching is the main priority for faculty. In his research, Dr. Wiencek enjoys the opportunity to be able to collaborate with colleagues from different fields. He says that the emphasis on research here at Iowa enables him to bring fresh ideas to the classroom in order to engage his students more.

Dr. Wiencek is continuously setting new goals for himself. One of his current goals is to be a successful Department Chair (he is about halfway through his five year term) which includes making continuous improvements to the department and getting through the next ABET accreditation cycle. In terms of research, Dr. Wiencek is currently interested in proteins and if they are the next generation of drugs. Nevertheless, proteins have proved challenging to deliver to the body, leading him and his collaborators to look into delivery methods by inhalation and through the skin.

The most important part of Dr. Wiencek's life is actually away from the College of Engineering. This part of his life includes his lovely wife of three years, Lydia, and their two boys, Jack, and Joe. On a side note, Dr. Wiencek can often be seen running, "a great way to manage stress and bad eating habits," he says. Dr. Wiencek says he feels "very fortunate to be in this department with its award-winning faculty and students that are actively involved." Dr. Wiencek, the feeling is mutual.

California Internship

By Lindsay Diercks

There's a reason they call it *research*. If there's anything that I have learned during my internship at Lawrence Berkeley National Lab, it's that stuff breaks, things go wrong, and you almost never get the results you expect or want...well, most of the time anyways. That's why you do your experiments over and over, again and again...you redo things.

Instead of spending my spring semester in Iowa, suffering through classes and tornadoes alike, I've been redoing experiments over and over again out west in Berkeley, California. Sunny California you think? No, Berkeley is in Northern California, right next to San Francisco. It's been raining quite a bit ever since I arrived in January, but the sun does like to make an appearance every now and then.

Continued on page 3

Most of my week is spent inside the lab, enzymatically reducing pyruvate to lactic acid or benzylacetone to 4-phenyl-2-butanol in an electrochemical cell. I classify my work as electrochemistry with a dash of organic synthesis. It's not at all what I was expecting to do out here. But still, when I leave in 3 weeks I'll be taking a load of new knowledge home with me - mostly about analytical methods. I now know how to do gas chromatography, capillary electrophoresis measurements, high pressure liquid chromatography, potentiostatic, and cyclic voltammogram. Some of these things I'd never even heard of before I started my internship.

In addition to learning how to run new machines and processes, I've also gotten some insight into the world of academic research. Ultimately, it has helped to shape the path I will be taking in a few short years - the road to graduate school or industry. You can expect to hear from me again in a short time...but next time I'll be talking about my experiences from an industrial internship.

New Faculty Announced

By Julie Karceski

This year's visit from the department's industrial advisory board presented students with the unique opportunity of meeting with the board on a more personal level. On April 20, students, faculty and the board met at the Iowa Memorial Union for dinner to discuss different areas of industry, recent developments in the chemical engineering department and, of course, the Hawkeyes. After the meal was finished, department chair Dr. John Wiencek delivered a speech about exciting news in the chemical engineering department.

Since the departure of Dr. Victor Rodgers for the University of California at Riverside, the department has been seeking to find new faculty. Two new professors have been selected to fill the void, Dr. Mani Subramanian and Dr. Jennifer Fiegel. Everyone present at the dinner had the good fortune of meeting Dr. Mani Subramanian for the first time. He will be the new director of Iowa's Center for Biocatalysis and Bioprocessing. With expertise in biochemistry, molecular biology and microbiology, he will be a strong contributor to CBB Fermentation/Bioprocessing laboratory and the Department of Chemical and Biochemical Engineering

Dr. Jennifer Fiegel recently completed her post-doc at Harvard University and will have a joint appointment with pharmaceuticals. She is interested in engineering improved pulmonary drug delivery systems for effective treatment and prevention of inflammatory and infectious diseases. We welcome them both and look forward to seeing their success at Iowa.

Government Role in Worker Safety

By Pierce Stark

Until the past few hundred years, worker safety was an issue that was mostly an individual's concern because many people were self employed. During the industrial revolution this changed, as many of the different types of jobs did. After many occurrences of safety disregard in many mass production factories, railroads, and mines, the governments of various countries decided to step in and set regulations. The government's role in worker safety is very important in today's society. If it were not for the regulations set and enforced by law, it could be a very dangerous world for the average worker today.

