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Title: University of Hawaii Laboratory Explosion, What went wrong? What went wrong? A Mentor and a Student Perspective IWSST Quarterly Presentation

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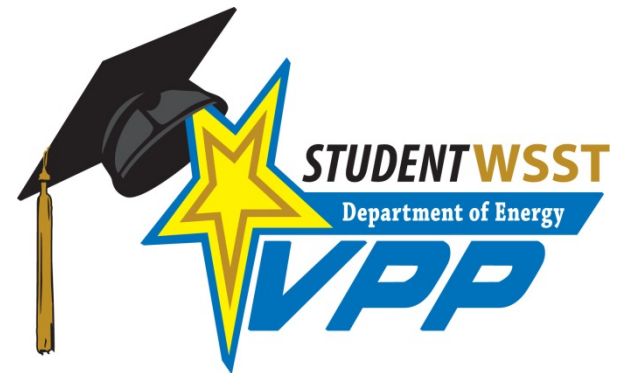
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UNIVERSITY OF HAWAII LABORATORY EXPLOSION

What went wrong? A Mentor and a Student Perspective
IWSST Quarterly Presentation

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The incident

MANOA, OAHU March 16, 2016 -Officials say the 29-year-old researcher *seriously injured* in an explosion at a University of Hawaii lab Wednesday was *conducting a routine experiment and handling relatively stable compounds* when something went very wrong.



"Something happened out of the ordinary and we don't know what that is yet," Brian Taylor, dean of UH-Manoa's School of Ocean and Earth Science and Technology, told reporters at a news conference Thursday.

Post-doctoral fellow Thea Ekins-Coward lost an arm and suffered other injuries in the explosion, which happened about 6 p.m. Wednesday in a basement lab *Ekins-Coward was conducting a routine experiment -- something that had been done every day since 2008 -- when the explosion happened in the Hawaii Natural Energy Institute lab, UH officials said. They said she was working with hydrogen (70%), oxygen (25%) and carbon dioxide (5%).*

In the following days



Explosion was due to the detonation of **a large volume of explosive gas mixture** including: Hydrogen, Carbon Dioxide, and Oxygen within the tank.

Digital pressure gauge in the tank was not designed (not Intrinsically Safe) for flammable gaseous atmospheres.

When the OFF button was pressed on the gauge, an electrical spark detonated the flammable gas causing the explosion.



The deeper you dig into the story

Status: Postdoctoral scholar

- Likely highly trained in similar procedures
- Would be able to identify if there was a problem
- Addressed problem with advisor
- Continued to proceed after talk with advisor about issues
- Procedure had been published as recently as 2013 by professor

- *Experiments earlier in the week failed using the same digital pressure gauge*
- *Small internal explosion in the other tank (evidence of soot and smoke stains)*
- *Static shock also appeared to have been a problem as Ms. Ekins-Coward would get shocked on occasion when touching the tank. She brought this information to the attention of Mr. Yu who she said told her don't worry about it.*



What are some of the factors leading up to this incident?

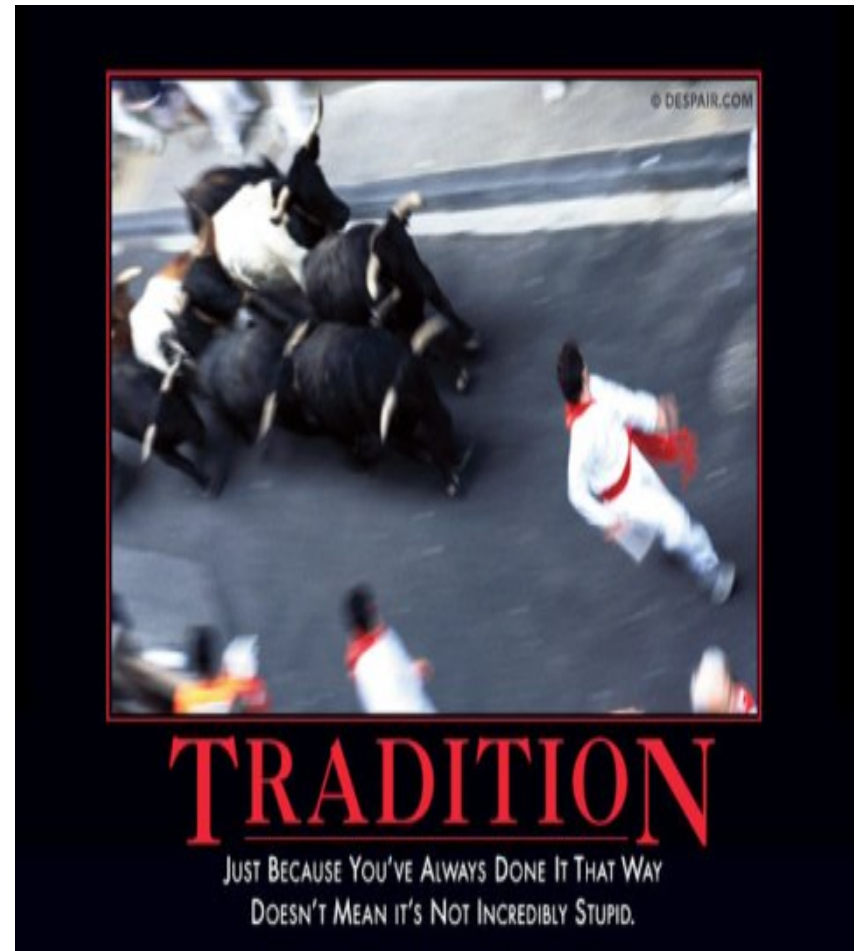
Important Questions, how can we learn?

