

CHEMICAL ENGINEERING NEWSLETTER

May 14, 2007
Spring Semester 2007



University of Iowa

Advisors Corner

By Professor David W. Murhammer

Greetings to Hawkeye Chemical Engineers!! The Spring 2007 issue of our AIChE Student Chapter Newsletter contains four "topical papers" that were written by four different students in my Chemical Process Safety course. These include point - counterpoint topical papers regarding whether a program similar to the new European Union REACH program would be useful for improving chemical safety in the United States. The other two topical papers address government policy involved with protecting chemical plants from terrorists. Other articles in this issue include a brief profile of two new faculty in our department and the participation of our student chapter in the recent AIChE Regional Conference held in Rolla, Missouri. This newsletter concludes with a list of student and faculty awards received since our Fall 2006 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, then please contact me via email at murham@engineering.uiowa.edu to discuss specific details.

Breaking News: Professor Wiencek, the current Department Chair, will be leaving our department to become the College of Engineering Dean at the University of South Florida as of July 1, 2007. I will be the new Department Chair. More details will be included in the Fall 2007 issue of this newsletter.

INSIDE THIS ISSUE

Advisors Corner	1
Point-Counterpoint: EU Reach	2
Improving Chemical Facility Security Regulations Through Clarification and Inherently Safer Techniques	5
Review of New Regulations for Securing of Chemical Plants and Suggestions for Improvement	7
Chemical & Biochemical Engineering Department	
Welcome Two New Faculty	8
AIChE Regional Conference	9
Faculty and Student Spring 2007 Awards	10

Point-Counterpoint: EU Reach

Evaluation of the EU REACH Plan for Potential Application to United States Policy

By Ryan Whitaker

Chemical regulation in the United States is governed by the Toxic Substances Control Act (TSCA), a statute that has remained relatively unchanged since it was signed into law in 1976 (Hogue, 2007). Whether the staying power of this law is due to its effectiveness as a regulation tool, or the unwillingness of the chemical industry to undergo change is a question that has recently come under increasing debate. The TSCA was evaluated in a congressional report published in September 1994 entitled Toxic Substances Control Act: Legislative Changes Could Make the Act More Effective. The report detailed several weaknesses of the TSCA that significantly limit its effectiveness. First, it is extremely difficult for the Environmental Protection Agency, EPA, under the TSCA to restrict or ban the use of existing chemicals. The EPA has the ability to significantly control new chemicals that come onto the market; however, chemicals that existed prior to the enactment of the TSCA require the EPA to prove that the risks presented by the substance significantly outweigh its potential benefits to society. Many believe that this aspect of the TSCA prevented the EPA from banning the use of asbestos in 1991, despite its obvious risk as a proven carcinogen (USGAO, 1994). A second problem with the TSCA is that it only requires limited testing on new chemicals. Much of the chemical information that is obtained is claimed as confidential and thus cannot be accessed by the public and non-EPA government personnel (USGAO, 1994). A third problem with the TSCA is that the chemical testing evaluation process is extremely slow, and occurs on a chemical by chemical basis

EU Reach: An Excessive and Unnecessary Burden

By Alan Martin

The European Union recently adopted REACH, the Registration, Evaluation and Authorization of Chemicals, a new regulation aimed at evaluating the safety of the chemicals manufactured in and imported into Europe. It has been proposed to replace the Toxic Substance Control Act (TSCA) in the U.S. with a program modeled on EU REACH. The TSCA provides for the testing of new chemical developed in or imported into the United States by the EPA. Chemicals produced before the passing of TSCA were grandfathered in and are not subject to the required testing. Some believe that this loophole along with the EPA having insufficient power to regulate the chemical industry is a fatal flaw of TSCA (Hogue, 2007).

The European Union's REACH regulation was adopted in late 2006. It requires registration for chemicals that are produced or imported at more than one ton per year. The registration process requires firms to submit detailed health and environmental data for each substance (Logomasini, 2005). Following registration those chemicals which are deemed to be possible carcinogens, are persistent in the environment, or have insufficient data are to be evaluated. A list of chemicals of high concern will be created. Chemicals on this list will undergo the authorization process. This process involves extensive tests to determine whether the chemicals represent potential risk to public health. "These substances will not be allowed to enter EU commerce unless the

(Hogue, 2007).

