



Delta Section

# NEWSLETTER

Volume 33 No. 9

May 2017

## May General Meeting

**Tuesday**  
**May 9, 2017**

**11:30 am - 1:00 pm**

**Energy Policy:  
Is It Effective?  
Is It Fair?**

**Frank Blaskovich**  
Vice-President  
Blaskovich Services, Inc.

### REGISTER ONLINE:

<http://connect.spe.org/delta/home>

Three meetings are listed: Southshore, Northshore, Computer Access. Register for the site you will attend.

### LOCATIONS:

**South Shore:** Superdome Holiday Inn  
330 Loyola Ave  
New Orleans, LA 70112

**North Shore:** Chevron  
Room B2304  
100 Northpark Blvd  
Covington, LA 70433

**Computer:** Computer Access Only  
Attend from your home  
or office

Southshore - \$25

Northshore - \$15

Computer Only - \$5

**Please remember:** All attendants must be pre-registered to attend the North Shore meeting in the Chevron office.

For questions or comments,  
please contact:

**Howard Duhon**

[hduhon@gateinc.com](mailto:hduhon@gateinc.com)

Programs Chairperson 2016-17

## MAY 2017 DELTA MEETING

May 9, 2017 • 11:30 am to 1:00 pm

### Energy Policy: Is It Effective? Is It Fair?

**Frank Blaskovich**

Vice-President • Blaskovich Services, Inc.

#### ABSTRACT:

Developing sound energy policies is difficult under the best circumstances. There is a delicate balance between government's need for revenue, modern society's need for energy and the producer's need for profitability to exploit resources. Many factors can affect the results for all interested parties. Good policies require an appreciation for the interactions among oilfield development and operations, costs and prices, government taxes and regulations and many other factors that are often difficult to define accurately.

We live in a complex world that acts like a system with many interconnected components. Humans are ill equipped to understand its behavior. We instinctively focus on short term, local issues and simple cause and effect rather than the bigger picture. This reduces the likelihood that we can design effective policies that will work well over the long term for all stakeholders.

There are no easy solutions in complex systems. We developed an approach using system models and regret analysis to find flexible and resilient tax policies, in spite of uncertainties, that would provide all parties with fair, profitable solutions – even though none might achieve their maximum goals. It can also measure the relative benefits of existing energy policies and, potentially, help to improve them.

These challenges will only become harder in the future and more important for the energy industry. Now is the time to pursue new ways of thinking to solve these problems.

#### BIOGRAPHY:

**Frank Blaskovich** is Vice-President of Blaskovich Services, Inc. in Northern California. He received his B.S. in aerospace engineering from the University of Notre Dame. He has more than 40 years of experience in reservoir engineering and simulation, software development, environmental modeling, and policy analysis. He has worked on energy issues around the world for the largest multi-national energy companies, government agencies and major consulting firms. He has published numerous papers on reservoir simulation and energy policy analysis available in the SPE literature and elsewhere. His work and research activities over the last decade have focused on developing improved energy policies that can benefit all stakeholders fairly.

## GREAT NEWS FOR FUTURE ENGINEERS!

The LA Board of Elementary & Secondary Education (BESE) is changing the grade level expectations (GLE) to include engineering. Until present, engineering was not included within GLE requirements.

### ASCE – Oil & Gas Session at Annual Conference

American Society of Civil Engineers (ASCE) will be holding their annual conference in New Orleans this year on October 8-11. They are planning a session of tracks related to the history of oil and gas in the New Orleans and Gulf of Mexico area. This will be a new topic for the society. As plans progress, there should be opportunity for societies and individual volunteers to help out.



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# SPE: ON THE HORIZON

### Upcoming Events:

- May 11** ..... SPE Delta Section Annual Awards and Recognition Ceremony and Banquet  
 Sheraton Galleria, Metairie, LA • 6:00 pm to 9:00 pm  
 For more information: Angie D. Gobert, 504-736-2876 or [angie.gobert@bsee.gov](mailto:angie.gobert@bsee.gov)
- May 17** ..... Baby Cakes STEM Day • Shrine on Airline, Zephyr Field, Metairie, LA  
 Exhibit Hours: 9 am to 2:30 pm • Baby Cake Game hours: First pitch: 11 am to 3 pm
- May 25** ..... Engineering Ethics Seminar by Louisiana Professional Engineering and Land Survey Board  
 11:30 am to 12:30 pm • Chevron, 100 Northpark Blvd., Covington, LA  
 For more information: Dan Alonso at [DAlonso@chevron.com](mailto:DAlonso@chevron.com)
- Aug 14-18** ..... Professional Registration Review Course for Petroleum Engineering - New Orleans Course  
 8:00 am - 5:00 pm, Monday - Friday • For more information: 405-822-6761 or [bingwines@cox.net](mailto:bingwines@cox.net)
- Aug 21-23** ..... 21st Annual Deepwater Technical Symposium • New Orleans Downtown Marriot  
 For more information: [www.deepwaternola.org](http://www.deepwaternola.org)

### SPE's NEWSLETTER HAS GONE DIGITAL!

Check our website <http://connect.spe.org/delta/home> or your email for the latest edition.



