



# Line and Equipment Opening

2014 Global Safety Team- Safety Workshop

Ana Caroline Trindade

The Dow Chemical Company

# Summary

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1. Life Critical Standards
2. Definition
3. Examples
4. Exceptions
5. Past Incidents
6. Chlorine L&EO
7. Hot L&EO

# Life Critical Standard

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1. Confined Space Entry
2. Electrical Safe Work
3. Elevated Work
4. Hot Work
5. Line & Equipment Opening
6. Isolation of Energy Sources
7. Safe Work Permit
8. Hydroblasting & Pressure Washing



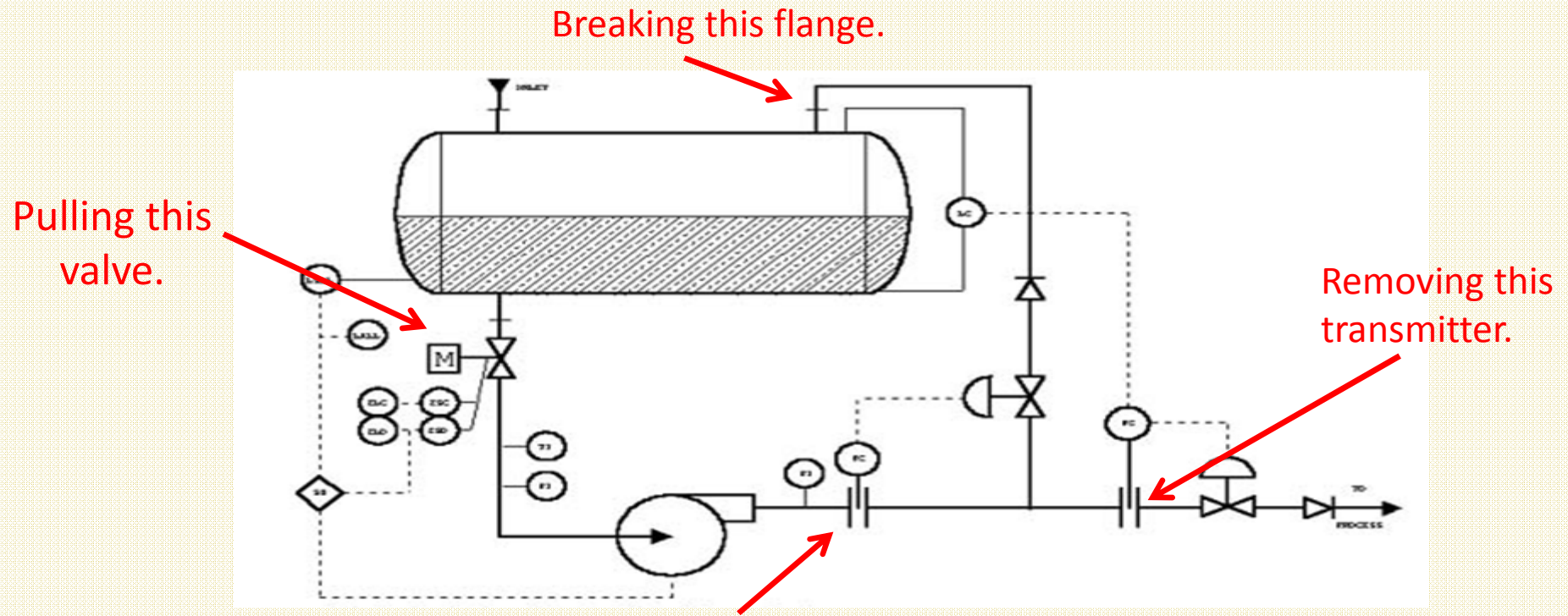
# L&EO Definition

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**A line or equipment opening begins when there is an effort to break the normal process containment. Line or equipment opening ends when either the last line break is completed or the process equipment is verified to be free of process hazards and removed from its normal location.**

- The act of opening a process or a part of a process to the atmosphere.
- The removal or opening of equipment when that equipment is still connected to the process in any manner.
- The act of opening lines/equipments or performing line breaks on equipments which are in their normal place/location, even after the equipment has been isolated from the process
- The act of opening lines/equipment associated with construction/demolition activities if in close proximity to in-service lines/equipment

# L&EO Examples



Pulling this transmitter is a LEO even after all the other L&EO's were done.