Countries throughout the world face many of the same issues with chemical regulation as the United States. However, in December of 2006 the European Union finalized a set of significant changes in its chemical regulation policies known as EU REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) (Hogue, 2007). The REACH plan will seek to establish an integrated system of chemical regulation that will fill in missing information on over 30,000 existing chemicals. It will provide a platform to enable workers, manufacturers and consumers to easily access chemical safety information (Gooch, Prisco, 2005). One of the most important aspects of the new REACH plan is that it requires companies to gather information on and register all chemicals that are produced in quantities of greater than one ton per year. The relatively low quantity ensures that nearly all chemicals present in significant levels are registered. If a chemical substance is not registered under the REACH plan it cannot be manufactured in or imported into the European Union (Gooch, Prisco, 2005).

This is a clear case where the United States has something to learn from other members of the global chemical market. The TSCA is an antiquated statute that simply does not provide the EPA with adequate regulatory power. Thousands of chemicals are produced and circulated in the US and global markets that do not have clearly established toxicology and safety data. Without adequate data on every commercial and specialty chemical those that are exposed to these substances are being placed at unnecessary risks. It would not only be negligent of the United States government and chemical industry to continue to ignore this problem; it would display a clear disregard for the safety of workers, consumers and others exposed to these chemical substances.

One of the key arguments of chemical manufacturers against the institution of regulations

manufacturer can demonstrate that the risks can be adequately controlled" (Logomasini, 2005). I believe the regulatory burden of EU REACH would harm the chemical industry and that it is not necessary in the U.S.

EU REACH will create an expensive bureaucratic program that will harm the chemical industry. REACH would require producers and importers of chemicals in quantities over one ton per year — approximately 30,000 substances — to register them, and to provide extensive information on their properties, uses and handling (Gray, 2006). Furthermore, "manufacturers also would have to address all identified uses of a chemical, adding immeasurably to the paperwork burdens required for registration" (Cohen, 2006). Small firms will be less able to bear this burden, thus putting them at a disadvantage. The American Chemical Council believes that REACH seeks considerably more information than required by regulatory authorities to ensure that chemicals are produced and used as safely as possible (Harrington, 2006).

REACH could cause chemicals to be needlessly withdrawn from the market. Some specialty chemicals may be pulled from the market if the demand for the products isn't high enough to justify the costs of registration and testing (Logomasini, 2005). The candidate list created from chemicals awaiting testing and evaluation could become blacklisted because of unfounded public concerns. This could inhibit innovation as chemicals may be withdrawn by the manufacturer when no risk has been proven (Gray, 2006). Downstream users, those dependent on other manufactures for their input chemicals, would be particularly at risk if the manufacturers did not register or withdrew a needed chemical from the market (Deloitte, 2006).

EU REACH is not worth the burden it would cause in the United States. Most of the benefits could be received without requiring new extensive regulation. "Industry has voluntarily supplied EPA

similar or equivalent to EU REACH in the United States is that it will damage the competitive edge possessed by the US in the global chemical market. Michael P. Walls, the managing director of the American Chemistry Council, pointed to statements made by Margot Wallstrom, EU's environmental commissioner, in which she effectively stated that the EU REACH plan has the potential to hurt the European economic position in global markets (Houge, 2007). Economics is an important factor to consider in the debate; however, when weighing an issue between human safety and health, and the chemical industry's bottom line, there simply should be no debate that health and safety should be of primary importance.

The United States should seek to work with members of the European Union to begin to establish an international standard for chemical regulation. This standard should have several key goals. First, data should be obtained, catalogued and made readily available for all existing chemicals and any new chemical products that enter the market. Second, policies should be instituted that allow regulatory agencies to ban or restrict the use of any chemicals that are deemed to be an extensive and unmanageable hazard to public or worker safety. The failure of the EPA to ban asbestos under the TSCA is a limitation that must be handled with new policies. Finally, companies should be required to provide a full disclosure of all chemical data related to product safety for public viewing.

