



Delta Section

# NEWSLETTER

Volume 34 No. 3

November 2017

## 20th Annual Joint Energy Industry Association Luncheon Wednesday • November 8, 2017

Registration begins 11:00 am • Program begins 11:30 am • Marriott Convention Center

**\$45 members | \$50 Non-members | \$10 Discounted Valet Parking**

Advanced registration recommended, <http://connect.spe.org/delta/home>

### *"A Case for the Growth of Louisiana's Oil and Gas Industry"*

#### KEYNOTE SPEAKERS:

**Sharon Hewitt**

**Louisiana State Senator, District 1**



**Senator Sharon Hewitt** serves as vice-chair of the Senate Transportation Committee and is a member of the Senate Environmental Committee, the Joint Budget Committee, and the Senate Finance Committee, which oversees the state budgeting process. In addition, the senator represents the state of Louisiana on two important national energy panels and serves on several statewide coastal restoration committees and councils focused on women and children's issues. Since beginning her first term in 2017, the

senator has focused on fiscal reforms through legislation to shrink the size of government and limit spending, measuring results, and streamlining higher education, while creating jobs with legislation to invest in workforce development in STEM and critical infrastructure.

**Dr. Gregory Upton, Jr.**

**Assistant Professor, Center for Energy Studies, LSU**



**Greg Upton** is Assistant Professor at the Center for Energy Studies at Louisiana State University. Dr. Upton is also Research Associate at Acadian Consulting Group (ACG), for which he has five years of experience in supporting expert analysis of economic, statistical, and public policy issues in energy and regulatory industries. With Christopher K. Coombs, David E. Dismukes, and Dek Terrell, Dr. Upton co-authored "*Gulf Coast Energy Outlook - LSU Center for Energy Studies and Economics & Policy Research Group Whitepaper*" released

in June 2017. The Gulf Coast Energy Outlook provides a broad overview of the status and trends guiding energy markets with an emphasis on the gulf coast region, including reference to the relationship between the Louisiana petroleum industry and predicted near-term activity levels in upstream, midstream, and downstream at national and global scales.



Delta Chapter



# 2017-2018 SPE Delta Section OFFICERS and BOARD OF DIRECTORS

Section Chairperson .....	Daniel Durey .....	Shell
Section Past-Chairperson.....	Angie Gobert.....	BSEE
Program Chairperson - 1st vice chair.....	Howard Duhon.....	GATE
Membership Chairperson - 2nd vice chair .....	Angie Gobert.....	BSEE
Secretary .....	Evan Graybill .....	Chevron
Treasurer .....	Jaime Villatoro.....	BOEM
Vice Treasurer.....	John Sanford .....	TAM International
Young Professionals Chairperson .....	TBD	
Student Chapter Liaison (LSU/Nicholls/FSU) .....	Caitlin Papso .....	Shell
Northshore Coordinator .....	Evan Graybill .....	Chevron
Northshore Coordinator .....	Ryan Smith.....	Chevron
Communications / Internet Chairperson.....	Forna Diphicyl.....	BSEE
Continuing Education Chairperson.....	Dan Alonso .....	Chevron
Scholarship / Career Guidance.....	Sue Barth.....	Chevron
Newsletter Contents & Advertising .....	Nick Justice.....	Hargrove Engineers & Constructors
HSE / Section Director .....	Michael Waguespack.....	Waldemar S. Nelson
Section Director 2015/2017 .....	Matt Wandstrat.....	LLOG Exploration
Section Director 2015/2017 .....	Phil Moses.....	Consultant
Section Director 2015/2017 .....	Lauren Woitha.....	BOEM
Section Director 2016/2018 .....	Henry Shurlds .....	Onesource Prof Search
Section Director 2016/2018 .....	Jan Catalano.....	ORX
Section Director 2016/2018 .....	Tony Richards.....	Consultant
Section Director 2016/2018 .....	Rivers Fike .....	Shell
ONE VOICE Chairperson .....	Jan Catalano.....	ORX
Deepwater Symposium Liason (Aug 2017).....	Sue Barth.....	Chevron
Deepwater Symposium Advisor .....	Matt Wandstrat .....	LLOG Exploration
Deepwater Symposium YP Chair .....	Matt Winters .....	Chevron
Sr. Advisor .....	Allen Porter .....	Consultant
Golf Tournament Co-Chairperson.....	Matt Wandstrat .....	LLOG Exploration
Golf Tournament Co-Chairperson.....	Jerry Simms .....	LLOG Exploration
Active Past Chairs: .....	Jan Catalano.....	ORX
	Charlie Mayne .....	W&T Offshore
	Phil Moses.....	Consultant
	Tony Richards.....	Consultant
	Matt Wandstrat .....	LLOG Exploration



