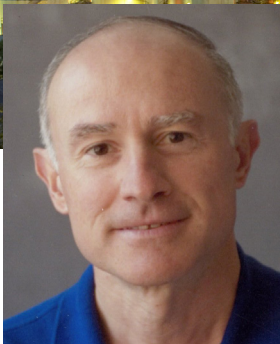


PURDUE PROCESS SAFETY & ASSURANCE CENTER



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Every day, ~14 people die in the United States from injuries received in workplace accidents, according to the U.S. Bureau of Labor Statistics. Many of these accidents are caused by the lack of proper design, training, maintenance, and recognition of chemical process safety. Purdue Process Safety & Assurance Center (P2SAC) aims to save lives through education, research, and outreach in process safety.

About P2SAC

In the past, many university chemical engineering programs did not adequately address safety, with the expectation that their graduates would learn on the job. Davidson School of Chemical Engineering at Purdue University stands out as a program which not only teaches a rigorous Chemical Process Safety course, but also requires completion by all seniors. With P2SAC, Purdue Chemical Engineering has one of the few research centers on earth focused on the prevention of major industrial accidents that often result in loss of lives, harmful environmental impacts, and facility damage.

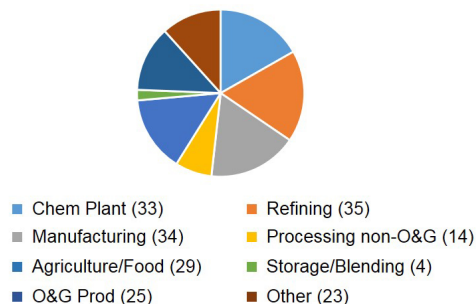


Buncefield, UK, 2005
(Photograph: Hertfordshire Police/PA)

Process safety is a technical quantitative discipline that addresses the handling of hazardous materials in any form (flammable, toxic, vapor, liquid, solid, or dust) and the assessment of processing hazards and risk. Such assessments require modeling of the chemical source, dispersion modeling of toxic gases, and the impact of potential fires and explosions within and outside a facility. Deficiencies in the area of process safety have led to many major industrial incidents, such as: Bhopal, Imperial Sugar, Deepwater Horizon, Fukushima, as well as the Challenger and Columbia space shuttle disasters.

Why P2SAC

Formed in 2014, P2SAC is uniquely positioned to address the process safety needs of a wide variety of industries, including oil and gas, chemicals, manufacturing, pharmaceuticals, and agriculture. Many industries are affected by devastating incidents, as illustrated by the chart below.



Fatalities associated with major US industrial accidents, per investigations by the US Chemical Safety Board; 1998-2018.

The P2SAC Team

Our Partners

P2SAC has a team of industry and education partners supporting its innovative and impactful research. Current process safety sponsors include AMGEN, BP, Chevron, Dow, ExxonMobil, Honeywell, Lilly, Pfizer, Phillips 66, Shell, and 3M. P2SAC also collaborates with risk management consulting firm sponsors such as Fauske Associates and Kenexis. Additionally, the National Science Foundation funded joint projects in the areas of laboratory safety and cybersecurity between P2SAC and the Engineering Research Center for Innovative and Strategic Transformation of Alkane Resources (CISTAR), headquartered in Purdue's Discovery Park.

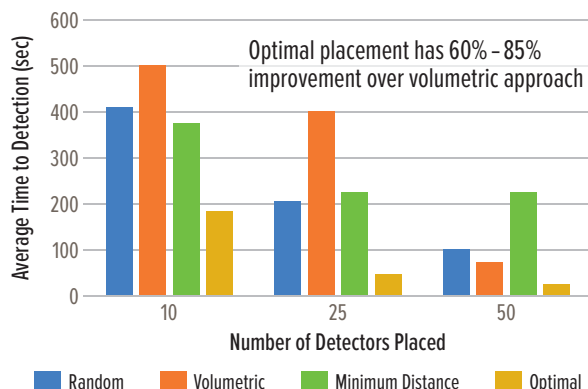
Our Research Team

P2SAC uniquely supports seven tenured Chemical Engineering professors who are engaged in PhD-level process safety research projects. These faculty are dedicated leaders in their fields of study, including process optimization, control, catalysis, fluid flow, and separations, who are now also engaged in industry-sponsored process safety applications. Through P2SAC, Master's and undergraduate students are also engaged in a wide variety of impactful process safety projects.

Recent P2SAC projects

Recent PhD Projects

- Optimal placement of gas detectors, where current industry guidelines have been shown in some instances to be less effective than random placement of the detectors, and far from optimal per quantitative analysis.



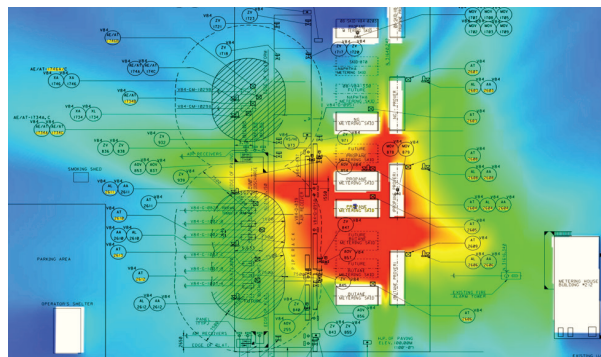
Other PhD projects include:

- Continuous vs. batch pharmaceutical processing via a thorough understanding of real time control strategy and assessment of process risks.
- Tailored design of zeolite catalysts to prevent undesired side reactions and the formation of hazardous products.
- Analysis of drop coalescence to reduce separator retention time.
- Advanced separation techniques, et al.

Recent Professional Master's Program Projects

P2SAC also oversees several industry-led Professional Master's Program (PMP) process safety-related research projects.

- Validation of large scale consequence modeling with data from a major propane release.



CFD Modeling of Propane Release

- Development of an automated software application for consistent and streamlined process hazard analyses.
- Quantification of toxicity effects of H₂S ingress into onshore and offshore shelters and temporary refuges associated with oil & gas production.

Recent Undergraduate Projects

Undergraduate students are further exposed to process safety through research projects suggested by industry.

- Comparison of global process safety regulations, published in *J Loss Prevention in the Process Industries* 50 (2017) 165-183.
- Analysis of reactive chemical incidents using dedicated ARSST calorimeter.
- Analysis of process safety incidents in the pharmaceutical industry, dust characterization, etc.

Learn more about P2SAC

Opportunities are available to conduct projects from a growing list suggested by industry and academia, including multi-disciplinary efforts with other fields such as Agricultural, Industrial, and Mechanical Engineering, Chemistry and Industrial Pharmacology. These departments offer special expertise in areas such as dusts and human factors, which are the cause of many industrial incidents.

Funding Opportunities are available to further recognize and grow this key discipline, such as: (1) Naming the Center by creating an everlasting endowment supporting the Center for \$5M, (2) Named Professorship to attract and retain a tenure track faculty dedicated to process safety (\$1.5M), as well as other options to become engaged as a sponsor of on-going research.

To learn more about P2SAC, visit:

<https://engineering.purdue.edu/P2SAC> or email: Dr. Osman Basaran at obasaran@purdue.edu or Dr. Ray Mentzer at rmentzer@purdue.edu.