The EU REACH plan, which will go into effect in June of this year, is surrounded by many unknowns and skepticism. Obviously it is not a one size fits all plan for chemical regulation, and it would be foolish for the United States or other global chemical producers to institute an identical plan. However, the EU REACH plan is an important step in the right direction. It is a step that may force the hand of the United States and other countries to institute similar policies, and possibly a step toward international standards for chemical safety. It is a step that most importantly begins to place worker and consumer safety as the foremost goal of the

with evaluation data covering more than 95% of all chemicals in commerce today, by volume. In this program, known as the High Production Volume (HPV) Program, more than 300 sponsoring manufacturers volunteered to provide hazard-screening information on 2,222 HPV chemicals." The safety data collected in Europe by EU REACH will be publicly available, making it unnecessary for U.S chemical manufacturers to duplicate the research being done in Europe as part of EU REACH for the chemicals not included in the HPV program. Allowing Europe to bear the regulatory burden alone, American manufacturers could have a competitive advantage.

"The fundamental flaw of REACH is that it is not carefully tailored to address possible harms, and its potentially enormous costs are not offset by enough clearly identifiable health benefits." (Gray, 2006). The United States should wait to see the impact EU REACH has on the European chemical industry before embarking on a similar program. In the meantime the U.S can reap what benefits there are from the safety data being collected in Europe without bearing the unnecessary burden of the regulatory regimen required, thus giving American industry a competitive advantage.

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<http://corner.nationalreview.com/post/?q=YjdiYzAxOTZzNzExNWE4Nzk1OTY0OTk4MmM0MTUxN2I=>

Harrington, Tiffany (2006) *REACH* Retrieved February 10, 2007 from

http://www.americanchemistry.com/s_acc/sec_mediakits.asp?SID=1&VID=124&CID=344&DID=1180&RTID=0&CIDQS=&Taxon

global chemical industry.

Gooch, Anthony and Prisco, Anna. "Reach: EU Takes Major Step in Agreeing New EU Chemical Legislation." *European Union* 14 December 2005. 2 February 2007 <<http://www.eurunion.org/News/press/2005/2005125.htm>>.

Hogue, Cheryl. "The Future of US Chemical Regulation." *Chemical and Engineering News* 8

January 2007. 2 February 2007 <<http://pubs.acs.org/cen/government/85/8502regulation.html>>.

United States General Accounting Office. Toxic Substances Control Act: Legislative Changes Could Make the Act More Effective. September 1994.

Improving Chemical Facility Security Regulations Through Clarification and Inherently Safer Techniques

By Christina Devine

The safety of chemical facilities has been in question since the September 11th attacks. The possibility of terrorists utilizing chemical plants to harm the American community is a realistic threat. Recently, the government has taken steps towards ensuring that proper security measures are in place and upheld. However, the language of the regulations is vague and the bill lacks any mention of enhancing security through inherently safer techniques. For the measure to pass, many changes must be made to clarify the intentions of the Department of Homeland Security (DHS) and the process used to determine the necessary regulations for each plant. In addition, the bill should encourage the use of inherently safer techniques to improve safety and make chemical facilities less attractive targets for terrorist attacks.

The Homeland Security Appropriations Act of 2007 outlines the DHS's plan for regulating the

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Hogue, Cheryl, (2007) Point/Counterpoint : The Future of Chemical Regulation, *Chemical & Engineering News* Retrieved on February 10, 2007 from <http://pubs.acs.org/cen/government/85/8502regulation.html>

Logomasini, Angela. (2005) *Europe's Global REACH: Costly for the World; Suicidal for Europe* Retrieved February 10, 2007 from <http://www.cei.org/gencon/025,04951.cfm>

security of high risk chemical facilities. The regulations for each plant will vary depending on the risk associated with a particular plant. To determine the risk posed by the plant, the facility must complete an online assessment. If the DHS deems the facility to be high risk, the plant must prepare and submit a vulnerability assessment and a security plan. This plan will then be reviewed by the government to determine if it meets requirements. If it does not meet requirements, it must be changed. If the plan is acceptable it will be implemented and must be maintained. If the facility does not comply with the regulations it may face a fine of \$25,000 for each day the facility is in violation of the regulation (Department of Homeland Security, 2006). It is a good plan in theory; however, the wording of the document causes discomfort with the measure in many people.