# L&EO Examples



Changing filters



Disconnection of hoses if connected to process/chemical lines



"Hot bolting"  
(replacing bolts on a flange when the line is still in service)



Sampling activities which are not exempted

# Exemptions



Using air, nitrogen or water below 60°C from stations that are intended to be opened to the atmosphere.



Laboratory and "bench-scale" equipment



Opening lines and/or equipment under construction which have never been used



Heating, ventilation and air conditioning ductwork (HVAC, NOT local ventilation or process vents)

Routine sampling/draining activities which do NOT require task based PPE, in addition to work area access PPE (not hazardous sampling)

# Incident Review

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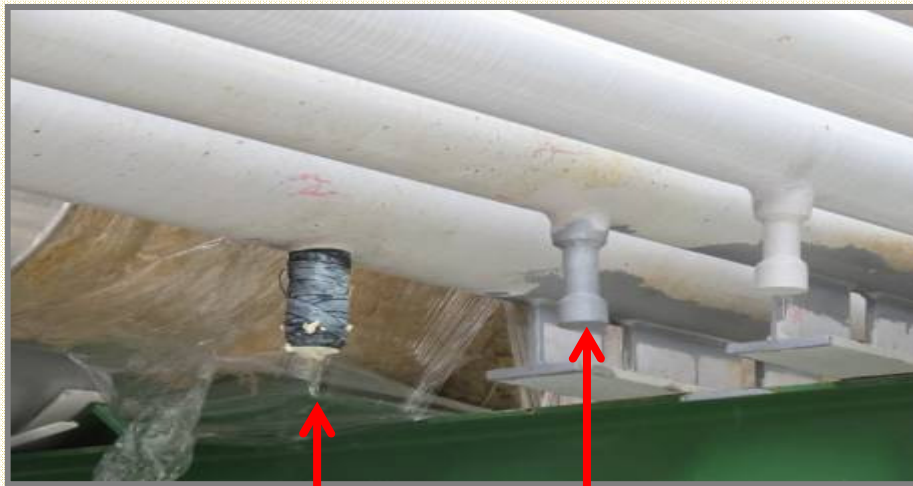
A worker from the off-plot general contractor started grinding off a welded cap on our “in-service” 8” ethylene line, while the intent was to do this work on the “under construction” 4” butene line. Ethylene leaked through the partially removed weld and caught fire, resulting in burns on the chest, face and left arm of the worker

- 2nd degree burns, 2 days off,
- Process Safety Incident
- 96 kg of ethylene



# Incident Review

Incident during construction: **release of Ethylene**



**Butene line drain –  
To be grinded on**

**In-service ethylene line drain –  
Grinded on by mistake**



# Incident Review

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## Main ROOT CAUSES:

- Lack of supervision
- Cap to be removed was not marked
- Work location was not well prepared

# Chlorine L&EO

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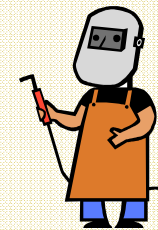
**Release**