## Delta Section

### *Our Mission*

*To collect, disseminate, and exchange technical knowledge concerning the exploration, development and production of oil and gas resources and related technologies for the public benefit; and to provide opportunities for professionals to enhance their technical and professional competence.*



## In This Issue:

Joint Industry Energy Association Luncheon .....	1
Officers & Board of Directors .....	2
Mission Statement .....	2
SPE: On the Horizon.....	3
Thank You From Angie .....	3
From the Chair .....	4
November Membership Report.....	5
SPE / LSU Golf Tournament .....	6
SPE North American Student Symposium .....	8
Engineering A Safer World.....	10
SPE Delta Beer Tasting Series #2 .....	14
Fueling Victory in WWII .....	15
Spotlight on Young Professionals .....	16
SPE's Mentoring Program.....	16
Dues Waiver / Out of Work? .....	16

# SPE: ON THE HORIZON

## NOVEMBER

Nov. 8..... Joint Energy Industry Association Luncheon - Marriott Convention Center, New Orleans

Nov. 10..... Golf Tournament (LSU/Arkansas weekend)

## JANUARY

TBA ..... SPEI Facilities & Operations Technical Director (Hisham Saadawi)

## FEBRUARY

Feb. 7-9..... SPE International Conference and Exhibition on Formation Damage Control - Lafayette, LA

## MARCH

Mar. 9 ..... SPE Golf Tournament - Carter Plantation

Mar. 14 ..... Pierre Ramondenc: Coiled Tubing Real-Time Monitoring: A New Era of Well Intervention & Workover Optimization

## APRIL

Apr. 17-18 ..... SPE/IADC Managed Pressure Drilling and Underbalanced Operations Conference and Exhibition - New Orleans, LA

## MAY

TBA ..... LSU PE Symposium

May 5..... R. Scot Buell: Waterflood Design and Operational Best Practices



## *Thank You*

*from Angie Gobert*

I would like to express my and my family's sincere appreciation and gratitude to SPE Delta Section Board and members for honoring my daddy's going to heaven with the beautiful flower arrangement. I also thank those of you who reached out to me via phone or sending a card thereby communicating with me during a very saddened time in my life. I know my daddy lives on but his presence is surely missed here on Earth in my life.

Thank you all!

**Angie D. Gobert,**  
*Past Chair and  
Membership Chair*





## from *THE CHAIR...*



Greetings!

Thanks to everyone who attended last month's meeting "Louisiana Coastal Erosion". This meeting aligned with our efforts to provide more topics of interest for our HSSE membership instead of the typical production, drilling or reservoir themed luncheon topics. Attendance was good both on the Southshore and Northshore as well as via computer based viewers. Our thanks to the guest speakers, Justin Ehrenwerth and Chris McLindon for their time and participation.

In November the section will not have a general meeting but we want to invite everyone to the 2017 Joint Energy Industry Association Luncheon. The guest speakers will be Senator Sharon Hewitt, Louisiana State Senator, District 1, and Dr. Gregory Upton, Jr., Assistant Professor, Center for Energy Studies at LSU. Look for the details in this newsletter and advanced registration is recommended.

On December 16th the Annual Louisiana FIRST LEGO League robotics program with SPE Delta sponsorship will take place at Jesuit High School. This program impacts over 1700 students per year and has a record of 160 registered teams anticipated. Come out and watch these teams of young people compete in a multitude of events. See the newsletter for more details about this event. Also, volunteers are always needed and positions include judges, judge assistants,

scorekeepers, timekeepers, and referees to name a few. You can find more information at <http://lafll.org/volunteering.htm>.

I encourage you to continue having conversations with your industry friends, colleagues, new hires and supervisors about becoming members or getting involved in the Society of Petroleum Engineers. Discuss the technical luncheons, the social events, the educational programs, the volunteer opportunities, the benefits to the community and the networking opportunities membership can afford them.

A reminder to all members who are in transition during this difficult industry environment, SPEI will waive your membership dues. Please contact SPEI at [service.org@spe.org](mailto:service.org@spe.org) for more information. Additionally, we will offer a more affordable meeting registration fee for those who are in between employments.

To close, once again thank you for being members of this chapter and by doing such you continue to support the beneficial activities of the Delta Section. Let us know if you need any assistance so we can better serve you.