## from *THE CHAIR...*



Welcome to May!

This will be last newsletter for the 2016-2017 active session for the Delta Section Chapter and will be returning in September 2017. As we close out this year, we will recognize the efforts and contributions of various members at the Annual Awards Banquet to be held on Thursday, May 11th at the Sheraton Metairie New Orleans Hotel. College scholarship recipients will be congratulated and introduced to the audience. Last year's banquet had a great turnout and we are looking forward to seeing you there. Please join us and celebrate your colleagues' accomplishments.

This month we will also support the STEM day at the Baby Cakes event hosted by Core Element on Wednesday, May 17th. This event will provide fun and interactive "hands-on" STEM activities for children in grades 3 to 8. These activities cover chemistry, space, physics, genetics, computer science, electricity, engineering and environmental science. Last year the event had over 9,000 in attendance with over 40 exhibitors. Please review this newsletter for more details about this event.

The 21st Annual Deepwater Technical Symposium is scheduled for August 21-23rd so be sure to save the date. This event is a joint effort between the three local professional societies: American Association of Drilling Engineers (AADE), New Orleans Geological Society (NOGS), and the Society of Petroleum Engineers Delta Section (SPE). The goal of the symposium is to share knowledge,

best practices, new technology, and process improvements. This event will be held at the New Orleans Downtown Marriot at the Convention Center.

The Family Fun Eat & Run held on April 9th was a success. This PIPE (Petroleum Industry Promoting Education) event benefits the three area Children's Museums. It was held at City Park in New Orleans and included a 5K Run/Walk and a Kids Dash Run/Walk. The weather was perfect and both adults and children enjoyed the exercise opportunity and most definitely the great food. Thanks to all who participated and volunteered in this event.

On April 19th the Delta Section sponsored an evening social hour at the SPE HSSE-DR Conference. The intent was to provide an event for all members and to also focus on our HSSE members. There was a larger-than-expected turnout of over 100 professionals and students. This social event provided great networking opportunities and was well received. Thanks to all who attended.

A reminder to all to keep your membership current and to encourage your colleagues who are not currently members to renew or join. It is your involvement and dues that enable the Delta Section to continue to deliver support to the local community and the industry.

Safe Travels,  
**Daniel A. Durey**  
*Your 2016-2017 SPE Delta Section Chair*

# SPE-Delta Membership Report

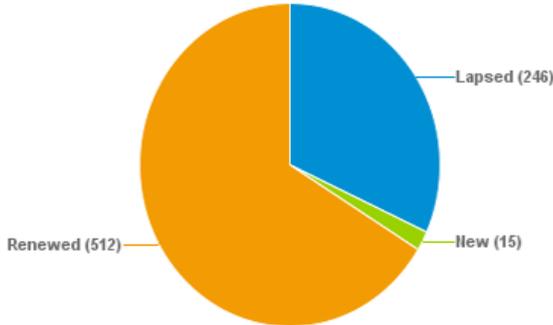
Submitted by Angie Gobert (Membership Chairperson)

As of May 2017

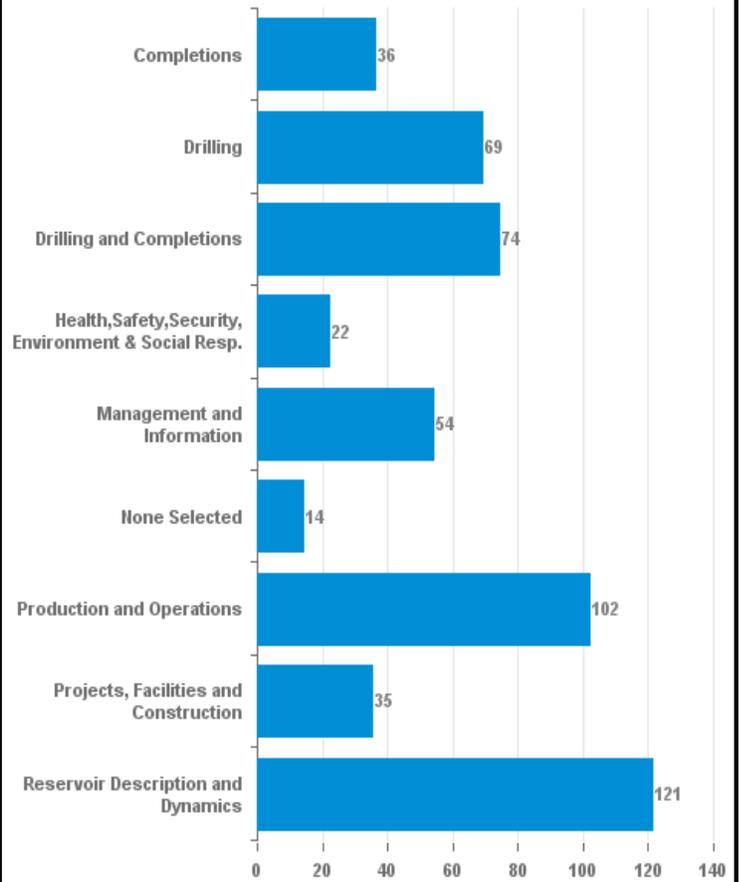


Total Full Members	773
New Members	15
Unpaid Members	246
Total Student Members	684

