Y2K and Chemical Safety

The U.S. Chemical Safety and Hazard Investigation Board (CSB) contracted with the Mary Kay O’Connor Process Safety Center to help coordinate a Special Expert Workshop on “The Y2K Technology Problem and Chemical Safety” and develop a report for submittal to the U.S. Senate. The workshop was held in Washington, DC on December 18, 1998 involving leaders from industry, equipment vendors, insurance companies, regulatory agencies, research agencies, universities, labor organizations, environmental organizations, trade associations, professional engineering associations, and health and safety organizations. Based on the workshop and research conducted by the Center before and after the workshop, a report was completed for submission to the Senate by the CSB. Senators Bennett and Dodd released the report on March 15, 1999. The report received positive commendations from all stakeholders because of its well-balanced perspective and objective description of the issues. The complete report is available at the CSB website: http://www.chemsafety.gov. The following is a brief summary of the background, findings, and recommendations contained in the report.

The Senate Special Committee requested evaluation of:

- the extent of the Year 2000 Problem as it pertains to the automation systems and embedded systems that monitor or control the manufacture of toxic and hazardous chemicals, or safety systems that protect processes
- the awareness of large, medium, and small companies within the industry of the Year 2000 threat,
- their progress to date in addressing the Year 2000 problem,
- the impact of the Year 2000 technology problem on the Risk Management Plans required in June 1999, and
- the role federal agencies are playing in preventing disasters due to the Year 2000 problem.

(Y2K continued on page 12)
We, at the Mary Kay O’Connor Process Safety Center appreciate the support and assistance given to us by various organizations and individuals. This support comes in many forms without which many of the activities of the Center would not be possible. A major part of the support for various programs and activities of the Center comes from annual membership dues. Organizations can become members of the Center at the Partner, Sponsor, or Advisor level. Small business and individual memberships are also available. Details about membership benefits, membership criteria, and annual dues are available on request. The Center recently welcomed OxyChem as one of the supporting members.

Armando Lara successfully defended his MS thesis on “Dense Gas Dispersion Modeling for Aqueous Releases” on March 25, 1999. Armando starts working in the Deer Park plant of Rohm and Haas in June. This has been an eventful semester for Armando. Earlier in January, Armando and his wife Nancy welcomed their first child, Regina. We wish Armando and his family the best in their professional and personal lives.

There are also two more students working on dispersion modeling projects and other students working on an assortment of projects. A PhD student is working on the reactive chemicals project. We have developed an informal collaboration with Shell Oil Company under which we will exchange reactive chemicals information regarding methodology, data, and results. We are also evaluating the need for becoming a part of round robin testing under the Design Institute for Emergency Relief Systems (DIERS) program. This is possible because of the recent addition of the Automatic Pressure Tracking Adiabatic Calorimeter (APTAC) to our Reactive Systems Laboratory. The APTAC and the Reactive Systems Screening Tool give us extended capability to not only participate in the DIERS round robin testing, but also start major research initiatives in the reactive chemicals field. Organizations are welcome to contact the Center for details about testing.

The Continuing Education program has been revamped and revised, thanks to the untiring efforts of Mr. John Susil of Celanese, Chair of the Continuing Education Subcommittee. John did a tremendous job in helping us revise existing courses, select new courses, and rotate new instructors. However, we need everyone’s help in getting the word out about our new program. Classes are held at the TEEX location near Pasadena, Texas. Please call the Center for details regarding the Continuing Education program and registration.

We continue to implement changes, additions, and improvements to our website. In fact, some information changes almost daily. We have also implemented a list server to send e-mail notices of information and events. If you would like to be included in the list server database, please contact the Center or register on the website.

The Center library has moved recently to new and spacious accommodations. This gives us the flexibility to acquire more literature, books, and reports relevant to process safety which students can use for education and research. Organizations or individuals who would like to find a home for their books and reports relevant to process safety, are encouraged to contact the Center.

