Radical Ingenuity Group White Paper – HazLoc and the CSB

Hazardous Locations and a recent CSB investigation.

The Chemical Safety Board was always a bastion of knowledge in investigating incidents in various chemical related industries, but a review of recent report highlighted an potential lack of concern/domain expertise regarding the Hazardous Locations basis of safety in one of their latest reports.

It can be found here: AB Specialty Silicones, LLC | CSB

Summary:

Soon after the hydrogen gas release started, it ignited, causing a massive explosion and fire. The explosion fatally injured four employees [Byron Biehn, Jeffrey Cummings, Daniel Nicklas, Allen Stevens], destroyed the facility's production building, and forced the company to cease some and relocate other operations until the production building could be rebuilt

So there was obviously an ignition source – *remember a leak without an ignition source is a leak – with an ignition source is an explosion.*

This was not the first time:

In April 2014, a drum containing EM 652 exploded as an operator inserted a charging wand into the drum... AB Specialty determined that static discharge from the movement of the charge pipe likely ignited the "explosive mixture that existed in the drum head space," which AB Specialty determined contained hydrogen gas.

So ignition sources are an repeating issue in this facility related to the process.. and here is a signpost to that:

*1.4 Ignition Source It was not possible to identify the specific ignition source that initiated the explosion. Multiple potential ignition sources were present in the production building, including electrical equipment, wiring, and installation methods that were not intrinsically safe. … See **Appendix D** for more information on potential ignition sources*

First concern – a common misconception of individuals 'not knowing what they don't know' is when they refer to the science of ignition source management as 'intrinsic safety' – this is only one protection concept available and there are 13 ignition source types to review, many cannot be addressed by 'I.S.'. Intrinsic safety is only one of the options and technologies in a large ecosystem. Intrinsic Safety is a term from 50 years of HazLoc but is being used more widely now and its getting diluted. Watch for that.

What do we find when we jump to Appendix D to seek the insight on the ignition sources:

> *Appendix D—CSB Blast Analysis See the CSB blast analysis at www.csb.gov on the AB Specialty Silicones investigation page. The blast analysis determined that a flammable gas cloud containing about 41–42 pounds of hydrogen could cause the observed blast damage*

No ignition sources discussed.

The report has a great diagram:

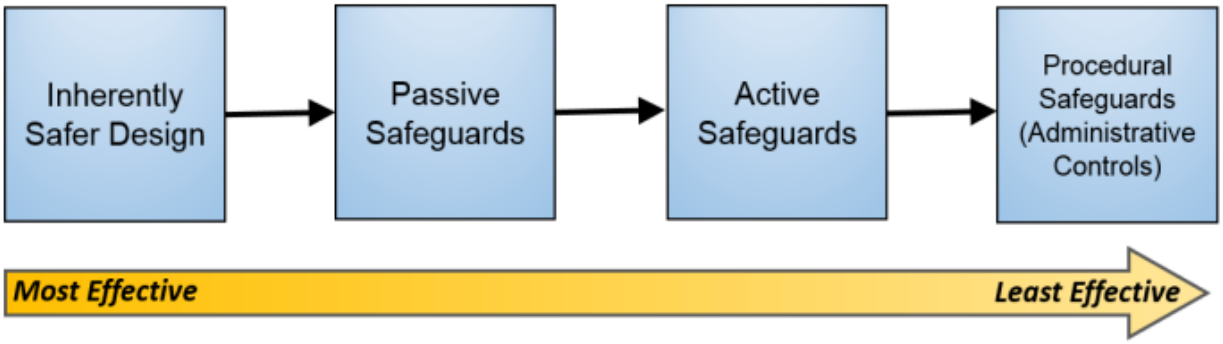

Figure 14. Hierarchy of controls, illustrating the effectiveness of controls, from most to least effective. (Credit: CSB based on CCPS [16])

Ignition Source Management sits at the left end of this value chain – Hazardous Location consideration in the front end engineering design fills the first box. HazLoc installations, inspection and maintenance cover the second box – H2 Gas 'active' detection sits in the third box.

The idea is there but the techniques are missing.

A well-established HazLoc review process is 'Substitute, Control, Mitigate' - this is a powerful tool that is underused – let me know if you want more information on this.

So it looks like the major causal factor of the ignition of H2 gas cloud causing the death of Byron Biehn, Jeffrey Cummings, Daniel Nicklas, Allen Stevens has not been addressed sufficiently.

The report focuses on the requirement of there not being an 'H2 detection system and automatic alarm' as the main correction required. Active safeguard rather than passive.

Without ignition source management, this mitigation could be interpreted as:

'Run when you hear the alarm as the H2 is likely to find an ignition source'.

The recommendations to the end user were:

> 2019-03-I-IL-R1 Develop hazardous gas detection and alarm programs ... Ensure such hazardous gas detection and alarm systems are functional at all times.
>
> 2019-03-I-IL-R2 Establish a safety management system that addresses process safety.
>
> 2019-03-I-IL-R3 Incorporate into operations and activities at AB Specialty the specific elements recommended in CCPS's Essential Practices for Managing Chemical Reactivity Hazards, which are:
>
> 1. Put into place a system to manage chemical reactivity hazards
>
> 2. Collect reactivity hazard information
>
> 3. Identify chemical reactivity hazards
>
> 4. Test for chemical reactivity
>
> 5. Assess chemical reactivity risks
>
> 6. Identify and implement process controls and risk management options Investigation Report
>
> 7. Document chemical reactivity risks and management decisions
>
> 8. Communicate and train on chemical reactivity hazards
>
> 9. Investigate chemical reactivity incidents 10. Review, audit, manage change in, and improve hazard management practices and programs

No recommendations were made regarding ignition source management of the 13 potential ignition hazards associated with a potentially explosive atmosphere. Process Safety is not the same as a comprehensive hazardous location risk management ecosystem.

You could argue the subject could be addressed in item 6, but Ignition Source Management requires much more prescriptive and directive recommendations.

None of this is new…. The rate of rise in fatalities from explosion continues to rise.

What are you doing to improve the situation?

R.I.G. has been involved in Hazardous Locations since 1988 and has trained 1000's of individuals and groups from 101 to in depth HazLoc management including Risk Based Inspections - from discrete device level to Enterprise.

Let us know how we can help to simplify and support your engineering challenges.

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