The industrial revolution ushered in a new age of production. The new technology discovered with the steam engine along with many other forms of new technology, made it possible to manufacture many goods at a low cost. The cost of goods then became lower, allowed production to be at a maximum rate, and this proved to be a very profitable business. Although the means of creating the goods was made easier, it still required many workers. These factories, although much more efficient, were still crude and unsafe. Under these circumstances the safety of the workers was mostly ignored, because the workers were of little concern to the owners and it also would cost extra money. Workers and firms responded in a few different ways, some people left their jobs because they were too dangerous, but the firm would still be able to attract workers by raising the pay of the more dangerous jobs.¹ In order to improve safety, a number of things were done by the US government. States began instituting railroad commissions as early as the 1840's. These were made to improve safety, but they had few powers and were rarely able to change working conditions. Mining commissions were also instituted, the first one began in 1869 and manufacturing commissions followed, but most were ineffective due to problems such as understaffing and no regulatory power.¹

The most effective effort to improve worker safety began as a spearhead movement by railroad workers in the 1880's. They began a campaign for better air brakes and couplers in freight cars. Due to this movement the airbrakes were improved, and the automatic coupler was invented. For the railroads these improvements only meant higher productivity for them, and began to apply the improvements in 1888.¹

Continued on page 4

Shortly after, the newly formed Interstate Commerce Commission published its accident statistics. The statistics showed that there were enormous risks of manual coupling and riding freight with the old fashioned brakes. In response to this the U.S. Congress passed the Safety Appliance Act, which mandated this technology. This was the first federal law primarily intended to improve worker safety, and by 1900 when the safety technology was in use, the risks to the trainmen was proven to be greatly reduced.¹

Ever since then the US government has taken on an ever-increasing role in the safety of the workplace. This has been done in many ways, but one of the most outstanding actions would be the Occupational Safety and Health Act of 1970, which instated the Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH). NIOSH and OSHA together are respectively the brains and the brawn in today's standards of worker safety. They hold inspections, set regulations, and also call the shots when it comes to companies infringing on these regulations. This puts much pressure on companies to maintain an environment that is worker friendly, a safe environment for all its employees, and safe for the community. It is not unreasonable to say that most all companies will state that safety is to be held paramount, but is this due to these government regulations? Many people might say no and say that it is because people care about fellow men, but when it comes to the executive decisions of safety versus greater profit, sometimes the government regulations could be the only thing affecting the decision to choose the safer route. Would these decisions be the same without such strict regulations?

An example of a country with fewer restrictions on safety would be China. China does not have the same strict safety regulations that we have in the U.S. Many of their companies sacrifice safety in order to cut costs of manufacturing. In China the amount of occupational related sicknesses leading to death is more than the U.S. and Europe combined.² Over half of the factories in Guangdong, a Chinese province, expose their workers to what we consider occupational hazards.² In Shenzhen, a Chinese city, an average of 13 factory workers every day lose a finger or an arm, and one dies every four and a half days.² Considering these statistics, this is an extraordinary problem. This problem can be directly related to the lack of regulations that the government sets in China. The Chinese government is trying to improve this problem, but is having a hard time, with little power being given to their safety commissions.³

Without government regulations on worker safety, many companies might not be as safe as they are now. Without regulations many companies

could become completely unsafe for employees, forcing them to either leave their job or take an unneeded risk. It would be almost certain that the death rate in almost every industry would increase, and this would be traumatic to the country. As with many industries there is a high demand for technical workers, such as chemical engineers. Without safety measures at a chemical company for instance, a high quality technical worker might leave due to unsafe working environment, and be replaced with a less qualified person. This could in a way force the industry to degenerate to an extent. Along with having the problem of unsafe workplaces, many industries could possibly be hindered from moving forward. It is the government's responsibility to keep such things from happening. I believe the government should have high authority when it comes to safety measures. Without such regulations there would be nobody to stop unethical safety ignoring decisions from taking place. The government's role in worker safety is very important in the workplace. If it were not for the regulations set and enforced by law, it could be a very dangerous world for the average worker today.

1. EH.net Encyclopedia. *History of Workplace Safety in the United States, 1880-1970*. Retrieved February, 2006 from the World Wide Web:
<http://www.eh.net/encyclopedia/article/aldrich.safety.workplace.us>.
2. The China Worker.org. *Killing Fields*. Retrieved February, 2006 from the World Wide Web:
<http://www.chinaworker.org/cgi-bin/index.cgi?action=viewnews&id=93>.
3. Kahn, Joseph. "Despite New Safety Regulations, China Workplace Deaths Are High." *The New York Times* 25 Oct. 2003, Beijing: Retrieved from the World Wide Web:
http://www-tech.mit.edu/V123/N51/long_4_51.51w.html.

