

# Global Safety Team Newsletter

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This Newsletter is published quarterly by the World Chlorine Council's Global Safety Team. The newsletter is 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 below.

The World Chlorine Council's Global Safety Team is comprised of more than 20 members from eight industry associations and nine companies who are members of one or more of these associations.

## WCC Global Safety Team Association Contacts

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These organizations translate and or post this newsletter on their member websites and/or distribute it to their members and/or employees. The Global Safety Team thanks all these organizations for their efforts to promote the safe production, distribution, and use of chlorine and related chemicals.

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## News about the Global Safety Team

### India Meeting

The Global Safety Team met in Delhi, India on October 25 as part of the World Chlorine Council's annual General Assembly. On October 24, the GST participated in a chlorine safety workshop cosponsored by the WCC, the Alkali Manufacturers Association of India, and the Indian Chemical Council. Seventy six people, including 43 from Indian chemical companies and five from the Indian government participated in the event.

At the October 25 GST meeting, attendees heard presentations on several topics of interest including

- Chlorine Training Drills - Response to a Transportation Accident (Clorosur)
- Emergency Transfer of Chlorine from a Railcar (Euro Chlor)
- Earthquake Management Issues (JSIA)
- Mercury Reduction Progress in Russian chlor-alkali Plants (RusChlor)
- Chlorine Customers Safety and Security Checklist (Chlorine Institute)

The team reviewed progress on implementing its 2007 goals and will meet by teleconference in December to agree on 2008 goals.

### Clorosur Workshops

On November 7 - 9, Clorosur held a series of workshops for its members addressing chlorine transportation and safety issues at the Casagrande Hotel Resort & Spa in São Paulo, Brazil. Martim Penna, Executive Director of Clorosur reports that 113 participants from Asia, Europe, North America, and South America attended the November 7 Transportation Congress which focused on hazardous chemicals transportation and emergency response; 75 participants attended the

November 8 Technical Seminar which focused on safety and technology issues affecting the chlor-alkali industry and 48 attended the Safety Workshop on November 9. Clorosur members from Argentina, Brazil, Colombia, and Uruguay attended the session. Martim Penna, in behalf of Clorosur, expresses his thanks to guest speakers Jean-Pol Debelle (Euro Chlor), Frank Reiner (Chlorine Institute), and Brain Skeuse (Reagents Chemicals) for their participation.

### Global Safety Team (GST) Incident Tracking Program

The GST seeks to learn about chlorine incidents and report about them in this newsletter or in its annual compilation of such incidents so we can all learn from the experience and minimize the risk of such an accident occurring again. The GST believes that the reporting of such incidents can also improve the technical

recommendations published by the WCC member associations.

Readers are urged to report all chlorine incidents to their member association per the contact list on page 2 of this newsletter as soon as practicable after an incident has occurred.

..... **Continued on page 10**

## Learning from Incidents

### 1. Fires Raise Havoc in California

#### Description of Incident:

In late October, the notorious Santa Ana winds that occur each fall in California were stronger and more deadly than usual. The winds caused several brush fires to spread and consumed hundreds of homes and other structures in the San Diego and Los Angeles areas. In one especially serious event, a water treatment facility was affected, and the building that housed chlorine for disinfecting the drinking water was seriously damaged (see photo on cover page of this newsletter). The intense heat caused the destruction of several chlorine ton containers as shown in the picture below.



The fusible plugs on all four ton containers were melted. However, note that the container on the left is breached. It is speculated that the intense heat caused portions of the contents to be heated rapidly causing the pressure within the container to rapidly rise while the areas near the fusible plugs were not yet sufficiently hot to melt the plugs. Due to the intense fires raging at the time, the chlorine was dispersed without any additional consequences.