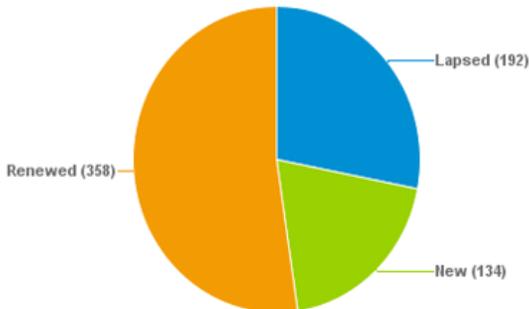
Professional Membership



Current Professional Members by Technical Discipline



Student Membership



## 60% Pass 2016 Petroleum PE Exam

NCEES and the State Engineering Boards released their 2016 Professional Engineering Exam results. Nationwide, the Petroleum Engineering Exam recorded a 60% pass rate. The Petroleum first time takers passed at a 66% rate. The pass rates for a few other engineering disciplines were:

Chemical	64%	Agricultural	71%
Civil	62%	Fire Protection	55%
Electrical	58%	Industrial	67%
Environmental	54%	Metallurgical	65%
Mechanical	69%	Mining	58%
Nuclear	71%	Control Systems	73%

The Petroleum pass rates in 2016 for a few states:

Alaska (4/5)	80%	Louisiana (9/15)	60%
California (0/3)	0%	Oklahoma (14/17)	82%
Colorado (4/5)	80%	Texas (92/158)	58%

What are the requirements to take the Petroleum PE Exam? Today, Louisiana requires that you have:

1. An engineering, math or science degree.
2. Passed the Fundamentals, or FE Exam.
3. At least four years of professional experience.

Interested? Contact the Louisiana State Engineering Board at (225) 925-6291 for application forms. State web sites are also available at: [www.ncees.org/licensure/licensing\\_boards](http://www.ncees.org/licensure/licensing_boards). The Louisiana application deadline to take this years PE Exam is June 1, 2017. This year's test will be given on Friday, October 27, 2017

## PROFESSIONAL REGISTRATION REVIEW COURSE FOR PETROLEUM ENGINEERING

### COURSE DESCRIPTION:

The course covers most topics that are found on the State Board Petroleum Engineering Professional Examination

### WHO SHOULD ATTEND:

Engineers who are planning on taking the PE Examination in Petroleum Engineering this fall.

## NEW ORLEANS COURSE

8:00 AM - 5:00 PM • Monday through Friday

**August 14 – 18, 2017**

For More Information: 405-822-6761 • E Mail: [bingwines@cox.net](mailto:bingwines@cox.net)  
Web Site: [www.winrockengineering.com](http://www.winrockengineering.com)

WINROCK ENGINEERING, INC. • P. O. BOX 42296 • OKLAHOMA CITY, OK 73123

# **SPE Delta Section 2017 Annual Awards and Recognition Ceremony and Banquet**

**Thursday, May 11, 2017 • 6:00 p.m. to 9:00 p.m.**

**Sheraton Galleria • 4 Galleria Boulevard • Metairie, Louisiana 70001**



**Keynote Speaker:**

**JOSEPH H. FRANTZ, JR.**

**Vice President of Engineering Technology  
Range Resources Corporation**

**Presentation:**

**Industry Supply/Demand Trends  
and How SPE has Adapted**

## **Abstract:**

The global shale revolution began in the United States and quickly increased gas, oil, and NGL production to unprecedented levels. Although technical advancements are largely responsible for unlocking the potential of shale gas, the industry's coordination with a broad set of stakeholders have influenced implementation of new shale developments. This presentation focuses on key technological advancements that drove shale gas development, but also the important aspect of how our industry is working with governments, regulators, academia, and the public more collaboratively to best maximize the immense benefits from this opportunity, while fostering the use of best practices. The last few years have been a painful reminder however of how quickly markets can become saturated, prices decrease, and industry responding by reducing activity. This presentation will also review the overall supply/demand trends, as well as discuss how SPE has adapted to the recent challenges.

## **Biography:**

**Joseph H. Frantz, Jr.** is the VP of Engineering Technology with Range Resources Corporation. He started working on shale reservoirs in 1984 and has been involved with studies on many shale fields across the U.S. Joseph has worked in every facet of upstream development. He has authored or co-authored more than 40 publications and taught an industry school on Developing Shale Reservoirs. He has served on numerous Technical Committees within SPE, Chaired the Pittsburgh PA SPE Section, Co-Chaired a Regional SPE Meeting, completed a tour as a SPE Distinguished Lecturer, and recently became the SPE Regional Director of Eastern North America. He is also Chair of the Drilling, Completion, Facilities and Production Committee within the Marcellus Shale Coalition. He earned a BSc in Petroleum and Natural Gas Engineering from Pennsylvania State University in 1981.