Sincerely,

**Daniel A. Durey**

***Your 2017-2018 SPE Delta Section Chair***

# SPE-Delta Membership Report

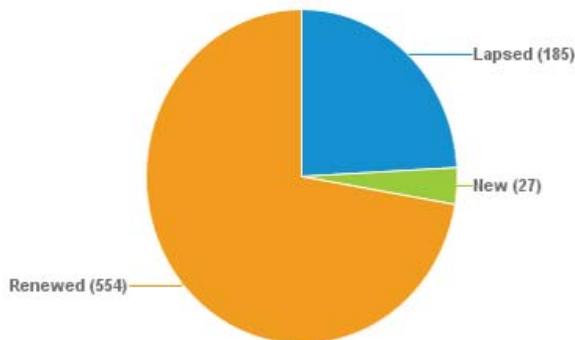
Submitted by Angie Gobert (Membership Chairperson)

As of November 2017

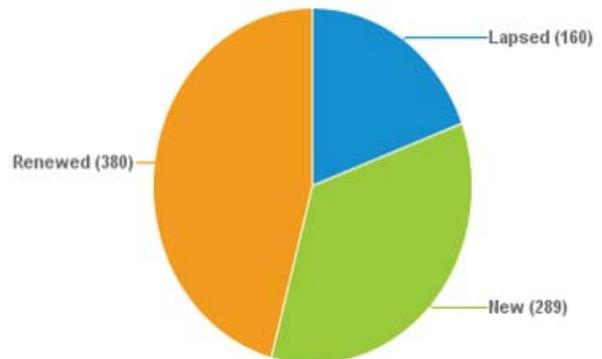


Total Full Members	766
New Members	27
Unpaid Members	185
Total Student Members	829

Professional Membership



Student Membership



Student Chapters	Total Current Members	New	Renewed	Lapsed
Florida State University	45	26	19	16
Louisiana State University	544	215	329	129
Nicholls State University	75	45	30	12
*Students Without a Student Chapter	5	3	2	3
<b>TOTAL</b>	<b>669</b>	<b>289</b>	<b>380</b>	<b>160</b>

# Annual LSU SPE Golf Tournament

November 10, 2017



Every year Louisiana State University brings both industry and students together for our annual golf tournament. This year's event will be no different as we look to make this the best golf tournament yet.

The Golf Tournament is our chapter's most important event in terms of fundraising and networking with our alumni, and is what keeps us going. This tournament will include many small games and competitions all over the course. Proceeds from this tournament will allow us to bring 50 students to the 2017 ATCE Conference in San Antonio, bring 25 students to the Symposium in 2018, host multiple student paper contests, contribute to our community through volunteer work, and allow our chapter to continue to inspire the next generation of Petroleum Engineers.

Coppermill Golf Club  
2100 Coppermill Blvd.  
Zachary, LA 70791

# 2017 SPE at LSU Annual Golf Tournament

Copper Mill Golf Club  
2100 Coppermill Blvd  
Zachary, LA 70791

Join us for a four-man scramble before our Fighting Tigers take on the Arkansas Razorbacks in football. This tournament is our chapter's primary fundraiser for the school year. Thanks to your support, we achieve our goals of developing our members personally, academically, and professionally. Below are our suggested sponsorship amounts, however we will gladly recognize any contribution your company can provide.

## Gold Sponsor - \$2,500

- Company name incorporated into our tournament title
- 3 teams (6 company reps paired with 6 students)
- Large company logo on Tournament Banners, Materials, and Apparel
- Complimentary breakfast and lunch

## Silver Sponsor - \$1,750

- 2 teams (4 company reps paired with 4 students)
- Regular size company logo on tournament banners, materials, and apparel
- Complimentary breakfast and lunch

## Bronze Sponsor - \$1,000

- 1 team (2 company reps paired with 2 students)
- Small size company logo on tournament banners, materials, and apparel
- Complimentary breakfast and lunch

## Hole Sponsorship - \$150

- Company sign at tee box

## Entry for Non-sponsors - \$250 per team

- For any industry professionals who wish to participate and are not a part of sponsoring company's team.
- Can register as individual or team (Max 2 per team – Paired with 2 students)
- Complimentary breakfast and lunch

## Registration Information

To register, please contact:

Abdul Homran (President)  
ahomra1@lsu.edu

Jason Fogarty (Golf Tournament Director)  
jfogar3@lsu.edu

Drumil Parekh (Treasurer)  
dparek2@lsu.edu

We will get back to you with all registration information and the complete tournament schedule.



**Society of Petroleum Engineers**

SPE International Students across North America are organizing the SPE North America Student Symposium. The symposium will be hosted at Louisiana State University in Baton Rouge, Louisiana on February 21-25, 2018.