M. Sam Mannan
Chemical Safety Program Assessment Project
Stakeholder Meeting Slated for June

During the fifteen years that have passed since Bhopal, many organizations throughout the United States, and indeed the world, have taken major steps toward improving industrial safety. These steps have included actions dealing with response, preparedness, training, and prevention. It is clear that there are a great many stakeholders concerned with chemical safety – governments at all levels, research institutions, trade associations, labor organizations, colleges and universities, industry – and each has an important role. What we have not yet accomplished is how to make all the pieces of the complex puzzle fit in a manner that brings out the best of them all and allows each organization – even individuals – to get credit for their contribution.

Due to the unique history, albeit brief, and the specific basis for the formation of the Mary Kay O’Connor Process Safety Center, the Center has undertaken the ambitious project of identifying the nation’s chemical safety goals. This will be accomplished partly by an analysis of the history of accident prevention activities, accident and injury statistics, and evaluation of other safety programs. The intent is to establish a measurement system that not only helps us establish the effectiveness of current programs and activities, but also serves as the basis for establishing future goals. EPA and OSHA have provided preliminary funding to get this important project underway.

The Chemical Safety Program Assessment project will be conducted in four phases:

Phase I: Identify Databases and Analysis Techniques
Phase II: Data Evaluation and Trend Determination
Phase III: Evaluation of Safety Program Effectiveness
Phase IV: Recommendation for Future Data Collection and Analysis

The objective of the project is to develop a methodology for safety program assessment and to apply the methodology in an analysis of the impact of various programs for prevention of accidental releases of reactive, flammable and toxic chemicals from stationary sources. The programs evaluated will include those required by regulatory authorities (e.g., OSHA, EPA) and industry standards (e.g., API, CMA). The phased approach establishes different segments of the program, each of which allows an opportunity to stop and reflect on how and whether or not to proceed.

To get stakeholder ideas and input, a critical Roundtable meeting is being held on June 2-3, 1999 at the George Bush Presidential Conference Center in College Station, Texas. This will bring together stakeholders involved in chemical safety programs to identify these national chemical safety goals and discuss a common means to evaluate our success in the future.

In preparation for the June Roundtable meeting, Center researchers are working feverishly to complete a briefing book that will be mailed to all the attendees prior to the meeting. The briefing book will contain briefing papers as well as information about organizational chemical safety goals and evaluation approaches. The latter is being solicited from all organizations represented at the meeting. The briefing papers being developed by Center researchers, in collaboration with external experts, are designed to stimulate discussion during the Roundtable meeting. The five briefing papers are as follows:

1. Chemical Safety – National Goal Setting
2. History of Chemical Safety and Risk Management Regulations
3. What Do the Various Accident Databases Tell Us?
4. Use of Benchmarking to Assess Chemical Safety and Risk Management Programs
5. Insurance Perspective on Future Direction of Chemical Safety and the Risk Management Programs

(Progam Assessment continued on page 11)
The 1999 meeting of the Executive Forum of the Mary Kay O'Connor Process Safety Center was held on March 29, 1999 at the Clayton Williams Alumni Center in College Station, Texas. Following the day-long meeting, the executives toured the Center facilities including the library, software laboratory, and reactive systems laboratory. In the evening, a dinner was hosted by the Center at Remedies, a local restaurant. The Executive Forum membership was unanimous in their support and approval of the programs and activities of the Center. The Executive Forum commended the Technical Advisory Committee’s work on defining the Research Agenda and developing specific research outlines. The following represents a summary of the Executive Forum discussions.

The work force in the chemical industry is changing dramatically. It is critical for the industry to develop and implement safe ways of operating during periods of organizational change. These changes include downsizing and outsourcing. While it is pretty simple to say that these organizational changes are having an impact on safety, it is much harder to quantify the impact, and even harder to determine changes in management systems to overcome the effects. What role can the Center play with regard to this workforce issue facing the industry? In 5-7 years, 40-50% of the base will retire. What can we offer to have the Center focus on this important problem? How do we capture the benefit of the retiring workforce? These issues should be discussed by the Technical Advisory Committee to determine an appropriate role for the Center. While human factors and human factors engineering is a factor, the problem is much broader. How do you use existing resources to maintain the same level of process knowledge, and as a consequence plant safety, during these periods of organizational change? Even though it is a sensitive issue, it is a major area of concern. It is not an issue directly related to process safety and yet it may create process safety problems. Can we develop benchmarking standards for safe operations during organizational changes?