## CULTURE MATTERS

# Bhopal: A Root Cause Analysis of the Deadliest Industrial Accident in History

Howard Duhon, GATE

In the 11th century, Raja Bhoj of Dhar founded a city on the shores of a beautiful lake in central India. Today, that city, Bhopal, is a bustling metropolis of 2 million people. The city and surrounding area is home to a large wildlife refuge, a museum of Indian tribal life, a collection of historical palaces and temples, and Stone Age cave paintings.

Almost anywhere else in the world, this city would be a major tourist attraction, but Bhopal is well-known for something else: It is the site of the deadliest industrial accident in history.

## The Accident

In the early morning hours of 3 December, 1984, a large amount of toxic methyl isocyanate (MIC) gas was released from a Union Carbide India Limited (UCIL) pesticide plant, which swept over a large, densely populated area south of the plant. The cloud also wafted over a railway station 2 km away, where many people waiting for and arriving on trains died.

About 500,000 people downwind were exposed to the gas cloud. Thousands of people died in the immediate aftermath, although the precise number is unknown. A commonly accepted number is 2,000



Tank E-610 is seen partially obstructed by overgrowth today. A reaction occurred in the tank that resulted in the release of a toxic cloud of methyl isocyanate from a Union Carbide pesticide plant in Bhopal, India, in 1984.

(D'Silva 2006), but it may be as high as 8,000 (Amnesty International 2004). Tens of thousands were severely injured, thousands of whom died prematurely from their injuries in the months and years following the release.

## A Personal Connection

I was an employee of Union Carbide Corp. (UCC), the US parent company of UCIL at the time of the accident. Like other UCC employees, I know

exactly where I was when I first heard the news.

While traveling in India recently, I traveled to Bhopal to see the site of the accident.

The plant has been idle for 30 years, rusting away, and overgrown with trees and shrubs. Many have clamored for years to have the plant demolished and the site cleaned up. Others have petitioned that it be maintained as a United Nations Educational, Scientific, and Cultural Organization World Heritage site.

Today, the accident is still alive in the neighborhood around the plant. Billboards and graffiti demand restitution. Hospitals and rehabilitation centers continue to treat the injured. Thousands still seek medical attention for problems, especially lung damage, and also immune system impairment,



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neurological damage, cancers, gynecological disorders, and mental health issues (Amnesty International).

The accident caused social and economic problems. For example, an already poor area was made much poorer, many families lost their sole breadwinners, and others lost their employment. Young women exposed to the gas cloud carry a social stigma and have had difficulty finding husbands.

I am frequently struck by how little people know about this accident. As the 30th anniversary of the event approaches, I think that it is important to remember those killed and injured in the accident, and to further resolve to learn from this accident, so that nothing like it will ever happen again.

## Seeking the Truth

We will never know the whole truth about Bhopal. It is difficult to investigate a catastrophe of this magnitude, and it was particularly difficult to investigate Bhopal because of interference from vested interests.

A great deal has been written about the incident and the plight of the affected people and communities, but much of it was speculation, or was written to achieve the specific objectives of various involved parties.

I have sorted through competing narratives and claims to present the following, which is based on my experiences and research.

## The Political, Legal, Economic and Social Environment

Trevor Kletz, a renowned safety expert, argued that there is no such thing as a root cause, but only a point at which we stop asking questions.

In this case, I think that it is appropriate to begin the inquiry during the days of the British Raj, the colonial occupation of India, because the residue of colonialism affected the psyche of the people and the political

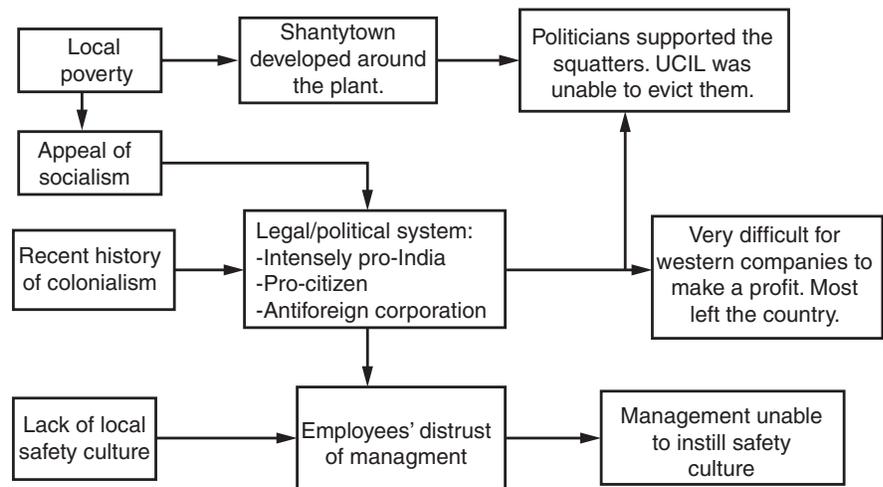


Fig. 1—The social, legal, and political culture at the time of the Bhopal accident.