The topic raising the most controversy is the preemption section of the bill. The bill would

preempt any state laws currently in action, even if the laws are stricter on security. Presently there are three states that have stricter chemical facility security laws: New Jersey, New York, and Maryland. If the law was passed the efforts these three states have made to create a safe environment for their communities would be overturned. Although the bill has recently been changed, removing the preemption section, the "DHS retained the right to invalidate state programs in the future" (Ember, 2007a). The fact that it is unclear as to whether states may enact measures stricter than the DHS's is unacceptable to many. The DHS must clarify what rights state governments have in protecting chemical facilities within their domain.

How the DHS determines the risk level of a facility and the required changes must also be clarified. Companies need to be able to predict what changes must be made and the magnitude of such changes. For example, the Synthetic Organic Chemical Manufacturers Association (SOCMA) does not believe it should have to follow the same requirements as other facilities. SOCMA represents many smaller companies that focus on batch processes so the chemicals used vary. For example, hazardous materials might only be used one week out of the month to make a certain product. Since the materials used might change from week to week, the risk posed by such a company may also vary weekly, as opposed to a facility that makes only one product throughout the year (Ember, 2007a). Therefore, it is difficult to determine the changes that a facility specializing in batch processes will have to make. These changes can be costly. Installing the necessary equipment and personnel required for security compliance can be expensive to implement. The plant might need to shut down while installing the required safety measures and this alone could cost thousands of dollars. More money must be spent in hiring security personnel and in the diverted resources associated with designing the security plan. If the DHS were to clarify what constitutes a high risk facility, companies may be able to predict required changes and adjust for the cost associated with the changes in advance. This will facilitate compliance and help companies prepare

economically.

An important part of securing a chemical facility is by using inherently safer designs. By using safer chemicals or decreasing the amount of dangerous materials on site, the risk posed by a facility can decrease substantially. According to Stephen E. Flynn, author of "The Edge of Disaster: Rebuilding a Resilient Nation," "[S]ecurity is more than gates, guards, and guns" (Ember, 2007b). He makes an excellent point, noting that an important part of making chemical facilities safer from terrorist attacks is to make them "far less consequential as targets" (Ember, 2007b). This can be done by implementing inherently safer techniques. However, inherently safer methods are not a part of the DHS regulations. Several groups including OMB Watch and Public Citizen attempted to convince the DHS to include a section encouraging companies to use inherently safer techniques. Unfortunately, the DHS responded that it did not have the authority to do such (OMB Watch, 2007). This is an issue that should certainly be included in the bill. Simply installing gates, extra personnel, and other such security systems will not make a facility invulnerable to terrorists. By reducing the quantity and use of hazardous materials and processes, the magnitude of a disaster will also be reduced, should all other safety precautions fail.

Conceptually, the Homeland Security Appropriations Act of 2007 is definitely a step in the right direction. It is important to ensure the safety of communities across the United States. However, there are still some kinks in the bill that must be worked out before it can be successful. The DHS must clarify what rights state governments have over the security of chemical facilities within their domain. To nullify stronger safety measures in states such as New Jersey and New York would be irresponsible. Clarification is also required in determining high risk facilities so that companies can plan for changes financially. This will improve compliance and facilitate the implementation of required changes. Furthermore, the DHS should include inherently safer techniques in the bill to make facilities less attractive targets for terrorist attacks and decrease the magnitude of a disaster should other safety measures

fail. Inherently safer design is the best way to ensure a safe environment and must be included. Through clarification and the addition of inherently safer techniques, the DHS can create an improved measure that will better protect chemical facilities from possible attacks.