Student Symposium Objectives:

- Present an opportunity for students to enhance their knowledge of the oil and gas industry through the insights and experiences of industry leaders and advocates
- Focus on encouraging future energy leaders' interest in learning as much as possible about all aspects of the oil and gas industry
- Provide the attendants a myriad of networking opportunities, as students, faculty, and industry experts from around North America will be participating
- Host a competitive SPE Student Paper Contest where students have the opportunity to advance to the International Student Paper Contest, held during the Annual Technical Conference and Exhibition (ATCE)
- Host the North America Regional Petrobowl Qualifiers where the winning teams will advance to the International Petrobowl Competition, held during the Annual Technical Conference and Exhibition (ATCE)

The theme for the Symposium is Big Data. The oil and gas industry today gathers massive amounts of data from producing wells, drilling activities, seismic, and many other operations. A study by McKinsey & Company found that less than 1% of data collected was being used. Efforts to make data more accessible to decision makers is at the forefront of every major company's agenda.

We are seeking support at the levels below. Any level of support or sponsorship is valuable and tremendously appreciated.

#### **Diamond Sponsor \$2,500**

- Opportunity to provide a technical speaker for the event
- Diamond sponsor recognition in all official emails
- + Platinum Sponsor Benefits

#### **Platinum Sponsor \$2,000**

- Platinum sponsor recognition in all official emails
- + Gold Sponsor Benefits

#### **Gold Sponsor \$1,500**

- Opportunity to sponsor a social event during the symposium
- + Silver Sponsorship Benefits

#### **Silver Sponsor \$750**

- Opportunity to have a booth at the career fair
- + Bronze Sponsorship Benefits

#### **Bronze Sponsor \$500**

- Logo recognition on the event website, event program, screensavers, and posters
- Opportunity to include special announcements and promotional items in the symposium bags

## Official Sponsorship Form

Company Name: \_\_\_\_\_

### Contribution Amount:

- Diamond: \$2,500
- Platinum: \$2,000
- Gold: \$1,500
- Silver: \$750
- Bronze: \$500
- Social Meet/Greet (Thurs. 22<sup>nd</sup>): \$1,000
- Promotional Items for Symposium Bags
- Speaker Gifts: \$1,000
- (2) Lunch Breaks: \$1,000 each
- Friday 23<sup>rd</sup>
- Saturday 24<sup>th</sup>
- Symposium Bags: \$2,500
- (4) Refreshment Breaks: \$500 each
- Wednesday 21<sup>st</sup>
- Thursday 22<sup>nd</sup>
- Friday 23<sup>rd</sup>
- Saturday 24<sup>th</sup>

Other Contribution: \_\_\_\_\_

Total Donation Amount: \_\_\_\_\_

To complete your sponsorship, please contact either Adam Larson at [arl5440@psu.edu](mailto:arl5440@psu.edu), Elii Skeans at [skeans@mines.edu](mailto:skeans@mines.edu), Aaron Sureshkumar at [aaronsureshkumar@gmail.com](mailto:aaronsureshkumar@gmail.com), or Joshua Mirabdolbaghi at [jmirabdolbaghi@gmail.com](mailto:jmirabdolbaghi@gmail.com). Specific item sponsorship will allow for companies to be named as the sponsor of the specific activity and is separate from being named as Diamond, Platinum, Gold, Silver, or Bronze sponsors.

**Please make all checks payable to:**

Society of Petroleum Engineers

Note: NASS2018

**Please send checks to the following address:**

Society of Petroleum Engineers

222 Palisades Creek Drive

Richardson Texas, 75080

*\*If you require tax documentation associated with your sponsorship, please let us know.*

### ***Your Support is Greatly Appreciated!***

For sponsorship questions, please contact Adam Larson at [arl5440@psu.edu](mailto:arl5440@psu.edu), Elii Skeans at [skeans@mines.edu](mailto:skeans@mines.edu), Aaron Sureshkumar at [aaronsureshkumar@gmail.com](mailto:aaronsureshkumar@gmail.com), or Joshua Mirabdolbaghi at [jmirabdolbaghi@gmail.com](mailto:jmirabdolbaghi@gmail.com)

[www.spestudentsymposium.com](http://www.spestudentsymposium.com)

# Engineering A Safer World

Howard Duhon, P.E.

This article was first published in the Dec 2014 issue of Oil and Gas Facilities Magazine, <https://www.spe.org/en/ogf/ogf-article-detail/?art=2069>

This column is a book report on Nancy Leveson's *Engineering a Safer World*.

The central premise of the book is this:

***The process hazard analysis methods we use today were designed for the relatively simple projects of yesterday and are not adequate for the complex projects we build today.***

I agree with her.

## Would it have prevented Bhopal?

My litmus test of a new process hazard analysis technique is "Would this approach have prevented the Bhopal accident?" A typical HAZOP would not have prevented Bhopal in my opinion. I believe that Leveson's STPA process and safety-guided design approach would have.