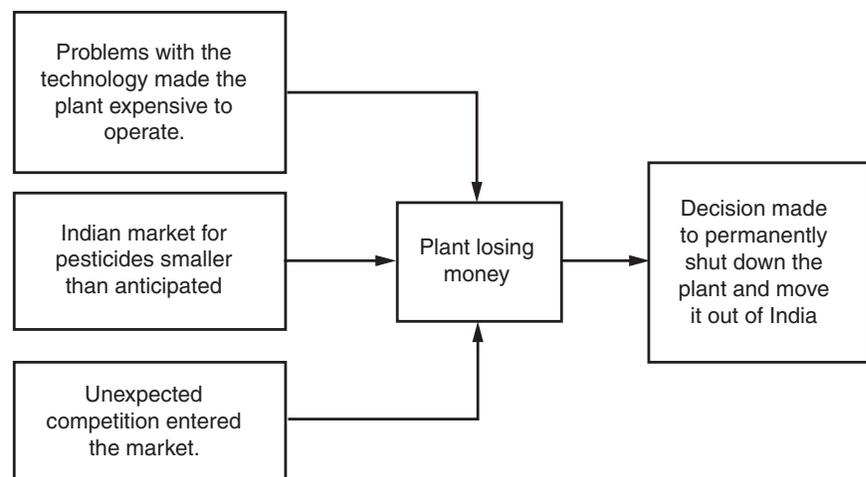


Fig. 2—The economic situation at the time of the Bhopal accident.

and legal systems of the country in ways that contributed to the tragedy.

Fig. 1 illustrates the cultural environment at the time of the accident. On the left, four drivers of the culture are

- The recent history of colonialism (the domination of India by a foreign power)
- The general poverty of the country and abject poverty of many people living near the plant
- The appeal of socialism in India at the time in history
- The lack of a safety culture

Fig. 1 also shows the effects of the drivers, which include

- The development of a legal system that was unashamedly pro-India, pro-citizen, and antiforeign corporation. This made it difficult for western companies to make a profit, and even more difficult to expatriate any profits that they managed to make. Most western companies, including IBM and Coca-Cola, left the country.
- A shantytown developed quickly in the undeveloped land around the plant, which was supposed to

## CULTURE MATTERS

be a buffer area. Local politicians supported the squatters and rebuffed UCIL's attempts to evict them from the property.

- Employees' mistrust of management made it difficult to instill a safety culture that was appropriate to the inherent risks associated with the plant. It was impossible to even investigate incidences and near misses because they were covered up by the workers.

The plant was not making money for a couple of reasons. Sales were much lower than predicted because of economic hardships in India and unexpected competition. Manufacturing costs were high due to problems with the technology. It cost four times as much to make the pesticide in Bhopal as it did to make it in the United States (Fig. 2).

UCIL had decided to permanently shut down the plant and ship it out of India. The plant was in its last production run at the time of the accident, working off the last batch of MIC.

It was against this legal, political, economic, and social backdrop that the final events and decisions leading to the tragedy unfolded.

### Description of the Plant

Fig. 3 illustrates the pesticide production facilities at which the MIC was produced on site in the production plant and consumed on site as a raw material in the pesticide plant (MIC consumer).

The plant design (partially batch) required MIC storage, which was to be kept at minimum volumes. A caustic scrubber was provided to neutralize the MIC vented from the storage tanks, and a flare was used to burn the vented MIC. A refrigeration system was provided to keep the stored MIC cold to decrease the rate

of MIC's reaction with water and other contaminants.

### Initiating Event: Operator Error or Sabotage?

Accidents begin with one triggering (initiating) event. The initiating event for Bhopal was the introduction of a large amount of water into the tank (about 200 gal). MIC is a stable compound, but is very reactive with water, generating an exothermic (gives off heat) reaction. As the reaction progressed, the tank's temperature and pressure increased, slowly at first, then at an accelerating rate until the venting began.

There is controversy over how the water got there. One story is that operators in another part of the plant were water-washing the vent header and did not properly isolate the header, allowing water to reach the MIC tank. However, this story does not pass technical muster. Simple pressure drop calculations show the scenario to be impossible (Kalelkar 1988). But this scenario sounds plausible, and is still argued by some who have vested legal and political interests in its acceptance.

It is likely that the true cause was sabotage. A disgruntled worker intentionally injected water into the tank, presumably to ruin the batch of MIC (D'Silva 2006; Kalelkar 1988).

### Bypassed or Broken Safeguards

Significant safeguards were designed into the plant to prevent an MIC release, or at least to minimize its impact. Although the safeguards were probably adequate for handling typical initiating events, they may not have been adequate to handle the quantity of water injected into the tank on that day. We will never know, because all of the other safeguards were bypassed, out-of-service that night, or otherwise rendered ineffective.