## Learning from the accident

No report has been received from the facility where the incident occurred. At this time it remains uncertain whether sufficient steps can be taken to avoid this kind of incident or whether it must be considered an “act of God”. When reviewing their emergency response plans,

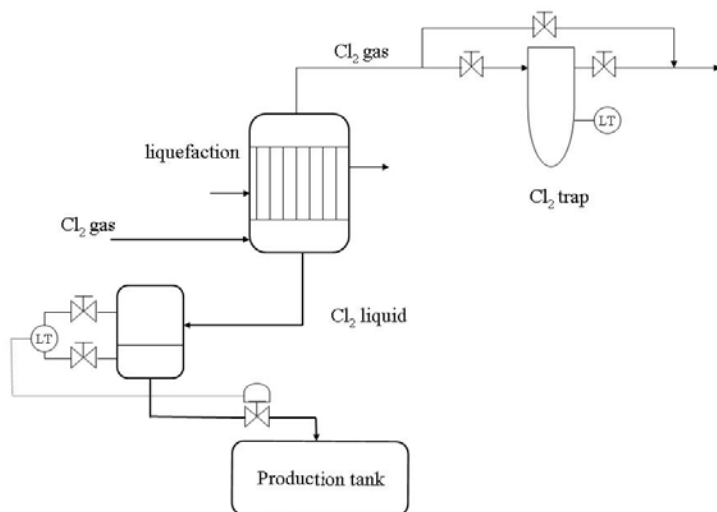
facilities are urged to evaluate responses to natural events such as field fires, earthquakes, hurricanes, tornados, floods, or other types of catastrophes that could occur in the region where the facility is located to mitigate any of the consequences.

## 2. Chlorine Emission During Plant Start-up After Maintenance

### Process Description

A chlorine liquefaction unit is equipped with small tanks to provide a hydraulic seal between the condenser and the storage tanks (see figure below). These seals avoid the risk of explosive

hydrogen/chlorine mixtures entering the production storage tanks from the liquefaction unit.



For safety reasons and in order to obtain high reliability in maintaining a liquid level, these seals are equipped with two level transmitters (only one is indicated in the figure). One of them forms part of an automatic level control loop to regulate the valve sending the liquid chlorine into the production storage tank and the other one is used as a check. Any discrepancy between the

two signals gives an alarm to the operators.

The exit gas line goes to the chlorine absorption unit, and passes through an empty safety trap, where any possibly entrained liquid drops are trapped. This tank is equipped with level and temperature detectors to alarm the operators in the event of liquid chlorine carry-over.

## Circumstances of the accident

The chlorine production and liquefaction unit had a planned shut-down for several days for modification and repairs. This included the replacement of one level transmitter on the seal tank. Due to a misunderstanding between the maintenance and the production staff, the impulse valves of both level transmitters were left closed after the transmitters were checked and the equipment was dried. Each supervisor (maintenance and production) believed the other was in charge of the final checking, and the installation was started up in those conditions.

Because a part of the safety trap was of PVC polyester reinforced construction, it was usually by-passed for the start-up of the unit (high flow of cold gas). During the first phase of the operation, when no liquid chlorine exists in the

liquefaction unit, the level control valve sending the chlorine into the production storage tank is closed manually. The operator opens it only when he sees an increase in the level measured. The level control system is then transferred to automatic control.

Since the impulse valves were closed, the two level transmitters continued to indicate zero level, even when liquid chlorine started to accumulate in the seal. Liquid chlorine filled the small seal tank and the condenser, and finally entered the pipe leading to the safety absorption unit. Since the safety trap was by-passed, no alarm occurred. Chlorine escaped via a hydraulic seal on this pipe and the plant was immediately shut-down.

## Learning from the accident

After analysis of the incident, the safety trap was immediately redesigned and fully constructed of steel, and the by-pass was removed to ensure the chlorine safety trap was always in service.

The procedures were rewritten to define clearly the operations to be performed and the responsibility of each team during such

maintenance work and start-up preparation. A check-list of all the equipment that was modified during the shut-down is now used for the final control, and the production supervisor is in charge of verifying that the production installation is completely operational before deciding to start-up.

## 3. Small Explosion in Last Drying Tower

### Description of the Incident

A preliminary report was received concerning a mild explosion inside the last chlorine drying tower. This tower is made of steel construction and 98% sulfuric acid is used to complete the drying of the chlorine before it is further processed. The plant was down for a scheduled turnaround and the tower had been purged with air and flushed with water. When trying to open the bottom manway of the tower, a small explosion occurred due to the use of a grinder to loosen up a davit holding the manway cover in

place. The preliminary investigation concluded that hydrogen was created inside the tower from the reaction of very dilute sulfuric acid with the carbon steel vessel. The hand grinder apparently created enough friction or spark to ignite hydrogen leaking out the un-bolted manway. No one was injured nor was there any property damage.