## Why do we need a new approach to safety?

The traditional approaches worked well for the simple systems of yesterday. But the systems we are building today are fundamentally different.

- 1) Reduced ability to learn from experience because of
  - a. The increased speed of technology change
  - b. Increasing automation removes operators from direct and intimate contact with the process
- 2) Changing nature of accidents from component failures to system failures due to increasing complexity and coupling
- 3) More complex relationships between humans and technology
- 4) Changing public and regulator views on safety. Decreasing tolerance for accidents.
- 5) Difficulty in making decisions because at same time as safety culture is improving the business environment is getting more competitive and aggressive

Accident models explain why accidents occur and they determine the approaches we take to prevent them from recurring. Any such model is an abstraction that focuses on those items assumed to be important while ignoring issues considered less important.

The accident model in common use today makes these assumptions:

- Safety is increased by increasing system and component reliability.
- Accidents are caused by chains of related events

beginning with one or more root causes and progressing because of the chance simultaneous occurrence of random events.

- Probability risk analysis based on event chains is the best way to communicate and assess safety and risk information.
- Most accidents are caused by operator error.

This accident model is questionable on several fronts.

Safety and reliability are different properties. A system can be reliable and unsafe.

Component failure is not the only cause of accidents; in complex systems accidents often result from the unanticipated interactions of components that have not failed.

The selection of the root cause or initiating event is arbitrary. Previous events and conditions can always be added. Root causes are selected because:

- The type of event is familiar and thus an acceptable explanation for the accident
- It is the first event in the backward chain for which something can be done
- The causal path disappears for lack of information (A reason human error is frequently selected as the root cause is that it is difficult to continue backtracking the chain through a human.)
- It is politically acceptable. Some events or explanations will be omitted if they are embarrassing to the organization.

Causal chains oversimplify the accident. Viewing accidents as chains of events and conditions may limit understanding and omit causal factors that cannot be included in the event chain.

It is frequently possible to show that operators did not follow the operating procedures. Procedures are often not followed exactly because operators try to become more efficient and productive to deal with time pressures and other goals. There is a basic conflict between an error viewed as a deviation from normative procedures and an error viewed as a deviation from the rational and normally used procedure. It is usually easy to find someone who has violated a formal rule by following established practice rather than specified practice.

We need to change our assessment of the role of humans in accident from what they did wrong, to why it made sense to them at the time to act the way they did.

## Complexity Primer

Project Management theory is based generally on the idea of analytic reduction. It assumes that a complex system can be divided into subsystems, and that

those subsystems can then be studied and managed independently.

Of course, this can be true only if the subsystems operate independently with no feedback loops or other nonlinear interactions. That condition is not true for today's complex projects.

Complex systems exist in a hierarchical arrangement. Even simple rules sets at lower levels of the hierarchy can result in surprising behavior at higher levels.



An ant colony is a good example (2): A single ant has few skills – a very simple rule set. Alone in the wild it will wander aimlessly and die.

But put a few thousand together and they form a culture. They build and defend nests, find food, divide the work.

CULTURE!?! Where did that come from? No scientist could predict ant culture by studying individual ants.

This is the most interesting feature of complex systems. Culture is not contained within individual ants – it is only a property of the collective. This feature is called emergence - the culture emerges.

An emergent property is a property of the network that is not a property of the individual nodes. The sum is more than the parts.

**Safety is Emergent**

There is a fundamental problem with equating safety with component reliability. Reliability is a component property. Safety is emergent. It is a system property.

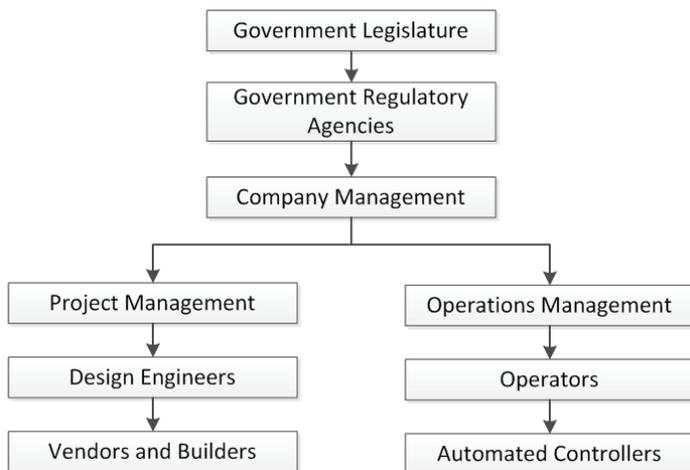


Figure 1: Simplified Hierarchy of Project and of Operating Asset

The system is hierarchical (see Figure 1). Safety depends on constraints on the behavior of the components in the system including constraints on their potential interactions and constraints imposed by each level of the hierarchy on the lower levels.

