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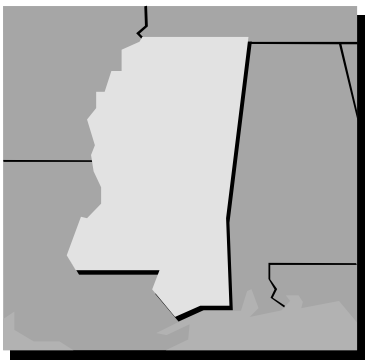
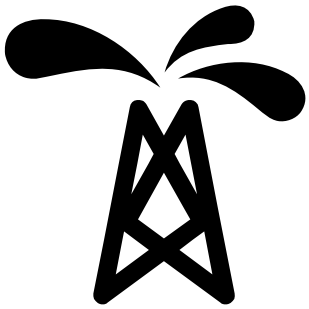
Case Study: $40K Penalty in Mississippi Oilfield Explosion

Proper safe work practices may have prevented the explosion at the Partridge-Raleigh Oilfield in Raleigh, Mississippi on Monday, June 5, 2006. Three workers died and one worker suffered broken bones while attempting to install new piping. According to the investigation conducted by the U.S. Chemical Safety Board (CSB), eye witnesses described the four workers standing on top of the production tanks, preparing for the new piping installation just before the incident occurred. The investigation determined that when "one worker lit a welding tool, explosive vapors in two of the tanks likely ignited, causing two rapid explosions that threw one worker over twenty-five feet from the tank and scattered debris as far as 130 feet away." The single survivor used fall protection equipment prior to starting his work and was found by emergency responders hanging from one of the oil tanks.



Failure to recognize the hazards posed by use of welding tools in a flammable vapor environment likely contributed to the incident at Partridge-Raleigh. Failure to manage those hazards with well-established, safe work practices could have contributed to the incident. During initial interviews with CSB investigators, Stringer (all four workers were employees of Stringer Oilfield Services) and Partridge-Raleigh employees stated that they regularly tested for flammability in oil tanks by lighting and inserting torches into open hatches on tanks prior to welding. The Occupational Safety and Health Administration (OSHA) regulations require purging of containers and piping before welding. In addition to citing the company for allowing welding in an explosive atmosphere and failure to ventilate or take steps to prevent heat or sparks from entering the piping and tanks, Stringer Oilfield Services will also be cited for failing to protect employees working on the tanks and failing to provide written safety programs for employees in confined spaces. OSHA has proposed penalties of $40,300, the company has 15 working days to appeal the citations and proposed fines.



REFERENCES

1. http://www.insurancejournal.com/news/southeast/2006/09/07/72074.htm

2. http://www.csb.gov/index.cfm?folder=current_investigations&page=info&INV_ID=61√

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Tracer ES&T *Now Offers*
ON-LINE Safety & Human Resource Training!!!

Tracer ES&T is now able to provide our customers with on-line safety training to satisfy various training requirements under the OSHA General Safety Orders. Check out our web site *(www.tracer-est.com)* for a demo of this capability. The package can also be customized to incorporate your company's policies and procedures. Contact *Jake Tilley, Jeanna Emmons, or your designated Tracer Project Representative* for more information. √

Inside This Issue...

Risk Group Update: Determining the Amount of Refrigerant Released Through a Pressure Relief Valve

A pressure relief valve (PRV) is a passive control device used to protect system components by allowing fluid to flow through an alternative passage that leads to the atmosphere or a diffusion tank. This particular type of valve is usually set off in situations of overpressurization within the equipment. When fluid flows through the PRV, pressure is decreased within the system and chances of catastrophic failure are reduced.

When a PRV is opened, it is essential to determine the amount of chemical lost. In a refrigeration system, the quantity of refrigerant lost can be found with the following data:

- pressure that causes the PRV to lift;
- absolute temperature of the refrigerant at flowing conditions (in Rankine);
- total time that the PRV was open; and
- "slope on air" of the PRV.