Research conducted at the Center has far-reaching impacts. The Center makes the research results and other information available through publications, other literature, and the Internet. The approach used by the Center to develop the Research Agenda is unique and allows for input from a large number of stakeholders. It is important to identify overlaps between the Center’s Research Agenda and other organizations (e.g., CCPS, NFPA, etc.) and pursue partnership opportunities, where appropriate. Active projects should be listed in Center publications (e.g., Centerline, Website).

The Center plays a vital role in providing credible and useful research results and reports such as the “Y2K report.” In addition to bringing science to these issues, the independent and unbiased position of the Center provides credibility to such reports, and is of tremendous value to all stakeholders. A further service that could be provided by the Center is to make Y2K-related contingency plans and other associated information available to stakeholders through the Center Website. The purpose is to provide the information to others especially the small and mid-sized enterprises.

The availability of risk management program information in June this year will cause facilities to look at their operations in a totally different manner. Worst-case scenarios will become the starting points for dialogue with the public as well as other issues. Terrorism is a concern, and EPA is planning to withhold the availability of offsite consequence analyses on the Internet. Ultimately the risk management program is intended to be a local program and the offsite consequence analyses are supposed to create a dialogue with the local public. As far as the risk management program and worst-case scenarios are concerned, the Center looks to have a role in providing credible and useful information to stakeholders.

(Executive Forum continued on page 15)
Technical Advisory Committee Makes Major Progress in Defining Research Areas

The semi-annual meeting of the Technical Advisory Committee of the Mary Kay O’Connor Process Safety Center was held in the Zachry Engineering Center at Texas A&M University on March 24, 1999. During the last six months, the Committee members have been busy giving shape and substance to the Research Agenda. The Research Agenda was developed through an intense process during which input was sought from the Executive Forum in 1998 and the Inaugural Symposium in 1998. The Technical Advisory Committee in its recent work has reorganized the research topics into six emphasis areas.

The numbers in the parentheses indicate the priority order assigned initially to the research topic by the Technical Advisory Committee when the Research Agenda was first established in 1998. Fifteen research subcommittees have been established to further define each research topic and develop research outlines. Because of synergistic advantages, in some cases, more than one research topic has been assigned to a subcommittee. Based on the research outlines, the subcommittees will also provide recommendations for staffing, funding mechanisms, and research implementation. As shown in the figure found on page 15, these research subcommittees have a definite purpose and duration. When a particular research topic reaches the stage of implementation and is fully funded, the subcommittee is sunset. For example, the research subcommittee on “Evaluation of Safety Programs” does not exist now since the research on that topic has been funded and the project is underway. Of course, periodic reports on the project progress will continue to be provided to the full Technical Advisory Committee.

Following, on page 15, is a list of research subcommittees and active members. The numbers in parentheses reflect the original priority order assigned by the Technical Advisory Committee. Bold, underlined names indicate subcommittee chair assignment. As the subcommittees develop research outlines, these will be published in future issues of Centerline. (TAC Continued on page 15)
Planning and organization for the 1999 Annual Symposium, “Beyond Regulatory Compliance: Making Safety Second Nature” is nearing completion. This yearly event provides a unique bridge between the practitioners and academia. The Center staff uses the opportunity to provide the stakeholders with research reports and updates on the activities and programs of the Center. In addition, the Center can help solve the complex and intriguing problems faced by industry. Having identified these problems through discussions and forum activities at the Symposium, the extensive expertise and resources available at the Center can be brought to bear through research and educational programs to solve the problems. Finally, this Symposium provides an independent and unbiased forum for exchange of ideas and discussion between academia, industry, regulators, and the general public.

The 1999 Symposium will be held on October 26-27, 1999 at the George Bush Presidential Conference Center in College Station, Texas. The keynote speakers for the two days of the Symposium are Mr. Jim Makris, Director of the Chemical Emergency Preparedness and Prevention Office of the U.S. Environmental Protection Agency and Dr. Paul Hill, Chairman and CEO of the U.S. Chemical Safety and Hazard Investigation Board. Fifteen technical sessions cover wide ranging issues indicating the versatile interests of the stakeholders and the Center.