**Safety as a Control Problem**

Safety depends on system constraints. It is a control problem. Figure 2 is a simple control loop. We are all familiar with control loops for controlling process variables. This is no different.

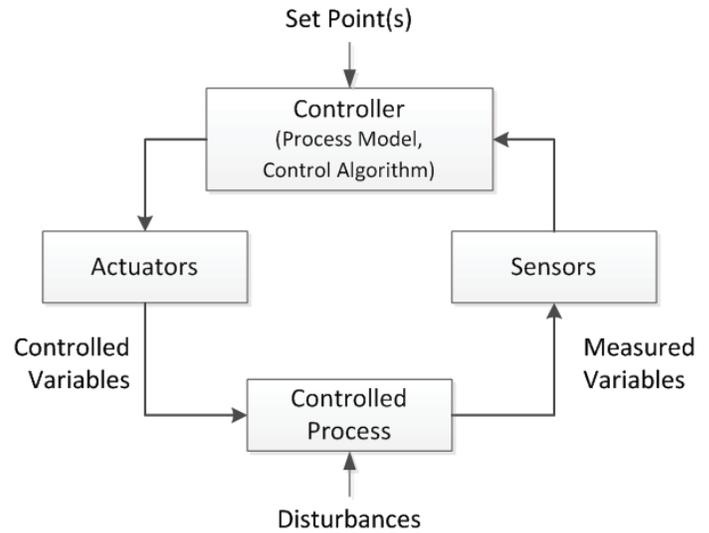


Figure 2: Control Loop

There are four required conditions for control:

**Goal Condition:** The controller must have a goal. For a simple process control loop the goal is to maintain the set point.

**Observability Condition:** Sensors must exist that measure important variables. These measurements must provide enough data for the controller to observe the condition of the system.

**Model Condition:** The controller must have a model of the system (process model). Data measured by the sensors is used both to update the model and for direct comparison to the goal or set point.

**Action Condition:** The actuator must be able to take the action(s) required to achieve the controller goals.

**Role of Mental Models**

The controller discussed above may be a human or an automated system. The controller must contain a model of the system (process model). If the control is a human, he/she must possess a mental model of the system.

The designer's mental model is different from the operator's mental model. The operators model will be based partly of training and partly on experience. Operators use feedback to update their mental models. Operators with direct control of thee process will quickly learn how it behaves and update their mental

models. In highly automated systems operators cannot experiment and learn the system.

Further in highly automated systems the operator will not always have an accurate assessment of the current situation because his/her situation assessment is not continuously updated. I have a fishing example of this. I occasionally (but rarely) go fishing in the marshes near Lafitte, LA (south of New Orleans). I don't know the area well, but I have a map. If I keep track of my movement I always know where I am and can easily recognize features on the map. If/when I get lazy and just motor around, then I find the map almost useless. I can no longer match geographical features to the map. Every point of land in the marsh looks much like every other point.

### Control Algorithm

Whether the controller is human or automated, it contains an algorithm that determines/guides its actions. It is useful to consider the properties of a typical automated loop. Most industrial control loops are PID (Proportional, Integral, Derivative) loops. A PID controller has three functions:

- Proportional action: Takes action proportional to the error (difference between the measured variable and the set point); small errors yields minor valve movements; large errors yield large valve movements.
- Integral action: Takes action proportional to the integral of the error. Here a small error that has existed for a long time will generate a large valve movement.
- Derivative: Takes action proportional to the derivative of the error. A rapidly changing error generates a large valve movement.

Tuning coefficients are provided for each action type. The appropriate tuning coefficients depend on the dynamics of the process being controlled. The process dynamics can be explained pretty well with three properties, Process Gain, Dead Time and Lag.

- Process Gain is the ratio of measured variable change to control valve position change.
- Lag is a measure of the time it takes the process to get to a new steady state.
- Dead Time is the time between when the valve moves and the process variable begins to change.

### Unsafe Control Causes

Control loops are complex and can result in unsafe operation in numerous ways, including:

1. Unsafe Controller Inputs
2. Unsafe Control Algorithms including inadequately tuned controllers
3. Incorrect Process Models
4. Inadequate Actuators

5. Inadequate Communication and Coordination among controllers and decision-makers

### STPA – A New Hazard Analysis Technique

The most widely used PHA technique is the HAZOP. The HAZOP uses guidewords related to process conditions (flow, pressure, temperature, level).

STPA (System-Theoretic Process Analysis) guidewords are based on a loss of control rather than physical parameter deviations. (Note that all causes of flow, pressure, temperature and level deviation can be traced back to control failure.)