The relief valve's "slope on air" is its rated capacity in an air medium. This is usually given in the relief valve data provided by the manufacturer. However, it can also be found in the National Board website under the NB-18 publication[1]. Given the slope and the pressure that causes the PRV to lift, the gas volumetric flow rate through the relief valve can be calculated with the following equation:

$$SCFM = slope_V \times (P_{set} \times 1.1 + 14.7\,psia)$$

where:

P_{set}	=	inlet pressure that causes the PRV to open
$SCFM$	=	relief device capacity (ft^3/min of standard air)
$slope_V$	=	slope on air expressed as SCFM of air per psia

With the relief device capacity at hand, the air mass flow rate through the PRV can be estimated as follows:

$$C_r = SCFM \cdot \rho_{air}$$

where ρ_{air} is the density of standard air at 60°F and 1 atm (0.0763 lb_m/ft^3). The air mass flow rate, C_r, is calculated first since the PRV's slope is characterized by air flowing through the valve. Once C_r is determined, it can be converted to a refrigerant mass flow rate as shown by the equation below:

$$\dot{m}_{refrigerant} = C_r \cdot \frac{C_{refrigerant}}{C_{air}} \cdot \sqrt{\frac{T_{air} \cdot M_{refrigerant}}{T_{refrigerant} \cdot M_{air}}}$$

where:

C_{air}	=	constant for air (356)
$C_{refrigerant}$	=	constant for refrigerant (347 for ammonia)
M_{air}	=	molecular mass of the air (28.97 for air)
$M_{refrigerant}$	=	molecular mass of the refrigerant (17.03 for ammonia)
$T_{refrigerant}$	=	absolute temperature of the refrigerant at flowing conditions (R)
T_{air}	=	absolute temperature of the air (520 R)

(Continued on page 3)

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Using the refrigerant mass flow rate, the amount of refrigerant lost from the system can thus be found:

$$M_{refrigerant,loss} = \dot{m}_{refrigerant} \cdot t_{open}$$

where: $M_{refrigerant,\ loss}$ = total refrigerant mass loss through the PRV (lb_m)
t_{open} = total time that the PRV was open (min)

REFERENCES

1. National Board of Boiler and Pressure Vessel Inspectors, "NB-18 Pressure Relief Device Certifications", www.nationalboard.org, September 18, 2006.
2. The Cold Front Vol. 6 No. 2: Relief Valves and Releases, The Industrial Refrigeration Consortium, Madison, Wisconsin, August 2006. √

Storm Water Compliance Update

The wet season (October 1 to May 31) is rapidly approaching for industrial facilities in California that are required to have a Storm Water Pollution Prevention Plan (SWPPP). Facilities should remember to conduct the monthly storm water visual observations (one storm per month during the wet season) as well as conduct storm water sampling and analysis (first storm event and one other storm during the wet season).

Also, applicable facilities are required to submit their storm water annual reports by July 1. Previously, mailing a paper copy was the only way to submit the annual report. Now a discharger may either mail a paper copy to the Regional Water Board or choose to file over the Internet. The pilot version of the Storm Water Annual Reporting Module (SWARM) is now available. SWARM is designed to mimic the existing paper report and is easy to use. After filing an annual report online, SWARM provides the discharger with a printable receipt. Anyone interested in using SWARM must register with the State Water Resources Control Board in order to receive an online account and password. The steps to enroll are:

1. Print the Authorization form and instructions from the Internet ((http://www.waterboards.ca.gov/stormwtr/docs/swarm/prereg.pdf)

2. Complete one form for each facility.

3. Mail the original signed Authorization form(s) to:

CIWQS Registration
P.O. Box 671
Sacramento, CA 95812

4. Each facility will receive an email with the SWARM login instructions.

5. Login to SWARM to prepare the facility's annual report online.

Note, blank annual report forms are still available at http://www.waterboards.ca.gov/stormwtr/annualreport.html. For more information, please visit http://www.waterboards.ca.gov/stormwtr/industrial.html. √

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Come Visit Tracer ES&T at the 97th Annual RETA National Convention in Arlington, Texas, October 3-6, 2006, at Booth #319!

Heavy Equipment Show opens 10/3/06, and is free to the public on 10/3 from 5 pm-9pm.

Arlington Convention Center
1200 Ballpark Way, Arlington, TX

Tracer ES&T Anniversaries

Some of the Tracer ES&T staff have been together through several name changes: Tracer Technologies, Team Environmental Services, and now, Tracer ES&T. Our staff is the foundation for this company and we appreciate their effort and dedication.

20 Years	**Steve Kerrin**	**(10/01/86)**
9 Years	**Dan Vossler**	**(10/16/97)**
4 Years	**Jose De Leon**	**(09/04/02)**
2 Years	**Anna Levy**	**(09/20/04)**
2 Years	**John Fox**	**(09/20/04)**