Contents of Volume 2 Issue 1

New Laboratory Safety Videos ............... Page 1
Compressed Gas Regulator Safety .......... Page 1
Sulfuric Acid Accidents ...................... Page 3
Signs, Signs Everywhere a Sign ........ Page 4
Trivia Quiz for $ ............................ Page 4

New Laboratory Safety Videos
There are seven new videos located in the HBLL Resource Center (LRC). Please feel free to go view any that may concern your type of laboratory work.
1. Using Chemical Hoods—a Laboratory Safety Test
2. Radionuclide Hazards
3. Chemical Hazards
4. Emergency Response
5. Centrifugation Hazards
6. Chemical Storage Hazards
7. Glassware Washing Hazards
8. Mammalian Cell Culture Hazards
9. X-ray Diffraction Hazards
10. Assessing Risks of Toxic Chemicals

Compressed Gas Regulator Safety

Thanks to those who attended the gas regulator safety class offered in February. Arvey McFarland of Airgas presented the class. We hope to offer this class at least annually. We can also offer it more frequently if needed. Now a few words about compressed gas regulator safety for those who missed the class. I have several references if you have questions about regulator selection, training, etc.

Principles of operation—Pressure regulators are used to reduce the pressure of gas supplied from a high-pressure cylinder of gas to a workable level that can be safely used for operating equipment and instruments. There are two basic types of pressure regulators: single-stage and two-stage. Both have similar outward appearances.

Please post this newsletter in your lab for other employees and students to read. It is also available on the Risk Management Website at http://www.byu.edu/hr/risk/Newsletter.html

Single-stage pressure regulators reduce the cylinder pressure to the delivery or outlet pressure in one step. This type of regulator is recommended when precise control of the delivery pressure is not required because delivery pressure variations will occur with decreasing cylinder pressure (continued on page 2)
Two-stage pressure regulators reduce the cylinder pressure to a working level in two steps. The cylinder pressure is reduced by the first stage to a pre-set intermediate level, which is then fed to the inlet of the second stage. Since the inlet pressure to the second stage is so regulated, the delivery pressure, manually set by means of the adjusting screw, is unaffected by changes in the cylinder pressure. Thus, the two-stage pressure regulators provide precise control of the gas being consumed.

Generally, single-and two-stage regulators are equipped with two gauges: a cylinder or inlet pressure gauge, and a delivery or outlet pressure gauge. The cylinder pressure gauge has the higher-pressure range and is located adjacent to the inlet port. The delivery pressure gauge of lower pressure range is located adjacent to the outlet port. Although most cylinder regulators have two gauges, regulators used on cylinders containing liquefied gases may not have a cylinder pressure gauge because the cylinder pressure varies only with temperature as long as liquid is present in the cylinder.

Regulator Operation and Handling

Inspection
Be certain that the materials of a pressure regulator are chemically compatible with the intended gas service before installation. Inspect the regulator for the proper Compressed Gas Association (CGA) inlet connection and note the ranges of the pressure gauges. NEVER TRY TO ADAPT FITTINGS. THERE IS A REASON WHY INCOMPATIBLE FITTINGS ARE INCOMPATIBLE. Also examine the physical condition of the regulator including its threads and fittings. Do not install a regulator on a cylinder containing oxygen or another oxidant if grease or oil is present on the valve. Such combustible substances (oil or grease) in contact with an oxidant (e.g. oxygen) can be explosive.

Installing a Regulator
The regulator should be securely installed on the cylinder valve using the proper wrench and without forcing the connection. Do not use pipe dope, pipe thread or Teflon® tape on CGA connections and never use CGA connections that leak. Adapters from one CGA connection to another CGA are not to be used to connect equipment to a high-pressure cylinder. The regulator-adjusting knob should be turned in the full counterclockwise or closed direction.

Operating a Regulator
The operator, protected by safety glasses (note prescription glasses are not safety glasses unless they are ANSI Z78 approved), should stand to the side of the cylinder opposite the regulator and slowly open the cylinder valve until the high pressure gauge indicates that full cylinder pressure. Gauge assemblies have injured people by separating from the gauge.

The regulator output needle valve can be opened after it is certain that all downstream equipment is rated for pressures above the maximum regulator outlet pressure.

Open the regulator by turning its adjustment knob clockwise until the desired output pressure is indicated on the delivery gauge. After this setting is made, inspect the delivery pressure gauge to make certain that the regulator is providing constant and stable output pressure.

Check the systems for leaks by closing the downstream equipment valve, setting regulator pressure, closing the cylinder valve and turning the regulator adjusting knob one turn counterclockwise. A decrease in the high pressure gauge will indicate a leak in the fitting where the valve connects to the cylinder or high pressure gauge. A decrease in the low pressure gauge indicates a leak in the outlet fitting, low pressure gauge or downstream equipment connection. Check for the exact location by using appropriate leak detection methods. A soapy solution will provide a visual leak detection method. A product for this can be purchased at the Chemistry Central Stockroom located in the Nichols Building. The name of the product is “SNOOP.” A decrease in the high pressure gauge occurring concurrently with an increase in the low pressure gauge indicates a leak in the regulator seat. The regulator must be returned to the manufacturer or qualified individual for repair.

Close the cylinder valve when the cylinder is not in use. When the downstream equipment is not being used, close the cylinder valve and open the equipment valve to remove all pressure from the regulator. Close the equipment valve and then release all tension on the regulator-adjusting knob by turning it in the full counterclockwise direction.