100 Years Later

By Julie Karceski

This year marks the one hundred year anniversary of the publication of *The Jungle* by Upton Sinclair, a novel that exposes the gruesome working conditions of the meatpacking industry. The book's allegations shocked the public and launched a government investigation that sought to protect worker safety and consumer health. However, it was not until 1971, when the Occupational Safety and Health Administration (OSHA) were formed, that an organization sought to reduce employee injuries and fatalities across the United States. Despite dramatic improvements in casualty statistics throughout commercial and private enterprises, OSHA has often overlooked the meat packing industry's continuing problems, and as a result it remains one of the most dangerous industries in America after 100 years of public exposure.

Continued on page 5

In 1999, the US Department of Labor's *Monthly Labor Review* published an alarming report that meat packing plants have the highest rate of repeated trauma disorders within the private sector¹. Common problems include tendonitis, torn muscles, slipped discs and pinched nerves². In its report, there were 921.6 disorders per 10,000 employees, nearly 30 times higher than the average 33.5 disorders for private industry as a whole¹. Even more startling is the overwhelming suspicion that work-related injuries within the industry go largely unreported due to pressure from company officials. During the Reagan era, an under funded OSHA sought to reduce red tape and adopted a new "voluntary compliance" policy². Under this policy, surprise plant visits were eliminated and worker safety monitored only through injury logs maintained by the company. The new policy did nothing to reduce the number of injuries, only the number of those reported. In a congressional investigation, it was found that voluntary compliance led companies "to understate injuries, to falsify records, and to cover up accidents"². With OSHA choosing convenience over accountability, it avoided inspecting any plant that had a satisfactory injury log while thousands of employee injuries went unreported.

Furthermore, the cleaning crews at meat packing plants face more severe safety hazards. Using a high-pressure hose, they spray a water-chlorine mixture at 180° F to clean the blood, animal fat and manure. Workers frequently experience headaches, nausea and vomiting on the job². The use of stronger chemicals for cleaning resulted in several deaths in the 1990s. For example, in Liberal, Kansas at a National Beef plant, two employees died while cleaning blood-collection tank due to overexposure of hydrogen sulfide, a chemical which targets the respiratory and central nervous systems². Eight years later tragedy struck again at the same plant with three men dying. OSHA's response was to fine National Beef, \$480 for each employee death due to negligence². It is a grim example of how the industry disregards employee safety, and OSHA casually punishes these deaths with a slap on the wrist.

Aside from chemical exposure, employees are frequently injured by machinery that is designed to grind, decapitate and dismember hogs and cattle. A 2003 investigation conducted by OSHA revealed that from 1999-2003 nearly 100 night cleaning employees suffered either a crushed body part or amputation³. This number does not include those who died from equipment accidents or chemical exposure, and does not scrape the surface

of those who suffered traumatic injuries such as lacerations, burns, fractures, contusions, etc. As Mr. Ziewbach notes in *An American Tragedy: The Decline of U.S. Unionism and its Human Rights Implications*, "The meatpacking industry of Upton Sinclair's *The Jungle* is anything but a thing of the past"³.

All of these implications suggest OSHA should take a more direct approach to protecting employee safety in the meatpacking industry. While it cut back on inspections to reduce costs, thousands of employees were injured without any documentation or compensation. For such a dangerous industry, plant inspections should be mandatory and unannounced. The use of hazardous chemicals needs to be regulated to eliminate deaths from suffocation and chronic health problems from years of exposure. OSHA also needs to create a safer atmosphere with limited risk, and heavily punish companies for casualties due to negligence. It is unfortunate that management often sees a dollar sign before OSHA intervenes with stricter laws to defend those employees that are not much better off than 100 years ago.

Technological advances in the past century have improved safety and efficiency of most industries, but the reality of the meatpacking industry is that a primal device, the knife, is still the primary tool used by employees. A comparison may be drawn between the failure of production methods to advance and the failure of working conditions to progress with the changing times. With the creation of OSHA, unions and other worker-defending organizations, all workers should be protected. It is unfortunate that despite a 100 year period for the government to reflect upon the accusations made by Sinclair in *The Jungle*, the ongoing predicament within the meatpacking industry suggests very little has changed.