### Learning from the incident

Sulfuric acid, like other acids, can react with steel to form iron sulphate and hydrogen gas. Even 98% sulfuric acid can react to a small degree with steel. Facilities need to take appropriate precautions when working around equipment (including transportation containers)

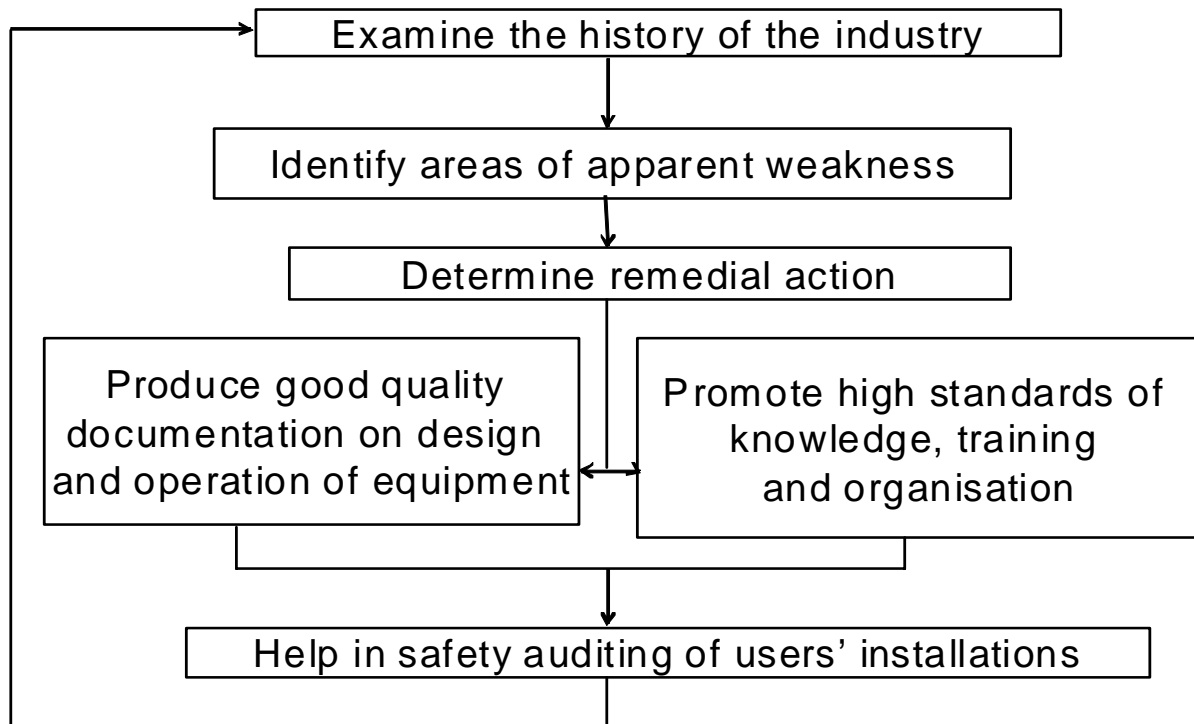
containing sulfuric acid. In addition to making certain employees are wearing the proper personal protective equipment to protect against sulfuric acid, procedures should be in place to protect against the possibility of a hydrogen explosion from occurring.

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### Decision Tree to Improve Safety Performance

One member of the GST has developed a decision tree for possible use by trade associations to improve the safety performance of their members. The GSAT will discuss this decision tree at an upcoming meeting.

Questions, comments, or concerns about the decision tree should be addressed to the GST Secretariat at the address indicated on page 2. Comments can be sent via mail, fax, or e-mail



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## Six more tips from the GST Always - Never Poster

### Always

Use only recommended lubricants in chlorine services!

Minimize flashing of liquid chlorine in case there is a high level of nitrogen trichloride (NCl<sub>3</sub>)!

Follow established procedures and review critical procedures on a schedule pre-planned for your facility!

### Never

Never allow a chlorine system to reach nitrogen trichloride (NCl<sub>3</sub>) concentrations above 20,000 ppm!

Never operate a chlorine cell with cell voltage higher than the manufacturer's recommended voltage!

Never allow dry chlorine systems to operate above pre-determined moisture levels!

The full poster can be downloaded from the WCC website at [http://worldchlorine.com/programs/safety\\_tips.pdf](http://worldchlorine.com/programs/safety_tips.pdf).