(continued on page 3)
Removing a Regulator from Service
Close the cylinder valve fully and isolate the regulator by safely removing all gas from it. Consideration must be given to the type of gas in service and the safe removal of residual gas from the regulator or equipment. With no gas pressure in the regulator, remove all tension on the regulator-adjusting knob by turning it in the full counterclockwise direction. Remove the regulator from the cylinder by using the proper wrench and protect it from damage and forcing materials. Install the protection cap on the cylinder valve.

Summary for Regulator Safety
1. If you haven’t been trained on regulator use, do not use until you have been.
2. Prior to set-up, select the correct regulator, fittings, tubing, etc., for the gas and pressure application intended for use. An ounce of prevention here.
3. Make sure regulator valve is off prior to opening cylinder valve.
4. Stand to side of regulator when installing.
5. Check for leaks.
6. Do not use Teflon® tape on joints.
7. Depressurize regulator when not in use.
8. Do not use acetylene with copper tubing.
9. Do not use chlorine with cast iron pipe.
10. Do not use plastic tubing for any portion of high pressure or flammable gases.

Resources
Compressed Gas Association website
http://cganet.com/
Scott Gases
http://www.scottechatalog.com/ScottGas
OSHA

Sulfuric Acid Accidents
Contributed by Barbara Hinshaw
Recently, two accidents occurred on BYU campus with concentrated sulfuric acid (H\textsubscript{2}SO\textsubscript{4}). Sulfuric acid is a highly corrosive, water reactive, and oxidizing acid. It is a strong dehydrating agent, abstracting water from such unlikely materials as wood, paper, and sugar, leaving behind a black charred substance. Sulfuric acid is miscible with water with the generation of a great deal of heat and a contraction of volume. So, even if the concentrated acid is added slowly to water (which is the only way to dilute it to avoid excessive spattering,) there will still be considerable heat generated. The larger the volume of material involved the hotter and more difficult it will be to control. Sulfuric acid is also an oxidizing agent, albeit not a particularly strong one unless it is hot.

Concentrated sulfuric acid is a viscous, oily material. Unlike concentrated hydrochloric acid (37%) and concentrated nitric acid (70%) which are both solution with high water content, concentrated sulfuric acid is 98% acid; it is not a solution in water, but almost a pure compound.

Even 6 molar (12N) sulfuric acid can result in sever burns as we found out on October 19 when an employee in the inorganic stockroom suffered 2nd degree burns of his arm and hand as a result of contact with 5 M sulfuric acid. The screw cap closure on a 2.5 gallon container failed and the employee’s hand and arm were drenched in warm, 6 M sulfuric acid.

A second incidence occurred when the bottom of a container with 6 bottles of concentrated H\textsubscript{2}SO\textsubscript{4} unexpectedly came undone. One bottle was broken open as it hit the concrete floor. Acid splashed on the employee’s shoe. The shoes were removed in time, and injury was avoided. The acid burned a hole in the shoe above the employee’s little toe. The shoe is now used for training purposes.
job. How much material am I going to be handling? What do I have to do with the material: transfer it, dilute it, etc: What concentration is the material What type of gloves are necessary to protect myself form this particular material: Would it be wise to use a chemical apron with this material? Contact Risk Management & Safety if you have any questions.

**Signs, Signs everywhere a Sign…**

Many of you may have noticed new signs in your laboratories. One declares the type of water at laboratory sinks. It reads,

<table>
<thead>
<tr>
<th>Non-Potent Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Industrial Water)</td>
</tr>
<tr>
<td>DO NOT DRINK</td>
</tr>
</tbody>
</table>

It is very convenient to get a drink from sink water in laboratories. But if it is industrial water it is not intended for human consumption. Also, drinking and/or eating should not be allowed in laboratories.

The second sign is a new laboratory exhaust hood safety sign. This sign is yellow and will be, if not already, located on chemical exhaust hoods. This sign will not be placed on Biological Safety Cabinets (BSC) and spray finishing booths. Signs for the BSCs will be placed in the near future. You might wonder as to why they are different? Chemical exhaust hoods are designed to remove gas and vapor contaminants. Chemical Exhaust hoods are hard ducted to an exhaust ventilation system. This is the classic laboratory hood. Notice I didn’t say fume. A fume is defined as a particulate produced by sublimation as in welding fume. This sign reads as follows: BSCs are designed for use with biological specimens. Most of these types of hoods filter air and are not hard ducted to an exhaust system.

Spray finishing booths are designed for use with particulate producing processes, i.e. painting, etc. Paint spray is a mist and classed as a particulate. These types of exhaust systems have a filter to capture the airborne contaminant. If it did not have this feature, the particulate would collect/adhere to the duct work, fans, and other objects downstream of the air flow. This could reduce the airflow significantly, increase

**Trivia Quiz**

Do you want to win $5 dollars? Five safety bucks that can be use at any BYU Dining Services location. Well, you might if you answer one of the following questions correctly and I receive your answer first. Please send your answers to me at kerry_smith@byu.edu

**Question No. 1** What does the BYU Chemical Hygiene Plan (CHP) say about eyewashes and safety showers? To win, you must submit to me the three sentences and the corresponding section numbers for this section of the CHP. Hint: The CHP is located at the Risk Management Website.

**Question No. 2** What is the one chemical responsible for more deaths and accidents than any other chemical?

If you would like to submit topics for the Safety Element, have any questions regarding CHPs, or would like to have assistance in developing a CHP, please contact Kerry J. Smith, BYU Industrial Hygienist at 378-2943 (email: kerry_smith@byu.edu)