1. U.S. Department of Labor Bureau of Labor Statistics. (1999, August). *MLR: The Editor's Desk: Meat Packing Plants Have the Highest Rate of Repeated-Trauma Disorders*. Retrieved February 5, 2006 from the Bureau of Labor Statistics *Monthly Labor Review*, from: <http://www.bls.gov/opub/ted/1999/aug/wk1/art04.htm>
2. Schlosser, Eric. (2002). *Fast Food Nation: The Dark Side of the All-American Meal*. New York, NY. HarperCollins Publishers, Inc.
3. Zwiebach, Peter. (2004). *An American Tragedy: The Decline of U.S. Unionism and its Human Rights Implications*. *Unfair Advantage*, 5. 105.

9/11 Commission Report

By Kate Cannady

Chemical plant safety and security was thrust into the spotlight after the attacks on September 11, 2001 forced the United States to acknowledge that it was no longer a country safe from terrorist activity. The focus of post 9/11 investigations not only addressed airport and aircraft security, but the nation's overall security regarding both foreign and domestic terrorism. Initially leading the way in the fight to bring attention to chemical plant safety and the improvements needed, was New Jersey Senator John Corzine who introduced the Chemical Security Act in late 2001. The Chemical Security Act outlined a balanced approach requiring the Environmental Protection Agency (EPA) to work with the Department of Homeland Security (DHS). The overall goal was to establish minimum requirements regarding the security and reduction of potential hazards at chemical plants and other facilities that store large quantities of materials¹. The plan required that high risk facilities would be identified within 1 year and that they must implement response and prevention plans within 18 months of the act's enactment. In addition to these requirements, compliance certifications would be made available to the public, but assessments would be kept undisclosed for security reasons. Unfortunately, in the years since the Chemical Security Act was proposed, very little has improved despite attempts by additional members of Congress as well as the states themselves.

Perhaps inspired by Senator Corzine's attempts to pass chemical security legislation in 2001, Senator Susan Collins has recently drafted a bill focusing on almost exactly the same items introduced in the Chemical Security Act. While it also aims at identifying high risk chemical facilities, requiring them to provide vulnerability assessments and response plans, it allows more control at the state level, permitting governors to establish more stringent security standards for plants in their states². While the overall proposal is a positive step, it falls short in several areas leaving many issues open for interpretation. One significant oversight of this bill is that instead of establishing specific minimum criteria companies need to include in their plans, it allows chemical companies to pick which items to include and which to leave out², enabling companies to suggest changes that may be the most inexpensive, but not the most effective. The draft also fails to include public accountability safeguards ensuring that surrounding community standards and proper implementation of the plans are met³. The current draft proposed by Senator Collins seems to contain several loopholes effectively allowing companies to navigate around requirements, potentially resulting in an ineffective means of control.

While Congress plays a tug-of-war game regarding what should and shouldn't be included in chemical plant security legislation, some states are taking matters into

their own hands. In late 2005, New Jersey Governor Richard Codey announced an order making New Jersey the first state in the nation to have mandatory standards for chemical plant security⁴. Under these new standards, all of New Jersey's 140 chemical facilities are required to evaluate potential vulnerabilities and potential consequences of a chemical release⁴. New Jersey also passed the Toxic Catastrophe Prevention Act requiring investigation into the adoption of safer technology including the substitution of less hazardous materials. While these mandates are a step in the right direction, they have been met with much resistance from chemical companies reluctant to change their practices in the name of preventing what might happen.

On December 5, 2005 the final report regarding 9/11 Commission Recommendations was released, awarding dismal grades to almost every division assessed by the commission. Critical Infrastructure Assessment, which incorporates chemical plant safety, was given a grade of 'D' by the 9/11 Commission clearly sending the message that the government has done very little to safeguard domestic targets. While members of Congress aren't falling short of ideas and suggestions on how to improve chemical plant safety and security, they do fall short deciding how and what should be included in legislation. In the 5 years since the attacks on September 11th occurred, they still can't seem to agree on what the 'best' solution is. Unfortunately, what they don't seem to realize is that any regulations above and beyond what are currently in place would most certainly be better than none at all. While most of the issues in passing chemical plant security legislation seem to stem from Congress, the chemical industry remains reluctant to change their ways as well. Although they appear more willing to cooperate than they were 5 years ago, embracing the changes in production and processing methods that would be required of them seems unlikely to happen without resistance. Unless both Congress and the chemical industry can come to an agreement, increasing the well-deserved grade of 'D' will be a lofty goal at best. Each side needs to partner in the design, implementation and enforcement of these regulations, otherwise the next topic on the table will be determining the best way to recover from a chemical plant attack instead of how to prevent one from happening.