The sessions are:
- Development and Application of Accident History Databases
- Accident History Database Analysis
- Abnormal Situation Management
- Advances in Design of Emergency Relief Systems
- Reactive Chemicals – I
- Reactive Chemicals – II
- Inherently Safer Design
- Human Factors/Human Factors Engineering
- Application of Expert Systems, Software, and Information Management in Chemical Safety
- Equipment Failure and Chemical Safety
- Advances in Dispersion Modeling
- Impact of Small Business Incidents on the Chemical Industry
- Benchmarking Process Safety Programs
- Process Safety Issues in the High-Tech Industry
- Chemical Safety in Transportation

Similar to the highly successful Inaugural 1998 Symposium, the 1999 event is being co-sponsored by several organizations including the American Society of Safety Engineers, the U.S. Chemical Safety and Hazard Investigation Board, the U.S. Environmental Protection Agency, the Occupational Safety and Health Administration, the Voluntary Protection Program Participants’ Association, and the American Institute of Chemical Engineers – South Texas Section. A major new attraction this year is an exhibit hall that provides organizations an opportunity to showcase new products, technology, and equipment related to process safety. For more details about the Symposium or the exhibits, please contact Ms. Donna Startz at (409) 845-3489. Information about the 1999 Symposium program is also available on the internet at: http://process-safety.tamu.edu.
Beyond Regulatory Compliance: Making Safety Second Nature
**Mary Kay O’Connor Process Safety Center**

**BEYOND REGULATORY COMPLIANCE, MAKING SAFETY SECOND NATURE**

**1999 Symposium**

**October 26 - 27, 1999**

**George Bush Presidential Conference Center**

**College Station, Texas**

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**Track II**

- **Track Chairs:** Early and Rob Smith

- **Human Factors/ Human Factors Engineering**
  - “Phy’s Law in Relationship to Chemical Process Safety,” Hanser, Rohm & Haas
  - “Ergonomics in the Underlying System-Based Human Errors in Major Chemical Plant Operations,” Will Hoyle, US Chemical Safety and Hazard Investigation Board
  - “Ergonomics with the Underlying System-Based Human Errors in Major Chemical Plant Operations,” Wilfred Baker Engineering

- **Benchmarking Process Safety Programs**
  - “Benchmarking Process Safety Programs,” John Noronha, Eastman Kodak
  - “Practical Approaches to EH&S Benchmarking,” John Stephens, Conoco, Inc.

- **Impact of Small Business Incidents on the Chemical Industry**
  - “Evaluating the Use of Third Parties to Measure Process Safety Management in Small Firms,” Pat McNulty and Lecon Shaller, Risk Management & Decision Processes Center, Wharton School of Business, University of Pennsylvania; Robert Barrish, State of Delaware Department of Natural Resources and Environmental Control

**Track III**

- **Track Chairs:** Mark Richter, and Bob Brant

- **Advances in Dispersant Modeling**
  - “Real-Time Modeling During Emergency Situations - Is This A Good Idea?” John Cornwell, Quest Consultants
  - “Blast Modeling,” Peter van het Veld, TNO, Netherlands
  - “Advances in Accurate Predictions of Atmospheric Dispersion,” Jerry Havens, University of Arkansas

- **Reactive Chemicals I**
  - “Thermal Runaway Reaction Studies,” Liz Cisneros, William Rogers, and Sam Mannan, Mary Kay O’Connor Process Safety Center
  - “Further Calorimetric Evaluation of Polymer/Oligomer Decomposition,” Marc Levin, Shell Oil Company
  - “Reactive Chemical Screening - A Widespread Weak Link?”, Jasbir Singh, Hazard Evaluation Laboratory, Inc.

- **Reactive Chemicals II**
  - “Polymer Decomposition and Adiabatic Kinetics,” G. Melhem, Arthur D. Little
  - “Advanced Reactive System Screening Tool,” James Burelback, Fauske and Associates

**Track I**

- **Track Chairs:** Sanjeev Mohindra and David Chung

- **Application of Software and Management in Process Safety**
  - “ProSmart: A New Approach to Process Safety Program Management,” Charles Dumas, Hart estándard Resources and Environmental Control
  - “Real Time Information Systems: Increase Productivity, Reduce Costs, Increase Productivity,” Osvaldo Bascur, GE