### No Means of Adding Water to the Tank

It is common in industrial facilities to install valves and drains in piping systems to make it easy to vent and drain the systems and inject water, steam, nitrogen, or air for purging or cleaning the systems. The designers of the Bhopal facility were aware that accidental injection of water could be catastrophic. Hence, the installed system had no drains or vents. Investigation (Kalelkar) suggested that the injection of water could not have been a simple human error. It appears that the saboteur removed a pressure gauge and installed a hose connection in its place.

### Minimizing the Stored Volume of MIC

The simplest of the safeguards was a safety directive to minimize the quantity of stored MIC. As indicated in Fig. 3, there were three storage tanks. According to the procedure, two tanks should have been empty and the third should have been at less than 50% level.

The actual level in Tank E-610 was about 70% (and Tank E-611 also contained MIC). Had there been less MIC in the tank, operators may have had the options to add diluent to slow the reaction.

### Refrigeration System Out of Service

The rate of an exothermic reaction is decreased by decreasing the temperature. A refrigeration system was provided to keep the MIC at about 30°F. Had the tank been operated at that temperature, the reaction rate would have been much lower and the event may have been far less catastrophic.

Ironically, the refrigeration system was turned off months before the accident as a safety measure. The seals of the pump circulating the MIC through the refrigeration unit were prone to leaks. After one catastrophic

seal failure, the refrigeration system was shut down permanently.

### Caustic Scrubber

The vented MIC escaped through the vent gas scrubber (caustic scrubber). In the scrubber, it should have contacted caustic (sodium hydroxide), which would have neutralized at least some of the MIC.

There are conflicting reports on the operation of the scrubber. Some report that the scrubber was out of service for maintenance, while others report that it was operating, but that the flowmeter was not working. Hence, we have no direct evidence that caustic was pumped to the scrubber.

Even if the scrubber was in service, it probably had little effect. Scrubbers function by causing intimate contact between the liquid and gas streams. The gas flow rate on the night of the accident was probably from four to five times the scrubber design rate. At that flow rate, the vapor/liquid contact would have been poor.

### Flare Out of Service

As in most processing facilities, the ultimate line of defense against vented gases is the flare, which is designed to burn the vented gases going through it. On the night of the accident, the flare was out of service. A section of pipe in the flare header was corroded and the flare had been taken out of service.

### Shantytown in the Plant Buffer Area

India is a crowded country with inadequate public transportation. The UCIL plant was a major employer, so it was natural that people would want to live near the plant. The poorest of the poor set up a shantytown along the plant perimeter, many literally using the plant's concrete fence as one wall of their house. UCIL had tried multiple times to have the shantytown removed, but was unsuccessful

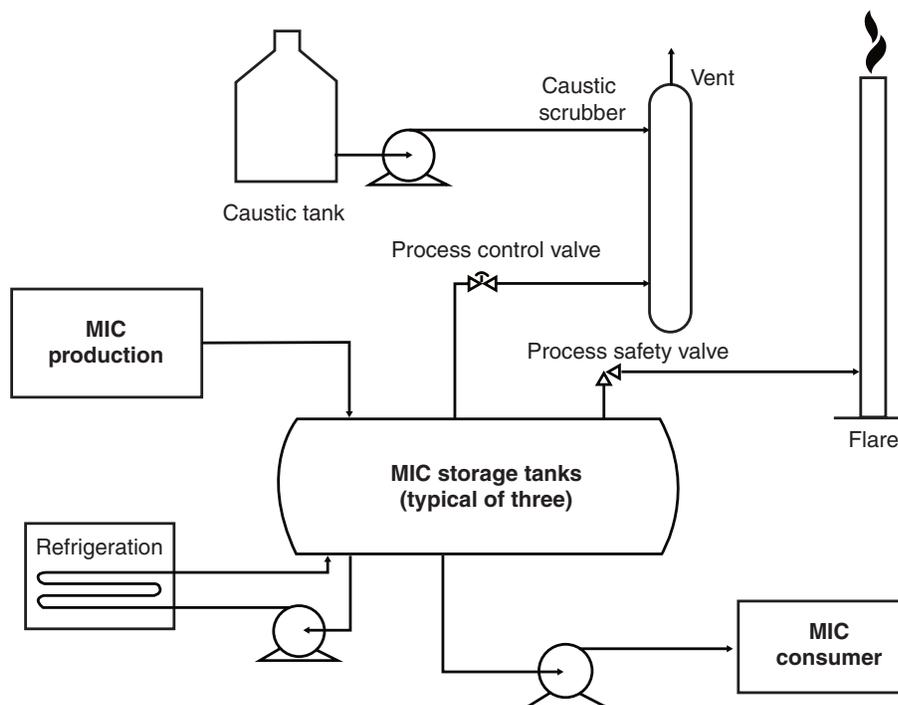


Fig. 3—A schematic of the methyl isocyanate (MIC) process plant.

because the shantytown residents were voters, and the local politicians supported them.

### Ineffective Emergency Response

No on-duty UCIL employees were killed in the event because as the plant operators became aware of what was happening, including the direction from which the wind blew, they chose an appropriate evacuation route.