## Always - Never for Packaged Chlorine (Draft 4)

The GST has prepared a draft Always- Never Poster to highlight some key points for packaged chlorine. The draft appears below. Please send any comments concerning the draft to the GST Secretariat at one of the addresses indicated on page 2.

### Always

Always empty, vent down and externally inspect containers/cylinders before each filling! Based on the inspection, inspect the valve internals and the interior of the container/cylinder prior to refilling!

Always maintain dew points below -40 °F (-40 °C) in systems before putting into chlorine service!

Based on your experiences, establish a procedure to empty and clean containers/cylinders as needed to prevent a build up of nitrogen trichloride!

Always apply new gaskets on blank flanges on ton containers prior to reinstallation!

Always perform a final leak tightness test, verify appropriate labels have been applied and then install the valve protective cover prior to shipment!

Securely fix/anchor containers/cylinders on vehicle for transport!

Always empty, vent down and neutralise containers/cylinders before performing any maintenance!

Always share learning experiences from near miss incidents with unit personnel!

Always investigate all process safety incidents and share findings with other units!



## Never

Never allow chlorine to come into contact with organic oils or greases (unless compatible with chlorine and specified for that service!)

Never allow a chlorine container/cylinder to reach nitrogen trichloride (NCl<sub>3</sub>) concentrations above 20 mg/kg!

Never allow moisture or water to enter dry chlorine systems!

Never fill the container/cylinder with more than its specified capacity!

Never store containers/cylinder where risk of collision or fire could be present!  
Never bypass safety devices!

## Useful Links:

**Center for Chemical Process Safety (CCPS)** <http://www.aiche.org/ccps/>

CCPS has a variety of information - much of it available for free downloads - on process safety. CCPS also issues a free monthly Process Safety Beacon in a variety of languages. These one page articles are great to use for tool box safety meetings. You may sign up for a free subscription at <http://www.aiche.org/CCPS/Publications/Beacon/index.aspx>.

**Chemical Safety Board** <http://www.csb.gov/>

The US Chemical Safety and Accident Investigation Board (CSB) investigates accidents that have occurred in chemical plants in the United States. Archives of completed investigations provide details of what went wrong. The CSB has issued a safety video on reactive chemical hazards, featuring computer animations of some accidents that it has investigated which can be downloaded from its website.

### OSHA Reactives Chemicals Technical Information

The US Occupational Safety and Health Administration maintains a website devoted to reactive chemicals at <http://www.osha.gov/dcsp/alliances/reactives/reactives.html>.

**EU Safety and Health** <http://osha.europa.eu/OSHA>

This European Agency for Health and Safety at Work is focused on helping the European industry in the field of occupational safety and health, with good practices information and practical examples. A specific site is dedicated to the 19 million small and medium-size enterprises (SMEs) at <http://sme.osha.europa.eu/>

**EU Prevention, Preparedness and Response to major accidents in the chemical industry**  
<http://ec.europa.eu/environment/seveso/index.htm>

Although it is located in the "Environment" section of this EU website, this specific section deals with the application of the EU Directive to prepare for and respond to major chemical industry accidents.

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## Calendar of Upcoming Events

December 5, 2007 - **GST teleconference**

April 6 - 9, 2008 - **Chlorine Institute 2008 Annual Meeting, Dallas, Texas**

April 7, 2008 - **Tentative date for next GST meeting, Dallas, Texas**

April 15 -17, 2008 - **Euro Chlor Seventh International Chlorine Technology Conference & Exhibition, Lyon, France, <http://www.eurochlor.org/index.asp?page=732>**

..... **News About the GST - Continued from page 3**

### **GST Ambassador Program**

The ambassador program is an outreach program to provide new and not so new producers, users, or distributors of chlorine with safety and stewardship information and to strengthen networking between industry contacts primarily in countries where there are no active WCC associations. Ambassador information packets are available from your local association contact or the secretariat of the GST per the contact list on page 2 of this newsletter.

### **GST Newsletter Translations and Postings**

This publication is translated into five other languages by the following organizations:

- Portuguese and Spanish
  - Japanese
  - Russian
  - Chinese (Mandarin)
- Clorosur  
The Japan Soda Industry Association  
RusChlor  
The Dow Chemical Company