#### STPA Process:

1. Identify the potential for inadequate control of the system that could lead to a hazardous state
  - a. A control action required for safety is not provided
  - b. An unsafe control action is provided
  - c. A control action is provided at the wrong time (too early, too late, out of sequence)
  - d. A control action is stopped too early or applied too long
2. Determine how each potentially hazardous control action could occur
  - a. For each potentially hazardous control action examine the parts of control loop to see if they could cause it.
    - i. Design controls and mitigation measurements if they do not already exist
    - ii. For multiple controllers of the same component or safety constraint identify conflicts and potential coordination problems
  - b. Consider how the controls could degrade over time and build in protection including:
    - i. Management of change procedures
    - ii. Performance audits where the assumptions underlying the hazard analysis so that unplanned changes violate the safety constraint can be detected.
    - iii. Accident and incident analysis to trace anomalies to the hazard and to the system design.

### Safety-Guided Design

Hazard analysis is often done after the major design decisions have been made. STPA can be used in a proactive way to guide design and system development.

#### The Safety-Guided Process

1. Try to eliminate the hazard from the conceptual design
2. For hazards that cannot be eliminated, identify

- potential for their control at the system level
3. Create a system control structure and assign responsibilities for enforcing safety constraints
  4. Refine the constraints and design in parallel
    - a. Identify potentially hazardous control actions of each system component and restate the hazard control actions as component design constraints
    - b. Determine factors that could lead to a violation of the safety constraints
    - c. Augment the basic design to eliminate of control potentially unsafe control actions or behaviors
    - d. Iterate over the process (perform STPA steps 1 and 2) on the new augmented design until all hazardous scenarios have been eliminated, mitigated or controlled

### Example – Thermal Tile Processing System (TTPS)

The Space Shuttle was covered with heat resistant tiles of various types. The lower surfaces were covered with silica tiles. They were 95% air, capable of absorbing water, and had to be waterproofed. The task was accomplished by injecting a hazardous chemical DMES into each tile. Workers wore heavy suits and respirators. The tiles also had to be inspected for scratches, cracks, gouges, discoloring and erosion.

This section is a partial/truncated application of Safety Guided Design to the design of a robot for tile inspection and waterproofing.

Safety-guided Design starts with identifying the high level goals:

1. Inspect the tiles for damage caused by launch, reentry and transport
2. Apply waterproofing chemical to the tiles

Next, identify the environmental constraints:

1. Work areas can be very crowded
2. With the exception of jack stands holding up the shuttle the floor space is clear
3. Entry door is 42" wide
4. Structural beams as low as 1.75 m
5. Tiles at 2.9 to 4 m elevation
6. Robot must negotiate the crowded space

Other constraints:

1. Must not negatively impact the launch schedule
2. Maintenance cost must be less than x

To get started a general system architecture must be selected. Let's assume that a mobile base with a manipulator arm is selected. Since many hazards will be associated with robot movement a human operator is selected to control robot movement and an automated control system will control non-movement activities.

The design has two controllers so coordination

problems will have to be considered.

Step 1: Identify potentially hazardous control actions

Hazard 1 - Robot becomes unstable

Potential solution 1 – make the base heavy enough to prevent instability.

Rejected – heavy base will increase the damage if/when the robot runs into something

Potential solution 2 – make the base wide

Rejected – violates environmental constraints on space

Potential Solution – lateral stabilizer legs

The stabilizer legs generate additional hazards that must be translated into design constraints:

1. The leg controller must ensure that the legs are fully extended before the arm movements are enabled
2. The leg controller must not command a retraction unless the stabilizer arm is in the fully stowed position
3. The leg controller must not stop leg extension until they are fully extended
4. Etc.

These constraints may be enforced by physical interlocks or human procedures.

### Summary and Conclusion

Leveson argues that our standard accident model does not adequately capture the complexity of our projects. Her proposed solution sensibly addresses the flaws that she has noted.

Viewing safety as a control problem resonates with me. All or almost all of the hazard causes that we discover in HAZOPs are control system related, yet the HAZOP method does not focus explicitly on control systems. And control between levels of the hierarchy is generally not considered at all in process hazard analyses.

I am particularly attracted to the ability to apply STPA during project design, as opposed to other process hazard analysis techniques that can only be applied to a 'completed' design.