- **Equipment Failure Data**
  - “Inspection Programs and Process Safety Data,” Jack Buller, National Institute for Occupational Safety & Health
  - “Chemical Process Safety Case Histories - PPG Industries,” John Noronha, PPG Industries
  - “A Significant Event,” Jeff Caplan, General Electric

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**FORUMS - NSORS -**

- U.S. Chemical Safety and Hazard Investigation Board
- American Society of Safety Engineers
- Occupational Safety & Health Administration, U.S. Department of Labor
- South Texas Section of the American Institute of Chemical Engineers
1999 SYMPOSIUM REGISTRATION FORM
Mary Kay O’Connor Process Safety Center
BEYOND REGULATORY COMPLIANCE, MAKING SAFETY SECOND NATURE

October 26-27, 1999
George Bush Presidential Conference Center
College Station, Texas

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Second Session: Track I Track II Track III Second Session: Track I Track II Track III
Third Session: Track I Track II Track III Third Session: Forum

Additional Persons Registering:

2) ______________________________________________________ 4) ____________________________________________________
3) ______________________________________________________ 5) ____________________________________________________

(Please include another sheet of paper for additional names.)

Registration Fees:
Received by October 1, 1999 - $295.00 per person
Received after October 1, 1999, or at the door - $350.00 per person
Total $_________________________

Multiple Discount: $50.00 discount per person when registering five or more

Fee includes: Refreshments, lunch and handouts
CEUs available upon request.

Please send registration form and check (made payable to the Mary Kay O’Connor Process Safety Center) or fax registration if paying by credit card (MasterCard, Visa, American Express or Discover) to:

Mary Kay O’Connor Process Safety Center Symposium
Attention: Jacque Hand
2nd Floor Rudder Tower
Texas A&M University
College Station, TX  77842-1232
Phone: (409) 845-8904   Fax: (409) 845-2519

FOR MORE INFORMATION PLEASE CONTACT:
Donna Startz
Mary Kay O’Connor Process Safety Center
Texas A&M University
College Station, TX  77843-3122
Ph: (409)845-3489   Fax: (409)845-6446
E-mail: donnas@tamu.edu
URL: http://process-safety.tamu.edu

Accommodations:
Rooms have been blocked at the following motels:
College Station Hilton (800/445-8667), Hampton Inn (800/426-7866),
Fairfield Inn-Marriott (800/228-2800), Super 8 Motel (800/800-8000), Best
Western-Chimney Hill (800/267-7750) and Quality Suites (409/695-9500).
Please indicate that you are attending the Mary Kay O’Connor Process Safety Center Symposium - Beyond Regulatory Compliance, Making Safety Second Nature. Rooms will be released to the general public after October 10, 1999.
Mr. Jack Weaver and Mr. Bob Perry from the Center for Chemical Process Safety (CCPS) visited the Mary Kay O'Connor Process Safety Center on March 15, 1999. Dr. Ray Anthony, Mr. Jerry Bradshaw, Dr. Sam Mannan, Dr. Michael McGuire, Mr. Michael O’Connor, and Dr. Harry West represented the Center at the meeting. Intent of the meeting was to exchange information on each other’s programs and activities, identify and reconfirm channels of communication, identify possible overlaps, and determine effective methods of collaboration and coordination. The ultimate goal of both the organizations is the same, namely to improve safety in the chemical industry. There will always be a certain amount of overlap between the activities of the Center and the CCPS, however, there was general agreement at the meeting that the mission and activities of the two organizations are quite different. The Center is bringing about a paradigm shift by incorporating process safety into chemical engineering education and research. On the other hand, CCPS has and continues to implement the programs and activities needed to improve safety on a day-to-day basis, emphasizing the management of process safety. The Center and CCPS will continue to help each other accomplish their respective missions and collaborate to accomplish the common goal of improving safety in the chemical industry.

As a first step in the collaborative process the Center and CCPS will coordinate all activities. CCPS and the Center will also actively collaborate with each other’s Symposia and meetings. Another initial area of collaboration that is being explored is process safety training for small and mid-sized businesses. Other mutually beneficial areas of collaboration that will be explored in the future are large-scale testing and experiments.

**Program Assessment continued from page 3**

The purpose, goals, and expected outcomes of the Roundtable meeting is listed below.

