Global Safety Team (GST) Newsletter

World Chlorine Council

Be aware of the limitations of equipment.

January 2007

Volume 1

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This Newsletter is the first of what is expected to be a series of newsletters issued by the World Chlorine Council's Global Safety Team. This newsletter is being distributed by your regional association to its members in a manner that it chooses. Feedback by anyone reading this newsletter is welcomed. Feedback should be sent to your association's GST contact as listed on page 8 of this newsletter.

The World Chlorine Council's Global Safety Team is comprised of 24 members from eight trade associations and nine companies who are members of one or more of these trade associations.

About the Global Safety Team

Our Vision

The global chlor-alkali community strives to operate with zero releases, incidents and injuries.

Our Mission

The Mission of the WCC Global Safety Team is to promote the safe production, distribution, and use of chlorine among the member organizations of the WCC.
The GST accomplishes its mission by working with WCC member associations to share best practices and safety related incidents throughout the global industry.

Our 2007 Objectives

1. Modify the incident tracking program by establishing reporting tiers. Each association will decide which tier it will select. Reports would be entered into the WCC database only if the incident was reported by an association or if any media account can be verified. The media report must be verified by the association in the region where the incident was reported to have occurred.

2. Review the incident tracking forms used by the WCC and modify as needed.

3. Review the WCC Safety Commitment and modify as agreed. - rewrite, approve, implement

4. Continue the Ambassador program and follow up with recipients of the packets requesting that they provide the GST with the requested information about the recipient.

5. Enhance the participation of GST members by holding at least two teleconferences of the team during 2007.

6. The GST will meet in person at the 2007 CI Annual Meeting in Houston, Texas (March 18- 21, 2007) and the WCC General Assembly (location and date unknown).

7. The GST recommends holding a Safety/Stewardship workshop in 2007 (India) during the WCC General Assembly and urges the Management Committee support (funding of $5,000 requested for 2007). The GST supports doing this on an on-going basis. If approved, GST will commit resources to plan and conduct such workshops.

8. Issue a GST Newsletter on a quarterly basis starting in January (incidents, ambassador program, other).

9. Develop a formal contact list (GST information input and outputs) for areas of the world.

10. Share safety tools in a more formalized way –(CvN and other means)

Learning from Incidents

Necessity of HAZOP study after any process modification

Process description (see drawing)

In a chlorine plant, two electrolysis cell rooms (diaphragm technology) are producing in parallel.

New safety valves had been installed in order to automatically flush the chlorine headers of the electrolysis in case of shutdown: the valves open automatically after the shutdown, allowing air ingress in the chlorine pipe (at pressure below zero atmosphere), with an exhaust sent to the chlorine absorption system.

Circumstances of the accident

One cell room was out of operation and its chlorine header was connected to the chlorine absorption unit, with the ingress air valve open and the valve to the compression unit closed.

One of the centrifugal chlorine compressors, common to both cell rooms, was stopped for maintenance operation.

The shutdown of the compressor caused the pressure to rise in the chlorine header and the diaphragm cell room still in operation consequently shutdown.

As foreseen, the automatic valve to the compression unit closed, and the new automatic valves for air ingress and exhaust to the absorption unit opened.

At that moment a slightly positive relative pressure developed inside the chlorine headers, due to the sudden connection of the shut-down cell room to the absorption unit, already loaded with the first cell room flushed with a too high air flow.

Chlorine escaped via the air ingress valves and a worker who was nearby at that moment inhaled some of the escaping gas.

He was brought to an oxygen respirator in the control room where he remained 10 minutes before he was taken to the medical facilities of the plant.