1. Corzine, Jon S., U.S. Senator for New Jersey. Fact Sheet on Senator Corzine's Chemical Security Legislation. Retrieved September 22, 2004 from http://corzine.senate.gov/priorities/chem_sec.html
2. Closing the Gap in Chemical Plant Security. (2006, February). Chemical Engineering Progress. Retrieved March 02, 2006 from www.cepmagazine.org.
3. Failing Grade on Chemical Security. (2005, December 12). Retrieved March 02, 2006 from <http://www.ombwatch.org/article/articleview/3221/1/408>.
4. Ember, Lois. (2006) New Jersey Mandates Chemical Plant Security. Chemical & Engineering News. American Chemical Society. ISSN 0009-2347.

The Vulnerability of Chemical Plants

By Jackie Alcantar

The idea of using chemicals for an attack has most certainly crossed terrorists' minds. The FBI has obtained evidence that Mohammed Atta, suspected ringleader of the September 11 attacks, landed a plane in Tennessee in March 2001 and asked a southwest Tennessee pilot what kinds of chemicals were stored in the enormous tanks he had just flown over. While the pilot told him they were empty, they were in fact filled with as much as 250 tons of sulfur dioxide. Such a chemical release could seriously injure or even kill as many as 600,000 people in the surrounding area. With copies of U.S. chemical trade publications found in Osama bin Laden's hideout, evidence of al Qaeda's interest in chemical attacks has been well-established¹.

Given this evidence that chemical plants and storage facilities are among the most vulnerable high-impact targets that terrorists could exploit, it is only logical that chemical plants should have adequate security. However, repeated media investigations have shown that U.S. chemical plants have inadequate security, with unlocked gates and unguarded chemical tanks^{2,3}.

The events of September 11 were a wake-up call to many organizations that chemical plants need more protection. The Environmental Protection Agency (EPA) has identified 123 chemical plants where a terrorist attack could, in a "worst-case" scenario, kill more than 1 million people and 7,605 plants that endanger over 1,000 people⁴. Reducing or eliminating the possibility of chemical releases can be accomplished by choosing inherently safer technologies, including modifying production or products to use safer or fewer chemicals, reducing chemical quantities, or by using processes involving safer pressure, temperatures, or other conditions. Nearly half of U.S. utilities are abandoning the use of liquid chlorine and replacing it with the less volatile sodium hypochlorite bleach. This was done in the Blue Plains Wastewater Treatment Plant in Washington, D.C.⁵. Two-thirds of U.S. oil refineries now use safer processes that do not require the use of highly toxic hydrofluoric acid⁶. In addition, many power plants, such as Electric Power in Cheshire, Ohio, have switched to urea-based pollution control systems rather than ones involving large-scale storage of ammonia that would have endangered the surrounding community⁷. Labor union officials and citizen groups say that even these inherently safer changes are superficial and inconsistent, leaving thousands of smaller plants vulnerable to attack¹.

Current chemical safety laws, generally speaking, are limited to cleanup, planning, response, and risk management. No federal laws have been passed that establish even minimum security standards at chemical plants, leaving the private sector to govern

itself^{8,9}. Numerous plants cannot afford to convert to safer methods with the consequence of harmful conditions. The chemical industry, led by the American Chemistry Council (ACC) and the American Petroleum Institute (API), has successfully blocked any federal efforts to authorize stronger security regulations for chemical manufacturers and companies that store and use hazardous chemicals. Federal lobbying disclosure records reveal that since 2002, the ACC and its member companies have given more than \$60 million in political contributions to federal candidates and political parties¹⁰.

There have been positive changes against terrorism by individual chemical plants that have the resources to afford them. However, there are many more chemical organizations and smaller chemical companies that do not want stronger security regulations because of the cost and inconvenience. This can be resolved by government funding directed toward these improvements. The government should also set security standards for all chemical plants to abide by. These standards should include a limitation on the amount of hazardous chemicals that can be stored in a single area and prohibit the usage of hazardous chemicals when safer alternatives are available. As long as those responsible for regulating the chemical industry have no authority to require the industry to adopt stricter security measures and lack adequate funding and personnel to inspect for potential security problems, the U.S. deserves a failing grade in protecting chemical plants from terrorists.