An effective emergency response would undoubtedly have saved many people in the community. UCIL issued no alarm to the community and provided no information to civil authorities until about 2 hours after the initial release of the gas.

### Ineffective Treatment of the Injured

A final safeguard would have been effective treatment of the injured. In the immediate aftermath, the doctors did not know the cause of the incident and were unable to

determine the appropriate treatment of the injured.

Local groups argue that still today, thousands are suffering from the exposure and that the funding allotted for their treatment is inadequate.

### Internal Communication Failures

It was a remarkable series of defeated safeguards and it seems incredible that a plant would be operated in this manner. As I read the various accident reports, I sensed that the decisions were made by different people at different times. It was possible that no single person knew that all of the safeguards were out of service. It is a fundamental weakness of defense in depth when an individual can bypass a single safeguard, convinced that other available safeguards will provide adequate protection.

### The Perfect Storm

In all or most major accidents, we see a similar pattern of multiple things going wrong. The list of things that went wrong at Bhopal is striking, including:

## CULTURE MATTERS

- The plant was losing money, which resulted in staff and maintenance budget cutbacks.
- A social system that dismissed safety culture and created extreme tension between management and workers to the extent that one disgruntled worker was willing to intentionally ruin a batch of MIC.
- The plant was to close permanently, which, no doubt, significantly affected operator morale and contributed to the lack of maintenance and the bypassing of safety systems.
- Adverse meteorological conditions contributed to the harm done. Stable conditions with low wind speed kept the gas cloud intact for an extended period of time and moved it slowly over a large section of the city.

- The complete failure or lack of an emergency response program.
- Ineffective treatment of the injured.

It is unlikely that there will ever be another industrial accident as deadly as Bhopal, which was a “perfect storm” event.

### What We Learned

Bhopal has had a significant effect on safety culture across multiple industries in the world. The legacy of Bhopal includes many things today that we take for granted, such as hazard and operability analysis, management of change, permit to work, and dispersion modeling.

Plants around the world immediately moved to limit the storage and shipping of toxic materials. It is unlikely that anyone will ever again store 15,000 gal of a substance as toxic as MIC.

### What We Have Not Learned

There were significant problems with the Bhopal plant design. Since then, we have learned to design safer plants. But the plant design played only a small role in the accident, which was caused largely by the failure to operate the plant as the designers intended (e.g., the bypassing of safeguard systems in particular and the violations in adhering to standard operating procedures [SOPs] in general).

UCC recognized the failure to follow SOPs as a root cause and launched a corporatwide program to update SOPs and instill a culture of using them effectively. In the years since, the airline industry has learned to make the following of SOPs a priority, resulting in improvements in the safety of air travel—a lesson that the oil and gas industry has yet to learn. **OGF**

### For Further Reading

D’Silva, T. 2006. *The Black Box of Bhopal: A Closer Look at the World’s Deadliest Industrial Accident*. Trafford Publishing. (The author worked in the UCC agricultural products division at the time of the accident and participated in the accident investigation. He wrote this book after he retired. I consider it to be the definitive book on the accident. The majority of the information in this article can be found in D’Silva’s book.)

Jung, B. and Bloch, K. 2012. The Bhopal Disaster. *Hydrocarbon Processing* June.

Kalelkar, A. 1988. Investigation of Large-Magnitude Incidents: Bhopal as a Case Study. Oral presentation given at the Institution of Chemical Engineers Conference on Preventing Major Chemical Accidents, London, England, May 1988. <http://www.bhopal.com/~media/Files/Bhopal/casestdy.pdf> (downloaded 25 April 2014). (The speaker discussed why it was difficult to investigate major accidents and why it was especially difficult to investigate Bhopal. He provided the best arguments that I have seen for why the cause was most likely a sabotage.)

Mukherjee, S. 2010. *Surviving Bhopal: Dancing Bodies, Written Texts, and Oral Testimonials of Women in the Wake of an Industrial Disaster*. Palgrave Macmillan. (Results from an oral history project.)

Sinha, I. 2008. *Animal’s People*. Simon and Schuster. (A novel about people injured in the Bhopal accident and a group of activists.)

Union Carbide Corp. 1985. Bhopal Methyl Isocyanate Incident: Investigation Team Report. <http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockkey=2000W9PM.txt> (Attachment One).

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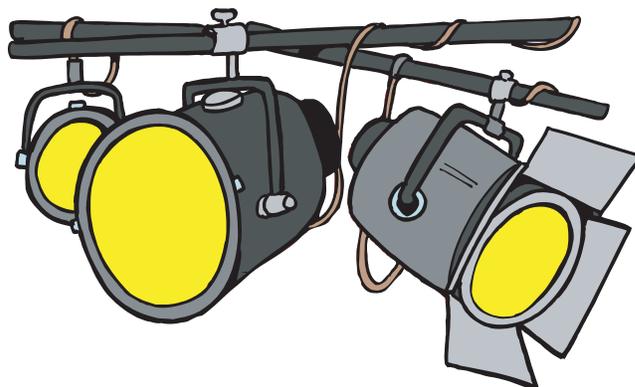


Society of Petroleum Engineers

Credit: This column appeared in *Oil and Gas Facilities* magazine in June 2014. <https://www.spe.org/en/ogf/ogf-article-detail/?art=141>



**Delta Section**



## Spotlight on Young Professionals

Do you know a young professional who deserves to be put in the Spotlight? If so, suggest them (or yourself) to be featured in the "Spotlight on Young Professionals." Help us identify worthy young professionals by submitting your story today for a chance to be featured in The Way Ahead™.