**Purpose:**
Provide a forum for the stakeholders to discuss and agree on some national chemical safety goals.

**Goals:**
To identify and agree on some national chemical safety goals and evaluation approaches.

**Expected Outcome:**
1. Consensus on some national chemical safety goals.
2. Identification of where we want to be and by when in relation to national chemical safety goals.
3. List of activities that need to be implemented to accomplish step 2 above?
4. Agreement on some common metrics for measurement of progress towards national chemical safety goals?

The Roundtable meeting will start the process to set the tone and direction of chemical safety programs in the US as well as overseas. The case studies in this project could be based on a sample that is representative of the 66,000 reporting facilities under the risk management program rule and/or based on those industries, processes, and chemicals identified as hazard concerns in the ARIP database. Another approach may be to look at narrow industry groups; such as chlorine manufacturing, ammonia, phosgene, ethylene, where there are multiple manufacturing locations (including international locations) and compare their safety records.

The project is being conducted by a multidisciplinary team consisting of experts from plant operations, process safety and risk management practices, the development and application of metrics, and public policy issues.
Synopsis

The Year 2000 Problem is a significant problem in the chemical manufacturing and handling sector posing unique risks to business continuity and worker and public health and safety. According to the United States Environmental Protection Agency, 85 million Americans live, work and play within a 5-mile radius of 66,000 facilities handling regulated amounts of high hazard chemicals. The report describes the following findings:

- Large enterprises with sufficient awareness, leadership, planning, financial and human resources are unlikely to experience catastrophic failures and business continuity problems unless their current progress is interrupted or there are massive failures of utilities.
- The overall situation with small and mid-sized enterprises is indeterminate, but efforts on the Y2K problem appear to be less than appropriate based upon inputs from many experts.
- While the impact of the Risk Management Plans should be positive, there are no special emphases or even specific mention of Year 2000 technology hazards in either U.S. Environmental Protection Agency or Occupational Safety and Health Administration regulations regarding process safety.
- Federal agencies are aware of and involved in Year 2000 technology and chemical safety issues. However, significant gaps exist, and there do not appear to be specific plans to address these gaps.

Scope of Issues

The Expert Workshop as well as the research conducted for the report concluded that the Year 2000 (Y2K) problem is one of major proportions and has the potential for causing disruption of normal operations and maintenance at the nation’s chemical and petroleum facilities. It is important to point out that Y2K compliance activities reported to the CSB to date have not found a single failure (embedded microchips or software) which by itself could cause a catastrophic chemical accident. However, it is unclear what the outcome might be from multiple failures, e.g., multiple control system failures, multiple utility failures, or a combination of multiple utility and control system failures. Surveillance of the industrial sector that handles high hazard chemicals is insufficient to draw detailed conclusions regarding Y2K compliance efforts.

One theme upon which experts agree is that failures from Y2K non-compliance at small and mid-sized enterprises is more likely. The reason is a lack of awareness regarding process safety in general and the Y2K impact in particular, lack of resources, and technical know-how for fixing the problems. Given the time constraints, altering this situation requires a massive effort. The report concludes that this effort should focus on:

1. providing easy-to-use tools,
2. promoting accessible resources, and
3. providing attractive incentives for Y2K compliance efforts.

Additional efforts should be the focus of an urgent meeting of agencies convened by the administration.

The potential for catastrophic events, at US chemical process plants, stemming from Year 2000 non-compliance, can be divided into three categories: failures in software or embedded microchips within the process plants, external Y2K-related problems (e.g., power outages), and multiple Y2K-related incidents that may strain emergency response organizations.

Workshop and the research conducted for this study concluded that large multinational companies are, in general, following a well-thought out and well-managed path towards Y2K compliance. These multinational enterprises have, in addition to their Y2K compliance efforts, made contingency plans, including, in some cases, plans to shutdown batch operations for limited periods at the turn of the century.
These conclusions vis-à-vis large and multinational companies should not be construed to mean that there is no potential for Y2K-related catastrophic events at these facilities. It is possible that some Y2K-impacted components may not have been identified, compliance programs may not achieve 100% completion in time, or multiple failures that may not have been considered may result in accidents.