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Ember, L.R. (2007a). Chemical Plant Security. *Chemical and Engineering News*, 85, 13. Retrieved April 22, 2007 from <http://icon.uiowa.edu>
Ember, L.R. (2007b). Securing Chemical Facilities. *Chemical and Engineering News*, 85, 39-43. Retrieved April 22, 2007 from <http://icon.uiowa.edu>
OMB Watch. (2007). *Department of Homeland Security Finalizes Chemical Security Program*. Retrieved April 22, 2007 from <http://www.ombwatch.org/article/articleview/3789/1/1?TopicID=1>

Review of new regulations for securing of chemical plants and suggestions for improvement

By Nichole Daringer

Recently, the Department of Homeland Security (DHS) put into place new security regulations to help decrease the risk of terrorist attacks on chemical facilities. Congress gave DHS the authority to enact these new security regulations while passing the 2007 DHS spending bill (Ember, L., 2007, Government & policy). DHS is now empowered to decide which chemical facilities are high risk and determine the necessary measures to keep the facilities safe. Under the new regulations, facilities must undertake vulnerability assessments and are required to develop and implement security plans if they are considered high risk (Ember, L., 2007, Government & policy). These chemical facilities are organized into four levels by the degree of risk as determined by the amount and types of chemicals used or stored at a facility along with the facility's proximity to populated areas (Department of Homeland Security, 2006). The chemical facilities that are deemed to be at highest risk have the strictest regulations to follow (Department of Homeland Security, 2006). These security regulations are set to expire in three years or sooner if Congress passes new, permanent regulations before that time (Ember, L., 2007, Government & policy).

While the regulations set by DHS are an important first step toward protecting our chemical facilities, changes should be made to increase effectiveness. One change that should be made is to include wastewater treatment plants as facilities that

are affected by the regulations. Many wastewater treatment plants still use chlorine to disinfect the water (Ember, L., 2007, Government & policy). According to Rick Hind, legislative director for Greenpeace toxics campaign, nearly 100 water treatment facilities could put at least 100,000 people each at risk (Ember, L., 2007, Government & policy). The DHS could use information submitted to the Environmental Protection Agency to determine which of these are high risk (Ember, L., 2007, Government & policy).

Another problem with the regulations enacted by DHS is that they claim preemption over state laws (Ember, L., 2007, Government & policy). Preemption was not granted by Congress and many Congressional members have directly stated that this was not their intent (Ember, L., 2007, Government & policy). The regulations state that only state programs that conflict with or hinder the federal rules would be overridden (Ember, L., 2007, Latest news). However, DHS retained the right to invalidate state programs in the future and did not clearly express that states can have stronger laws than DHS (Ember, L., 2007, Latest news). This is especially worrisome for New Jersey. New Jersey feels that it requires stricter safety measures than DHS has enacted because of a higher density of both critical infrastructures and population than other states (Ember, L., 2007, Government & policy).

Perhaps the biggest change that needs to be made to the regulations is to amend the lack of a requirement for safer technologies and chemicals.

Right now, chemical facilities are not required to use safer technologies or chemicals where possible (Ember, L., 2007, Government & policy). No matter what precautions are taken to protect chemical facilities from terrorist attacks, the possibility still exists. By reducing the amount of dangerous chemicals at a chemical facility or by substituting dangerous chemicals with less hazardous ones, the amount of harm that could be caused by the chemical facility decreases significantly (Ember, L., 2007, Government & policy). This not only would keep surrounding communities safer, but would make chemical facilities less desirable targets (Ember, L., 2007, Government & policy).

Securing chemical facilities is an important step to help protect our country from potential terrorist attacks. Congress recently granted DHS power to regulate this security, but should pass new regulations that make their intent more clear. This includes stating that DHS regulations should not

preempt state regulations or prevent states from enacting stricter security measures. In addition, DHS should include water treatment facilities in their regulations. Finally, chemical facilities should be required to increase safety by reducing the amount of hazardous materials present or by using less hazardous materials when possible. Not only does this decrease the amount of damage that could be done by a chemical facility, but it also decreases the likelihood of a plant being targeted in the first place. Necessary changes to current regulations should be made to ensure the safety of chemical facilities before any incidents occur.

Department of Homeland Security (2006). *Chemical facility anti-terrorism standards; Proposed rule*. FR Doc 06-9903.

