Process Safety Education – Start them Young
Process Safety Undergraduate Education

• Nearly 35000 ChEs graduating every year
• Not enough universities with Process Safety programs
• There is a real need to upgrade training material
• In order for faculty to better teach process safety, it benefits them to see and hear directly from industry
• Process safety culture needs to be developed while in the classroom and expected by students entering industry.
1992 -- SACHÉ® (Safety and Chemical Engineering Education)

- Education materials & faculty workshops
- CCPS members and engineering schools
- Improved awareness

Limited by scope, technology and lacked overall process safety “Curriculum” approach
2007 T2-Lab Explosion

- CSB Found T2 Laboratories Explosion Caused by Failure of Cooling System Resulting in Runaway Chemical Reaction
- Key finding: Company Did Not Recognize Hazards of Chemical Process

- In 2010, CSB asked AICHE - CCPS to include process safety in Chemical Engineering curriculum
- AICHE worked with the US Accreditation Board for Engineering and Technology [ABET] and the ChE curriculum was updated in 2012 to include process safety
In 8-10 years, all graduating BS ChE’s anywhere in the world will have learned the process safety basics necessary to have a successful and safe ChE career, on a sustainable basis. To this end:

• Professors will appreciate process safety and be knowledgeable enough to teach it

• The necessary instructional materials and textbooks will be available

• Language of instruction will not be an obstacle

• Industry will strongly reinforce both the need for process safety and the education of professors and students
Plan for Accelerating Undergraduate Process Safety Learning [2015]

- Modernize curriculum
- Educate professors
- Fill gaps in student education
- Maintain continuing awareness

100% of graduating bachelor-degree chemical engineers knowledgeable about process safety.

Expand to 35+ learning modules, translated to multiple languages. Currently 10, only available in English.

Mini-Boot Camps
Research funding

Ramp up to 6 workshops per year and standardize the program.
Process Safety Curriculum

- The Importance of Process Safety
  - Understand Hazards and Risk
  - Fire Hazards
  - Management of hazards and risk - Background

- Hazard Recognition
  - Process Safety at a Personal Level
  - Explosion Hazards
  - Management of hazards and risk – Emergency Relief [ER]

- Identifying & Minimizing Process Safety Hazards
  - Hazard Assessment/Source Models – 1
  - Chemical Reactivity
  - Management of hazards and risk – Safeguards other than ER

- An Introduction to Managing Process Safety Hazards
  - Hazard Assessment/Atmospheric Dispersion – 1
  - Toxicological Hazards
  - Management of hazards and risk – Hazard ID Techniques

- Safe Design & Operation / Equipment Hazards
  - Inherent Safer Design
  - Safety Systems and How they work
  - Equipment Hazards
  - Damage Mechanism
  - Reactor Pressure Relief
  - Facility Siting

- Hazard Assessment/Atmospheric Dispersion – 2
  - Quantitative Methods and Hazard Assessment
  - Material Hazards
  - LOB
  - Adv Dispersion & Consequence Modeling
  - Adv Proc Haz Analysis

- Risk Based Process Safety Management
  - LOB
  - Risk Based Process Safety Management

- Commit to Proc Safety
  - Understand Hazards & Risk
  - Manage Risk
  - Learn from Experience

Additional detailed courses build on concepts presented in Level 2 courses
New SACHE Modules by 2017 end

**LEVEL 1**

1. The Importance of Process Safety
2. Hazards Recognition
3. Identifying & Minimizing Process Safety Hazards
4. An Introduction to Managing Process Safety Hazards

**LEVEL 2 & 3**

1. Understand Hazards and Risk
2. Hazard Assessment/Source Models
3. Fire Hazards
4. Explosion Hazards
5. Chemical Reactivity Hazards
6. Toxicological Hazards
7. Management of hazards and risk – Safeguards other than ER
8. Management of hazards and risk – Hazard ID Techniques
9. Inherent Safer Design
10. Risk Reviews using LOPA
11. Common chemicals and their major hazards
Faculty Workshops
Educating the Educators

2016 Faculty Workshops
Dow - Freeport, TX June 20 – 23, 2016
Archer Daniels Midland - Decatur, IL, July 25-28, 2016
Cargill - Blair, NE, August, 15 – 18, 2016
Chevron - Richmond, CA, August 21 -24, 2016
Faculty Workshops

• Five Completed in 2017,
  – Dow, ADM, WACKER, Reliance, Chevron Richmond
  – 119 total faculty trained in 2017
• Planning stages
  – 3M during the Annual mtg., (Nov 2017)
  – LyondellBasell (Jan 2018)
  – BASF (Summer 2018)
• Discussion stages
  – Dow, Chevron, ADM, Reliance
• Goal for 2018: Complete Six workshops (or more)
Faculty Workshops

• How are we doing?
  – Surveys collected at each workshop
  – Typical feedback strongly positive
  – Scores consistently above 4.5 on a 0 to 5 scale

• Going Forward
  – Suggestions and ideas collected and analyzed
  – A set of improvements are identified
  – Examples:
    • Provide attendees detailed prep guidance prior to the workshop
    • Set even more clear expectations of what the attendees will learn
    • Provide tools and emphasis on how to integrate the learnings into the curriculum
2016 Student Bootcamps

UC Berkeley – April 2-3
Georgia Institute of Technology – Sept. 10-11
University of Illinois-Urbana (mini regional) – Sept. 10-11
Global Outreach to Faculty

ASSIGN SOMETHING THEY'LL ALWAYS REMEMBER

Introducing
THE NEWLY UPDATED & COMPLETELY REDESIGNED

SACHE
Certificate Program
THE GOLD STANDARD OF PROCESS SAFETY EDUCATION

WHEN IT COMES TO PROCESS SAFETY EDUCATION DOES YOUR SCHOOL MAKE THE GRADE?

Introducing
THE NEWLY UPDATED & COMPLETELY REDESIGNED

SACHE
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THE GOLD STANDARD OF PROCESS SAFETY EDUCATION

IT'S 10 PM. DO YOU KNOW WHERE YOUR CHEMICAL ENGINEERING UNDERGRADUATES ARE?

(Hint: it's probably not studying process safety)