The major control and instrumentation vendors canvassed in this study are involved in an extensive program to provide Y2K compliance for their products. There is, however, reason to believe that some independent control systems integrators may have developed and implemented control systems for which there is little or no documentation of Y2K-related vulnerabilities. In addition, some vendors are no longer in business or not as cooperative as the major control and instrumentation vendors.

EPA’s Risk Management Program and OSHA’s Process Safety Management program mandated by the Clean Air Act Amendments of 1990 may provide significant benefit in terms of improving overall safety programs, reliability of chemical process plants, emergency response plans, and other programs. As a result, the overall capability and readiness of the chemical process industry to deal with and effectively overcome the Y2K threat is very high. However, it must be pointed out that none of these regulatory programs or activities have any direct relationship with Y2K compliance.

Instituting new regulations to standardize testing or certification is not a reasonable approach for three reasons. First, in the remaining time, it is not possible to develop the mechanism and logistics needed for rulemaking, standard development, and establishment of reporting procedures. Second, implementation of any standardized method or regulation may cause penalties and unnecessary complications for many companies that do not fit the selected standard but have already expended an extensive amount of effort on Y2K compliance. Third, it is critical to minimize overall administrative efforts in order to focus available resources on the remedial efforts within this limited time frame. This should not be construed to minimize the need for independent verification and validation of Year 2000 compliance programs and contingency planning.

### Priority Issues and Findings

Special Expert Workshop attendees reached consensus on the importance of four issue areas related to Y2K problems and chemical safety: 1. Small and medium-size enterprises (SMEs) risks and needs, 2. Risk management programs and their applicability, 3. Utility continuity, and 4. Responsive communication among the stakeholders. The following findings were developed based on input from the workshop attendees and research conducted during this study.

#### 1. Small and Mid-sized Enterprises (SMEs)

The Y2K Expert Workshop members were quite concerned about Y2K failures at SMEs, particularly since their risks to public health and safety can be quite significant. Multinational companies and other organizations may be willing to make available Y2K information and tools to SMEs. However, this willingness is tempered by concerns about legal liability to individual companies or trade associations that contribute the information. For example, if Y2K checklists or tools are made available through a website used by an SME, and yet that SME still has a Y2K problem for whatever reason, could the SME sue the information provider? SMEs also have lesser access to associations that have helped larger corporate entities become educated on safety issues. The experiences with some SMEs on other issues seems to indicate that in order to be useful, the information provided has to be very detailed and specific to the SMEs.

However, large businesses and even SMEs have restructured and thus may have fewer resources to devote towards time-limited technical problems. To compound the problem, trade associations have also undergone restructuring and as a result may not have the resources needed to serve their membership.

#### 2. Risk Management

There is a general consensus that facilities doing an effective job in managing their risks

(Y2K continued on page 14)
should not see any major health and safety problems. Risk management generally consists of a variety of programs and activities to assess and manage risks. To be fully effective these programs must be implemented with the complete involvement of the management, labor, and local responders. Risk management also includes the utilization of best practices (e.g., equipment, procedures, auditing, testing, and certification), adherence to industrial and professional society standards, and compliance with applicable regulations. The chemical processing industry has practiced these risk management principles for a long time. However, the Y2K issue will test the existing system of safety, and failure may engender review of policy issues as well as review of industrial programs and practices.

3. Utility Continuity

A major concern of the participants at the Y2K Expert Workshop was that the main threat to facilities could be from external failures, such as electrical, natural gas, water and wastewater utilities. Many members of the chemical process industry are concerned about the reliability of electric power supply and are seeking ways to assess the vulnerability of their specific utility.

For some managers of facilities that draw high power loads prudent safety practice may determine that the plant be shut down during critical time periods and restarted at a later date. However, such decisions should not be made without communicating these planned actions with their utilities in order to prevent problems on the power grid.

4. Responsive Communications among Stakeholders

Communication and trust between stakeholders is of tremendous importance in resolving Y2K-related problems. Stakeholders, in the context of chemical safety, include: corporate and facility managers, operators, other workers, vendors, equipment manufacturers, unions, trade associations, regulators, non-regulatory agencies, emergency responders, insurance companies, community organizations and environmental organizations. Stakeholder communication has various dimensions.