### References

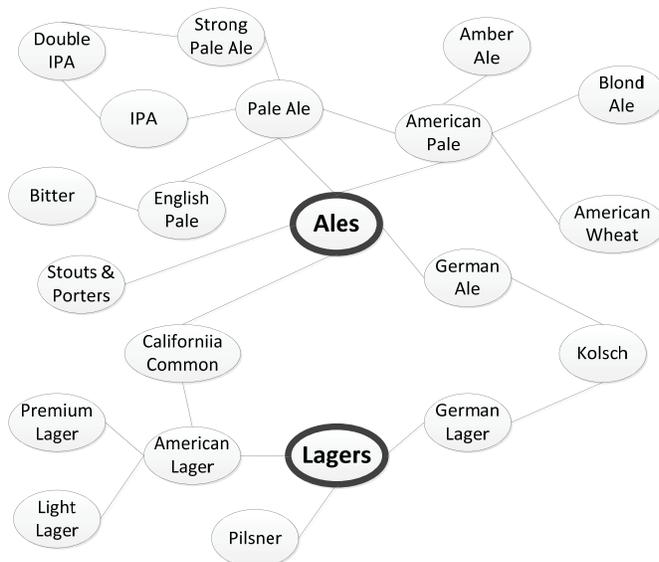
1. 2011, Nancy Leveson, *Engineering a Safer World, Systems Thinking Applied to Safety*, MIT Press
2. 2009, Melanie Mitchell, *Complexity, A Guided Tour*, Oxford University Press



## SPE DELTA BEER TASTING SERIES (Meeting #2)

(The Engineering Geek Version of Beer Tasting)

Few people attend SPE Delta Technical meetings. This year we are trying a couple of different things to get more involvement, including this beer tasting series.



Once a month we'll meet to sample 8 beers, eat finger food, and network.

**The Geek Factor:** We'll discuss and try multiple styles. You will rate every beer you try. We will use your ratings to construct a mathematical model of your beer preference and then use that model to predict your favorite beer in the bar, and bring you a sample of that beer.

If you attend enough tasting, we'll have a large amount of data by the end of the season and the model may be pretty close. (The modeling will take some work so we may not pull it off for the first tasting.)

We'll also invite brewers occasionally share brewing insight.

**Something for Everyone:** NA and Gluten Free Beers and Wine available

### *Southshore*

**Tuesday Nov 7**

**Cooter Browns, 509 S. Carrolton, in the Back Bar**

6:00 to 8:00 PM

\$20

Register at: <http://connect.spe.org/delta/events/upcomingevents>

**Northshore** TBD, We could use a volunteer to manage similar beer tastings on the Northshore. To volunteer contact Howard Duhon at [hduhon@gateinc.com](mailto:hduhon@gateinc.com)

# VOLUNTEERS NEEDED

## Fueling Victory in WWII: Production & Use of Oil in WWII

The National WWII Museum in New Orleans is a remarkable place. It contains snippets of oil's role in winning the war, but not much of that story.

Armies, navies, air forces consume vast quantities of resources. Oil - lots of it - was required to make the victory possible.

SPE Delta is launching a study to develop the story of fuel, oil in particular, in winning WWII.

We are looking for volunteers willing to dive-in and research this piece of

history to tell the story of how much was needed, where it came from, how it was found, produced, refined, conserved, transported, and fought over, how it affected military strategy and about the people who made it all happen.

We hope that eventually the story we develop will be presented in the National WWII Museum.

This is likely to be a multi-year effort. Our first goal will likely to be development of a short documentary video.

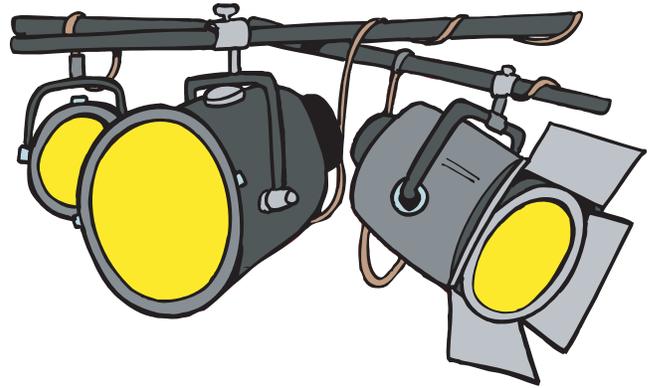


Delta Section

If you would like to be involved,  
please contact **Howard Duhon** at  
[hduhon@gateinc.com](mailto:hduhon@gateinc.com).



**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™.

*Learn more at <http://www.spe.org/members/yps.php>*



**Volunteering Looks Good on You.**  
Engage Support Contribute

## Become a Mentor through SPE’s eMentoring Program

eMentoring gives SPE members a way to contribute to the E&P industry by sharing industry insights and practical career advice with young professionals, or by helping university students with academic and career direction. Young professionals also have the unique opportunity to serve as mentors to students.

Join the program today by going to <http://www.spe.org/ementoring/>

## Dues Waiver

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.