Ember, L. (2007). Government & policy - Securing chemical facilities. *Chemical & Engineering News*, 85(12), 39-43.

Ember, L. (2007). Latest news - Chemical plant security. *Chemical & Engineering News*, 85(15), 39-43.

Chemical & Biochemical Engineering Department Welcome Two New Faculty

By Jesse Shuck

The AIChE Iowa chapter would like to extend a warm welcome to Jennifer Fiegel and Mani V. Subramanian. Dr. Fiegel joined the faculty as an assistant professor in 2006 after completing her post doctorate at Harvard University. She is currently appointed both in Pharmacology and Chemical & Biochemical Engineering. Her research interests include using mathematical modeling coupled with experimental studies to develop medicinal aerosols. These aerosols are used as drug delivery systems that combat inflammatory and infectious diseases that attack the lungs and so contain the promise of helping countless people manage pulmonary illness and make them less debilitating. Actually helping someone to breathe easier is a worthy and

rewarding task to undertake, and we welcome and support her in these efforts.

Dr. Subramanian joined the engineering faculty in 2005 and obtained his Ph.D. in biochemistry at the Indian Institute of Science in 1978. His current research interests include Biocatalysis, Fermentation, Process Development, Production, and Protein Expression to name a few. Better understanding of these processes in a controlled environment has wide-ranging benefits for everyone. He is the director for the Center for Biocatalysis and Bioprocessing (CBB). The research group places emphasis on collaboration of students, faculty, the government, other institutions, and industry to further research in and better understanding of Biocatalysis. For more information

on CBB, visit their website at <http://www.uiowa.edu/~biocat/>.

We look forward to learning from their extensive experience and knowledge in their respective fields. We are fortunate to have such accomplished educators join our faculty here at the University of Iowa. A warm welcome to both of you from all of us here on campus.



Professor Mani V. Subramanian and Assistant Professor Jennifer Fiegel

AICHE Regional Conference

By Jennifer Pratt

On March 30–31, 2007, 7 AIChE members attended the annual Regional Conference in Rolla, MO. This conference showcased many events, which were highlighted by the ChemE Car competition and paper competition. Although the University of Iowa did not have a ChemE car team this year, they did have 3 students who participated in the paper competition.

The attendees to the conference spent the first day at the conference viewing the ChemE car poster competition and learning about the other attending schools' cars. The second day was primarily devoted to the car competition and paper competition followed by an awards banquet. The

ChemE car competition proved to be an interesting event which was dominated by the University of Oklahoma taking 1st and 3rd place in the competition. The University of Missouri–Rolla used their home team advantage to secure 2nd place. Both schools earned a trip to the national ChemE car competition in Salt Lake City, Utah.

The University of Iowa Students Jackie Alcantar, Dan Weber, and Isaac Helmer participated in the paper competition. Jackie won 1st place and Dan won 2nd place in this competition over several students from other participating schools. Either Jackie or Dan now has the option of competing in the national competition in Salt Lake City as well.

Faculty and Student Awards Spring 2007

Faculty

Alec Scranton 2007 Cooperative Research Award in Polymer Science & Engineering from
the American Chemical Society

Allan Guymon NSF For Polymer Research Grant

Students

Jessica Melanko Osburn Teaching Award

Adam Okerlund Osburn Teaching Award

Lijing Gou Dean's Distinguished Dissertation Award

Bill Liechty Parent Times Magazine Features Engineering Students

Tim White Parent Times Magazine Features Engineering Students & Kammermeyer
Research Award

Beth Ficek Vetter Service Award

Angela Mclver Vetter Service Award

Sherrie Elzey National Defense Science & Engineering Graduate Fellowship

Corin Nisly MECCA Week Mr. Engineer 2007
Competition Award

Jason Clapper Kammermeyer Research Award

Anyone interested in speaking at professional seminar should contact Steve Gant at sgant@engineering.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: Jesse Shuck would like to thank the following people for their contributions to the 2007 Spring Chemical Engineering Newsletter:

Faculty Advisor: Professor David W. Murhammer

Contributors: Nichole Daringer, Christina Devine, Alan Martin, Jennifer Pratt and Ryan Whitaker.