- Who designed the tank and selected the pressure gauge?
- Did the post doc have adequate information available on experimental design?
- Did the post doc understand the significance of explosive gas mixtures?
- Is it accurate that both the PI and postdoc were trained as chemical engineers, as brief Google searching seems to indicate?
- What is the role of the institution and its EH&S office in this? Did the EH&S office know about the Yu Laboratory's experimental systems, including those of his colleagues?
- Is there a safety program that understands specific designs and hazards, or do they look at general lab safety?
- This was clearly an unsafe experimental setup – will the comments about this experiment being safely performed since 2008 be walked back? What changed between 2008 and 2016?



“Routine” does NOT mean “no intrinsic hazards”

- Def: “performed as part of a regular procedure rather than for a special reason.”
- Coal mining (explosive coal dust)
- Driving (speeding, distractions)
- Target shooting (control of your and other’s weapons)
- Crossing street in traffic
- Experiments with gas mixtures having explosive force of >1 stick of TNT
- ALL have hazards that must be controlled!



Standard Procedures– when do we go back to look at them?

- Never?
- When new person is added to team?
- When revised?
- According to a schedule?
- When questions arise?
- When hazards are recognized to have changed or been misunderstood?

Students at the Laboratory

- Generally Short Term (~400 year round, 1000+ extra in summer)
- Diverse Backgrounds
 - Education
 - Institutions
 - Safety Cultures
- Lab vs. Universities
- New or Old Process?
 - Student in field vs. Student trying out new field
 - Power Dynamics
 - Short time period → Produce, Produce, Produce
 - Expectations
 - Recommendation letters

CORE PRINCIPLES IN RESEARCH



OCCAM'S RAZOR

"WHEN FACED WITH TWO POSSIBLE EXPLANATIONS, THE SIMPLER OF THE TWO IS THE ONE MOST LIKELY TO BE TRUE."



OCCAM'S PROFESSOR

"WHEN FACED WITH TWO POSSIBLE WAYS OF DOING SOMETHING, THE MORE COMPLICATED ONE IS THE ONE YOUR PROFESSOR WILL MOST LIKELY ASK YOU TO DO."

Student Worker Safety and Security Team

- SWSST at LANL:
 - Drives worker involvement in resolving issues and improving safety and security
 - Represents all workers
 - Facilitates communication between workers and managers
 - Serves as an advocacy group for all students at the lab

SWSST serves a unique eager, diverse, and transient population: How do we learn from situations like Hawaii?

Important Questions, how can we learn?

What can we, as SWSST do to help prevent similar instances?

- What do you do if your advisor tells you to proceed but you feel unsafe?
- What about potential repercussions?
- Can we be an advocacy group for students if they are uncomfortable?
- Not just chemical labs, but lab wide. What are some safety issues you encounter you could alert students to when they arrive?
- Safe Space



Bottom Line: No one should ever fear repercussion when bringing safety or security issues to attention

Student Perspective

- Take 2 4 You → Stopping to think about a process before you start
 - Calling Cards for Students
 - We need REPS!
 - Directorate Specific
 - Extra peer point of contact
 - Time commitment small, but important!
 - Advocacy → problem arises what can you do?
-
- 10 weeks is short!
 - Take back to Universities
 - Better awareness with “routine” tasks.

Who can I call?

Project mentor:

Mentor:

Direct Line Manager:

SWSST rep:

WSST rep:

EH&S Rep:

Occ Med:

Security Incident Team:

LANL Scientist Perspective

- It's obvious to me, but is it obvious to the student?
- It's obvious to the student, but not to me?
- If a student discovers a better, safer way, am I supportive or defensive?
- Are work instructions clear?
- Am I complacent to risks I've been taking routinely?
- Am I available to supervise work today? If not, what trusted, trained, colleague familiar with the work is authorized and willing to take over?
- Does my group/team take a collective approach to mentoring?
- Am I receptive to questions and criticism?
- Uncleared student? Have I built a firewall for sensitive information?