Learning from the accident

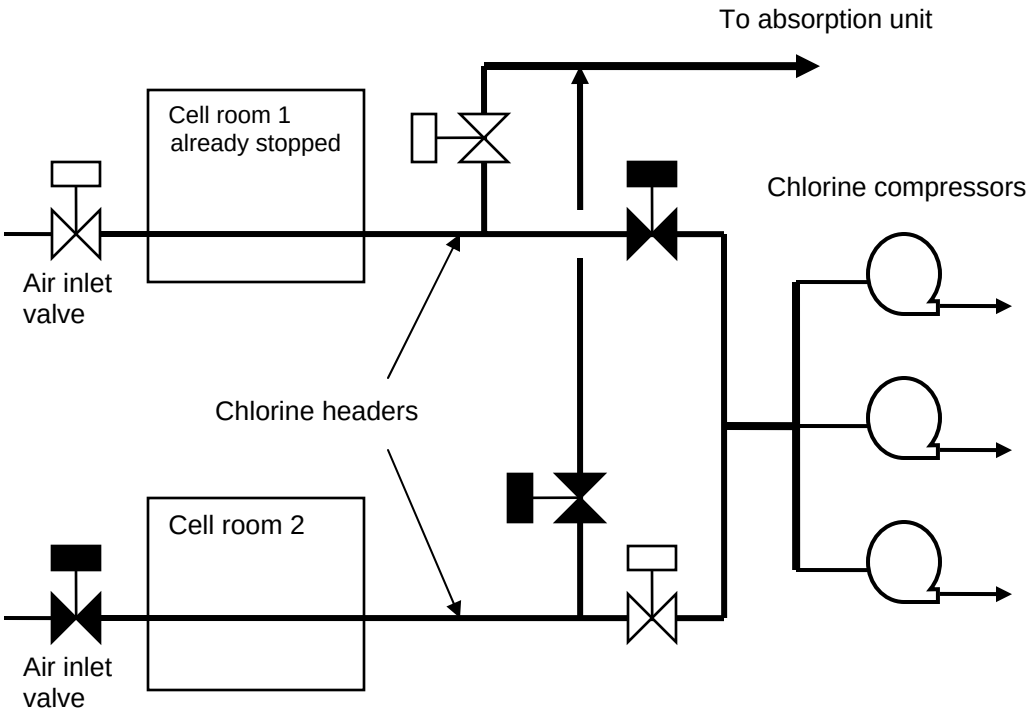
These new valves were installed to increase the safety, but the global system was not fully examined (no HAZOP study), and did not take into account all the possible situations (for example this type of maintenance operation).

A complete HAZOP study was then performed and led to the following modifications:

- increase the time delay between cell room shut down and opening of the air ingress valves,
- adjust (reduce) the ingress air flows to the value needed,
- add a logic condition in the system, checking that the pressure in the chlorine header is below zero to allow opening the air ingress valves,

The HAZOP study also revealed that the prior decision to provide emergency medical oxygen cylinders in the control room was helpful in mitigating the severity of the inhalation injury.

Situation before the shut down
(the valves in black are closed)



When the cell room 2 shut down, the “white” valve closed
and the 2 “black” valves opened

Explosion in Hydrogen Header during Start Up

Description of Incident:

A hydrogen header explosion spoiled a start up at a chlor-alkali plant. Evidence revealed that the nitrogen purge was insufficient to prevent a vacuum from occurring as the system cooled allowing air to enter the hydrogen system.

Corrective Actions undertaken:

(1) Modified cell liquor funnels to reduce the potential for sparking.

(2) Modified procedures to minimize openings of the header during shutdown to insure the nitrogen purge is sufficient.

(3) Routinely verify adequacy of nitrogen purge during shutdown.

(4) Sample hydrogen header for oxygen content prior to start up.

Lessons Learned

(1) An undetected excess of oxygen in the hydrogen header can support an explosion.

(2) An inert should be used to purge the hydrogen header prior to start up and after shutdown.

Chlorine Compression Suction Chiller Incident

Description of Incident:

Approximately 750 pounds (340 kg) of chlorine escaped when the suction chiller vessel for a chlorine compressor failed. The failure was caused by an iron-chlorine fire causing a hole in the vessel. The vessel had just been repacked and the failure occurred during the start up phase of the process. Investigators determined that the pall ring packing was contaminated with mineral oil in excess of 1000 micrograms per 1" (2.54 cm.) pall ring packing.

The packing was ordered as oil free and received as detergent washed. The packing was washed with a commercial cleaner (Oakite 129) by the vendor. The cleaning agent is a combination of carbonate, silicate, and phosphate. This type of cleaning was new as previously the packing was cleaned employing a vapor degreasing process. Lab tests were conducted on extra packing from the same batch that was used to repack the suction chiller. When exposed to dry chlorine, there was little or no reaction. However, chlorine saturated with water did react causing a chlorine-steel reaction. The investigators concluded that moisture was introduced into the system during the shutdown. The probable cause of the incident was a chlorine-steel reaction. This reaction was likely caused by elevated temperatures due to the presence of oil and water which initially reacted with chlorine. The metal surface area and the flowing (dynamic) system contributed the combustion process.