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SPE offers a dues waiver for renewing members who have lost their jobs due to the industry downturn and other circumstances. To qualify, submit a written request by either postal mail or email to [service@spe.org](mailto:service@spe.org)

## Out of Work?

Check out the Members in Transition Toolkit at <http://www.spe.org/members/transition/>. Learn how to optimize your job search, develop your network, enhance your skills, and thrive in a downturn.

**SAVE THE DATES:***Live and Online!***SPE Professional Engineering Ethics Class  
May 25, 2017**

SPE Delta is Sponsoring an Engineering Ethics seminar May 25th. The 1 hour class will be presented by the Louisiana Professional Engineering and Land Survey Board (LAPELS) at the Chevron Covington office (100 Northpark Blvd) on May 25th from 11:30am to 12:30 PM.

We will also be providing live online viewing of the event that SPE members can access remotely from their computers.

There is no fee or price of admission. This course, whether attended in person or remotely, will count as Ethics credit for all registered Professional Engineers.

An email will be sent to all SPE members with the information required to access the event remotely.

Contact Dan Alonso (DAlonso@chevron.com) with any questions.



Delta Section

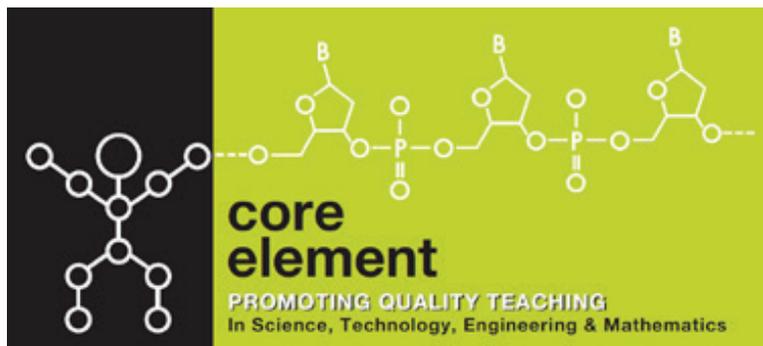


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### *It is that time again!!*

Core Element will host the Third Annual “Hands-On STEM” Interactive Education Day at the Shrine on Airline with the Baby Cakes! STEM day is an opportunity to raise awareness and engage students, teachers and parents in hands-on fun activities in STEM: Science, Technology, Engineering and Math. Core Element is reaching out to our STEM partners and industry professionals. It is also an opportunity for you to highlight and promote your organization’s commitment to STEM and the community.

Last year we had over 9,000 in attendance with over 40 exhibitors. Your participation made the 2016 event a phenomenal success. School registration for 2017 has already and many new exhibitors have asked to be added to the event. We have pushed the date into May to ensure that student testing is complete and there are NO CONFLICTS for the students and teachers. Expected 2017 attendance: 10,000 to 12,000 students, grades 3 to 8; and 1,000 teachers and parents.

### *Here is the pertinent information!*

Mark your calendar:

**Wednesday, May 17, 2017**

Exhibitors Set up: 7:30 am to 8:45 am

Exhibit Hours: 9 am to 2:30 pm: (Arrivals start promptly at 9 am)

The attendees will visit your booths before and throughout the game.

Baby Cakes game hours: First pitch: 11 am to 3 pm

### *Next Steps:*

- **DUE FRIDAY, APRIL 21st:** Identify and prepare a description of the hands-on activity you will host at the Core Element –Baby Cakes STEM Day on May 17. Also consider creating/providing a handout or suggested lesson related to your activity that teachers can use in the classroom. Distributing promotional items is permitted. Complete and return the attached STEM Day information sheet which includes logistical needs, and contact information. (See page 7 of this issue.)
- **Please return to Jan Brenan at [jan.brenan@core4kids.org](mailto:jan.brenan@core4kids.org) no later than FRIDAY, APRIL 21.**
- Attend the follow up meeting to be held in advance of the event: date to be determined

### *Event Purpose:*

- Provide “hands-on” learning and demonstrations for students of all ages to interact with STEM professionals in a fun, interactive environment.
- Serve as a catalyst to increase community awareness of STEM education, STEM employment opportunities and increased economic development opportunities for Southeast Louisiana.
- Work collaboratively with industry, small business, K-12 professionals, higher education, community colleges, non-profits, and media to promote economic development opportunities for Southeast Louisiana.
- Elevate community interest in STEM and create pathways that lead our youth to elevated interest in STEM subjects and rewarding STEM careers.