While logistic and timing problems may prevent a regulatory approach for assuring Y2K compliance, voluntarily communicating accurate and relevant information to the public on the status of Y2K compliance is essential. Given the extent of work being done for Y2K compliance, this communication will avoid creating chaos and panic, allay public fears and promote rational behavior. Contingency planning, risk management, and decisions concerning shutdown must also involve communication among stakeholders.

Equally as important is the communication between different companies, both large and small, and communications across sectors of the economy. The complex interdependency of modern society assures that all entities have a stake in the Y2K efforts of others. The sharing of information and building experience has a much greater chance of reducing or even completely eliminating the catastrophic threat of Y2K-related failures. Historically, safety-related issues have been addressed on a non-competitive basis, and the safety-related year 2000 issues should follow the same path.

Knowledge is key to responsive communication. Public agencies and the private sector already support training and education for chemical managers, workers and Hazardous Materials (HAZMAT) emergency responders through programs which tailor training modules to specific targeted groups of responders at the awareness, operations, technician and specialist levels. Y2K contingency planning and responsive communications should be enhanced through training and education efforts developed to address the challenges of Y2K-related incidents and scenarios.

(Y2K continued on page 15)
concerned, dispersion modeling is not an issue. However, in the long run, we should try to improve prediction capabilities for dispersion modeling. The Center can also advance the understanding and good science in this field by developing experimental programs for large-scale experiments. For example, development of large-scale experiments for dispersion data and aerosols, fire modeling, and combustion experiments.

Summary
In summary, the Year 2000 technology problem is a significant problem in the chemical manufacturing and handling sector posing unique risks to business continuity and worker and public health and safety. Large enterprises with sufficient awareness, leadership, planning, financial and human resources are unlikely to experience catastrophic failures and business continuity problems unless their current progress is interrupted or there are massive failures of utilities. The overall situation with small and mid-sized enterprises is indeterminate, but efforts on the Y2K problem appears to be less than appropriate based upon inputs from many experts. Federal agencies are aware of and involved in Year 2000 technology and chemical safety issues. However, significant gaps exist, and there do not appear to be specific plans to address these gaps.

Executive Annual Forum Symposium

Research Subcommittees and Active Members

1. Chemical Safety Program Assessment (1) – Sam Mannan, Eboni McCray, Mike O'Connor, Harry West – (Project Underway, Subcommittee sunset)
2. Reactive Chemicals, Runaway Reactions and Relief Systems (4,11,12,15) Ron Darby, Walter Howard, Marc Levin, Sanjeev Mohindra, William Rogers
3. Accident: Tools, Investigation, Lessons Learned, History Database Analysis (2,17) Mike O’Connor, Mike Sawyer
4. Control Systems and Abnormal Situation Management (3) Bill Bosler, Ian Nimmo, Harry West
5. Risk: Perception, Tolerance, Cost-Benefit, Communication (5,13) Dave Willette, John Woodward
7. Reliability Data (7) Doug Sharp, Dave Willette, John Woodward
8. Expert Systems and Information Management (8) Bill Bosler
9. Inherently Safer Design (9) Skip Early, Sanjeev Mohindra, John Susil
10. Best Practices: Cataloging and Dissemination (10) Vic Edwards, Mike Sawyer, Dave Willette, John Wykowski
11. Design for Maintainability: Maintenance Hazard Analysis (14) Doug Sharp, Dave Willette
12. Electrostatic Hazards (16) Robert L. Smith, Harry West
13. Human Behavior and Safety (19) Dave Willette
14. Toxicity, Hormesis, Acute Exposure Effects, Probit equations (18, 21) C.D. Holland
15. Operator Training, Simulators and other Methods (20) Jim Rountree
1999 CALENDAR

June 2-3
Chemical Safety Program Assessment Project Stakeholder Meeting
George Bush Presidential Conference Center
College Station, TX

October 26-27
Mary Kay O'Connor Process Safety Center 1999 Symposium
George Bush Presidential Conference Center
College Station, TX

INFORMATION
Mary Kay O'Connor Process Safety Center
The Texas A&M University System
College Station, Texas 77843-3122
Phone (409) 845-3489  Fax (409) 845-6446
E-mail donnas@tamu.edu
URL:  http://process-safety.tamu.edu

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