

HAZARD ALERT

Soybean Soapstock Storage Tank Explosion

In November 2015, a soybean soapstock storage tank exploded, killing a welder installing a catwalk on top of the tank shown in Figure 1. The storage tank, which was in active use, exploded when flammable gases venting from the tank were ignited during the welding operations. The resulting tank explosion blew the welder, the tank's domed top, and the partially-completed catwalk off the tank. A flash fire from soapstock vapors burned for a few seconds after the explosion.



Figure 1: Soapstock tanks (red arrow shows where worker was welding when tank on left exploded).

Background

The soybean processing facility hired a specialty subcontractor to install a catwalk to bridge the tops of the two tanks (shown in Figure 1) to eliminate the need to climb each tank separately to collect readings and measurements.

When the incident occurred, the welder (employed by the specialty subcontractor) was working alone and welding catwalk supports onto the soapstock tank. The welder was working near an open vent on the top of the storage tank.

Definition
Soapstock is used to make soap. Soybean soapstock is a mixture of heavy soybean oils, water, and chemicals.

What Led to the Tank Explosion?

Unknown Vapors and Gases

For a fire or explosion to occur, there must be a **fuel source** (in this case, flammable vapors and gases). The flammable vapors and gases causing this explosion likely came from inside the tank through the open vent. Sources of flammable vapors and gases may have included:

- Lighter oils or chemicals entrained in the soapstock from upstream processes



Figure 2: Welder performing hot work.

Welding sparks similar to Figure 2 likely dropped near the open vent on the top of the tank setting off the explosion and flash fire.

- Microbial contamination of the soapstock that was producing foam and bubbling at the top of the tank (see green arrow in Figure 3 below)

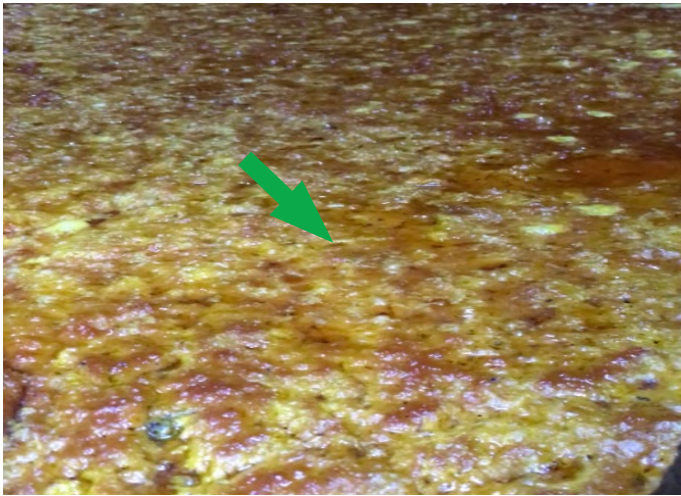


Figure 3: Soybean soapstock with bubbling and foaming.

No Job Hazard Assessment, Environmental Monitoring or Communication about Work Area Hazards

The control of ignition sources is critical at oil and solvent extraction plants. Although the facility had a **hot work program**, an evaluation of the dangers that could result from welding near the tank vent was not completed by, or communicated to, the welding specialty subcontractor. The welder was not informed of the dangers of welding in that area. Ultimately, no **hot work permit** was prepared for this job. Additionally, there was no air monitoring for explosive gases and no steps were taken to make the weld area safe by eliminating the potential fire and explosion hazards.

Hot work is any work that involves burning, welding, cutting, brazing, soldering, grinding, using fire- or spark-producing tools, or other work that produces a source of ignition.

Hot work programs are programs implemented by an employer to ensure that hot work hazards are safely addressed. Typically, such programs require a designated knowledgeable individual to conduct a job hazard assessment before work starts, consider potential dangers, ensure hazards are addressed, and then prepare a **hot work permit** granting authorization to proceed.

Corrective Measures

An effective **hot work program** includes the following:

- Prior to issuing the **hot work permit**, a job hazard assessment is conducted that includes input from the subcontractor and a facility worker knowledgeable of potential dangers at the worksite.
- The **hot work permit** is prepared prior to work beginning.
- For identified hazards, controls must be implemented to eliminate these hazards prior to work beginning.
- If hazards may develop during the work operations, routine monitoring must be conducted to ensure no hazards pose a risk to workers.
- If hazards cannot be mitigated without stopping facility operations, operations must be stopped and the elimination of hazards verified before hot work begins.
- The employer must share relevant information about ongoing operations that could create hazardous conditions with specialty subcontractors performing hot work at the facility.
- Plant personnel familiar with the process must be available to assist specialty subcontractors to make sure work areas are safe.

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Conclusion

The soybean processing facility's **hot work program** must require a comprehensive job hazard assessment completed by the welding specialty subcontractor with input from knowledgeable plant operations personnel, before work begins. Implementing an effective **hot work program** consistent with the guidelines above, can help eliminate hazards and avoid the potential for fires or explosions during hot work.

Applicable OSHA Requirements include:

General Industry:

- [1910, Subpart Q](#) – Welding, Cutting and Brazing
- [1910.252](#) – General requirements

Construction:

- [1926, Subpart J](#) – Welding and Cutting
- [1926.352](#) – Fire Prevention
- [1926.20](#) – General safety and health provisions
- [1926.35](#) – Employee emergency action plans
- [1926.150](#) – Fire protection

Consensus Standard:

- National Fire Protection Association (NFPA) 50B- Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, 1962
 - Incorporated by reference, [1910.252\(a\)\(1\)](#)

How OSHA Can Help

OSHA has compliance assistance specialists throughout the nation who can provide information to employers and workers about OSHA standards, short educational programs on specific hazards or OSHA rights and responsibilities, and information on additional compliance assistance resources. Contact your local OSHA office for more information www.osha.gov/contactus/bystate.

OSHA's On-Site Consultation Program offers no-cost and confidential services to help small and medium-sized businesses find and fix workplace hazards. On-Site consultation services are separate from enforcement and do not result in penalties or citations.

To locate the nearest OSHA Consultation office, visit: www.osha.gov/consultation or call 1-800-321-OSHA (6742).

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For additional information, see [OSHA's Workers page](#).

How to Contact OSHA

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to help ensure these conditions for America's workers by setting and enforcing standards, and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627. States enforce similar standards that may have different or additional requirements. A list of state plans is available at www.osha.gov/stateplans.

Disclaimer

This hazard alert is not a standard or regulation, and it creates no new legal obligations. It contains recommendations as well as descriptions of mandatory safety and health standards. The recommendations are advisory in nature, informational in content, and are intended to assist employers in providing a safe and healthful workplace. The Occupational Safety and Health Act requires employers to comply with safety and health standards and regulations promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, the Act's General Duty Clause, Section 5(a)(1), requires employers to provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm.



U.S. Department of Labor



Occupational Safety
and Health Administration

1-800-321-OSHA (6742) • TTY 1-877-889-5627
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