1. Grimaldi, J.V., & Gugliotta, G. (December 16, 2001). Chemical plants feared as targets. *Washington Post*. Retrieved March 1, 2006, from <http://www.washingtonpost.com>
2. Fager, J. (Executive Producer). (2004, June 13). *U.S. plants: Open to terrorists* [Television broadcast]. New York, NY: MMVI, CBS Worldwide Inc. from <http://www.washingtonpost.com>
3. Prine, C. (2002, April 7). Lax security exposes lethal chemical supplies. *Pittsburgh Tribune-Review*. Retrieved March 1, 2006, from <http://www.pittsburghlive.com>
4. Hind, R., & Halperin, D. (2004, September 22). Lots of chemical, little reaction. *New York Times*. Retrieved March 1, 2006, from <http://www.nytimes.com>
5. Leonnig, C.D., & Hsu, S.S. (2001, November 10). Fearing attack, Blue Plains ceases toxic chemical use. *Washington Post*. Retrieved March 1, 2006, from <http://www.washingtonpost.com>
6. Purvis, M., & Claglin, W. (2003). *Needless risk: Oil refineries and hazard reduction*. Washington, DC: U.S. PIRG Education Fund. <http://www.washingtonpost.com>
7. *Protecting communities from chemical hazards: Inherent safety at work*. (2002). Retrieved September 18, 2004, from http://www.ems.org/chemical_plants/inherent_safety.htm
8. Reiland, R.R. (2004, April 16). Vulnerable still. *Pittsburgh Tribune*. Retrieved March 1, 2006, from <http://www.pittsburghlive.com>
9. Mintz, J. (2003, April 8). Bush seeks voluntary chemical plant security steps. *Washington Post*. Retrieved March 1, 2006, from <http://www.washingtonpost.com>
10. Bollier, D., Clemente, F., MacCleery, L., Jackson, H., & Aaron, C. (2004). Homeland unsecured: The Bush Administration's hostility to regulation and ties to industry leave America vulnerable. *Public Citizen*. Retrieved March 1, 2006, from <http://www.citizen.org>

Faculty and Student Awards

Undergraduate Students:

Jackie Alcantar Dept of Homeland Security scholarship and internship
Third place in the poster competition in her division at SURF (Spring 2006)

Alexandra Olson Collegiate Scholar Award
First place in the paper competition for AIChE Regional Conference

Katie Doherty Collegiate Scholar Award
Second place in the paper competition for AIChE Regional Conference

Tyler Kleene Collegiate Scholar Award
Third place in the paper competition for AIChE Regional Conference

Graduate Students:

James Osburn Graduate Award for Teaching and Mentoring

Cynthia Hoppe
Nicole Kenning

Karl Kammermeyer Graduate Award for Research and Scholarship

Ying Cai
Michael DePierro

Arthur Vetter Graduate Award for Excellence in Service and Outreach

Kwame Owusu-Adom
Jessica Rodriguez

Treniece Terry Popular Choice Award, first place in the COE Research Open House, Spring 2006
Hancher-Finkbine Medallion for Outstanding Contributions and Leadership, University of Iowa

Timothy White Outstanding Graduate Student Mentor Award for the University of Iowa

Faculty:

Chris Coretsopoulos Collegiate Staff Research Award

A.K. Salem Young Investigator Travel Award for National Academy of Engineering/Institute of Medicine Meeting on Vaccine Production
The Pharmaceutical Research and Manufacturers of American Foundation Award, 2005 AAPS conference
Young Investigator Award from University of Iowa/Mayo Clinic Lymphoma SPORE

John Wiencek Faculty Excellence Award for Teaching

ANYONE INTERESTED IN SPEAKING AT PROFESSIONAL SEMINAR SHOULD CONTACT JACKIE ALCANTAR (JACQUELINE-ALCANTAR@UIOWA.EDU) FOR SPECIFIC DETAILS

ANYONE INTERESTED IN MAKING A TAX-DEDUCTIBLE CONTRIBUTION TO THE UNIVERSITY OF IOWA AIChE STUDENT CHAPTER PLEASE CONTACT PROFESSOR DAVID MURHAMMER VIA EMAIL AT MURHAM@ENGINEERING.UIOWA.EDU FOR DETAILS

Editor-in-Chief: Julie Karceski would like to thank
Faculty Advisor: David Murhammer
and Contributors:
Jackie Alcantar
Kate Cannady
Alex Conway
Lindsay Diercks
Pierce Stark