The investigators hypothesized that initially the moisture in the system formed chlorine hydrate when liquid chlorine was introduced to the suction chiller during the start up. When cell gas (100ºF or 38ºC) entered the chiller, the chlorine hydrate melted allowing for the water-oil-chlorine reaction to begin. Sufficient temperature was soon obtained to allow a chlorine-steel reaction to commence resulting in causing the packing and burning a hole in the vessel wall.

Corrective Actions Undertaken:

(1) Replaced the packing with 1 ½ inch (3.81 cm) pall rings to reduce the surface area.

(2) Used 304 SS packing instead of steel. The ignition temperature for the stainless steel is higher.

(3) Degreased the packing using methylene chloride which reduces the oil content to less than 10 microgram per piece of packing. (Note – an alternate means of degreasing can be employed.)

Global Safety Team (GST) Incident Tracking Program

The GST has two incident tracking programs to collect information on chlorine related incidents. Associations and their member companies can decide to which program it will participate.

Tier 1 - Complete Incident Reporting

Report all chlorine incidents involving

- an injury to one or more employee
- off-site consequences (off-site injuries, evacuations or shelter in place, damages of any type)
- property damage in excess of $50,000
- the issuing of a report to any governmental agency
- a credible media report

Tier 2 – Major Incident Reporting

Report chlorine incidents involving

- serious injury to one or more employees
- off site consequences (serious injury to one or more persons, evacuations or shelter in place involving more than 50 people, off-site damages in excess of $100,000)
- property damage in excess of $100,000
- a release in excess of 1,000 pounds
- significant media reporting

The goal of the GST is to have reports prepared and circulated within the WCC and its member organizations on all major chlorine incidents and on other incidents to the extent possible. Please submit any reports to your WCC GST representative as listed on page 8. This person can also provide you with additional instructions and any needed forms.

Global Safety Team Ambassador Program

What is the Ambassador program?

The ambassador program is an outreach program to new and not so new producers, users, or distributors of chlorine to provide them with safety and stewardship information pertaining to chlorine and to industry contacts primarily in countries where there is no active WCC association.

What are the Responsibilities of an Ambassador?

- ***Hand deliver the package of safety and stewardship information to your industry contact*** and tell them about the mission of the World Chlorine Council (www.worldchlorine.org) and the availability of safety information.

- ***Have your customer complete the Safety Steward Contact Data Form***. If your contact is comfortable doing so, we would appreciate it if you could have them fill out the form while you are with them so that you can clarify any questions and fax it directly to the WCC member association that gave you the package.

- ***After your visit, follow up with your source association by phone or e-mail*** advising them of your visit, the interest level of your customer, and what additional information they are interested in receiving.

What Happens Next?

The source association will contact the customer and offer to provide the following:

- Additional laminated 8 ½" x 11" Safety Tips wall charts
- An enlarged Safety Tips wall chart for their plant
- Additional safety and WCC information packets
- Up to five free safety pamphlets
- WCC Newsletter
- The association will invite the customer to join.

Ambassador Packet Requests?

Ambassador packets can be obtained by contacting the Secretariat (see page 8).

WCC Global Safety Team Association Contacts

Association	Person	E-mail
Chlorine Chemistry Division American Chemistry Council	Robert Simon	rsimon@americanchemistry.com
Chlorine Institute	Art Dungan	arthurdungan@CL2.com
Clorosur	Martim Penna	mpenna@clorosur.com.br
Euro Chlor	Jean Pol DeBelle	jpd@cefic.be
Euro Chlor	Alistair Steel	ast@cefic.be
Japan Soda Industry Association	Shigeru Moriyama	moriyama@jsia.gr.jp
RusChlor	Boris Yagud	jagud@chlorcentre.ru

Secretariat:

WCC Global Safety Team
C/o Chlorine Institute
1300 Wilson Boulevard
Arlington, VA 22209
Tel: 703-741-5770
Fax: 703-741-6068
E-Mail: fbyrne@CL2.com

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Six of the tips contained in the GST's Always- Never Poster

Always

- Maintain dew points below –40 °F (-40 °C) in systems before putting into dry chlorine services!
- Use only oil-free compressors in chlorine systems!
- Understand what your emergency plan is for the unit!

Never

- Never expose titanium to chlorine with insufficient moisture!
- Never acidify hypochlorite streams in open to atmosphere systems!
- Never flow 98% sulfuric acid at high velocities in carbon steel piping!

The full poster can be downloaded from the WCC website at http://worldchlorine.com/programs/safety_tips.pdf .