**Operation**



**Opening**

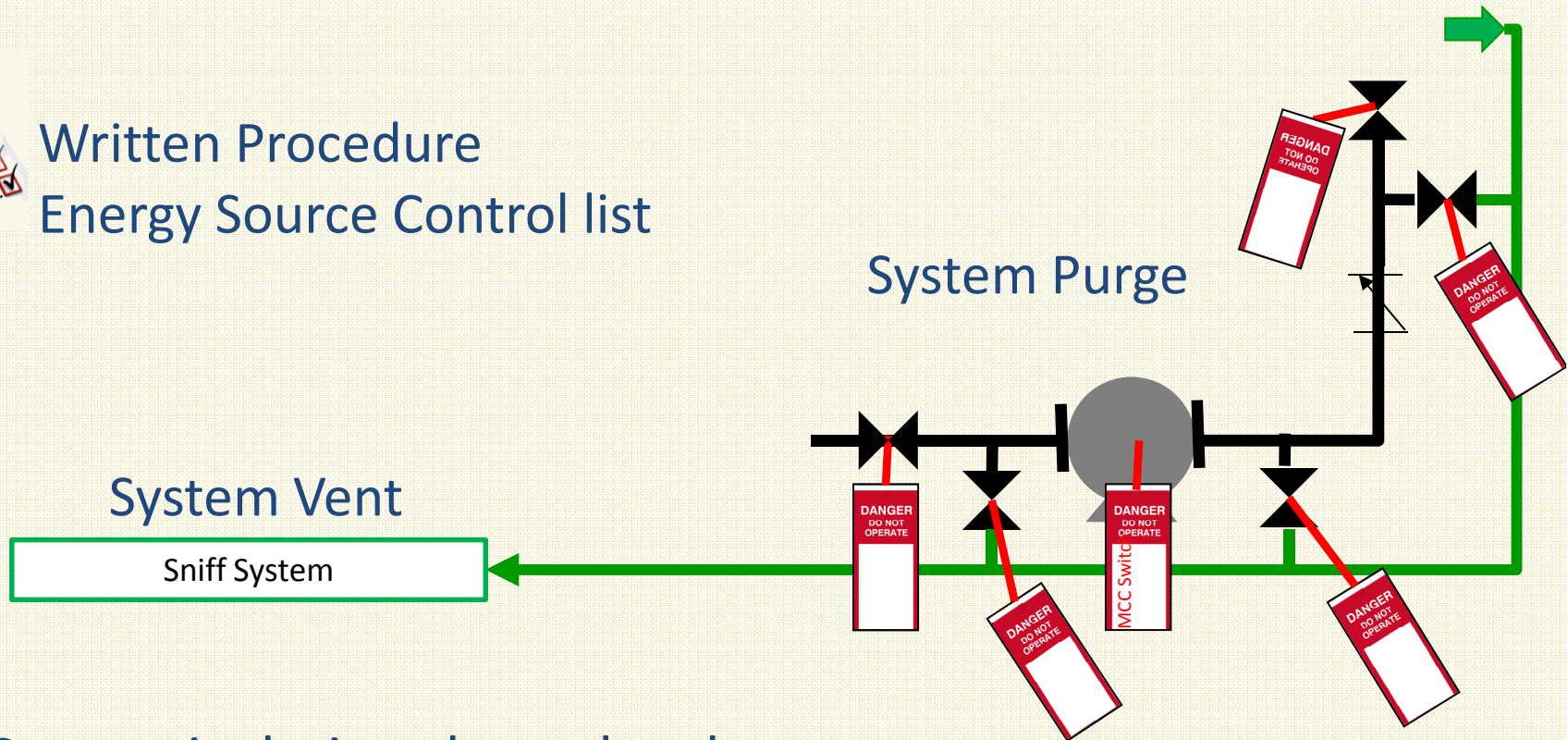
**Maintenance**



# Release - Operation



Written Procedure  
Energy Source Control list



System isolation through valves  
Isolation of Energy Sources Standard

# Release - Operation

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## System Purge

- Dry Air (Dew Point = -40C)
- Nitrogen – Chlorine Pipeline
- Sniff System – Compressor suction recovery (vacuum system)

## Chlorine Removal Confirmation

- Ammonium Hydroxide
- Portable chlorine detector

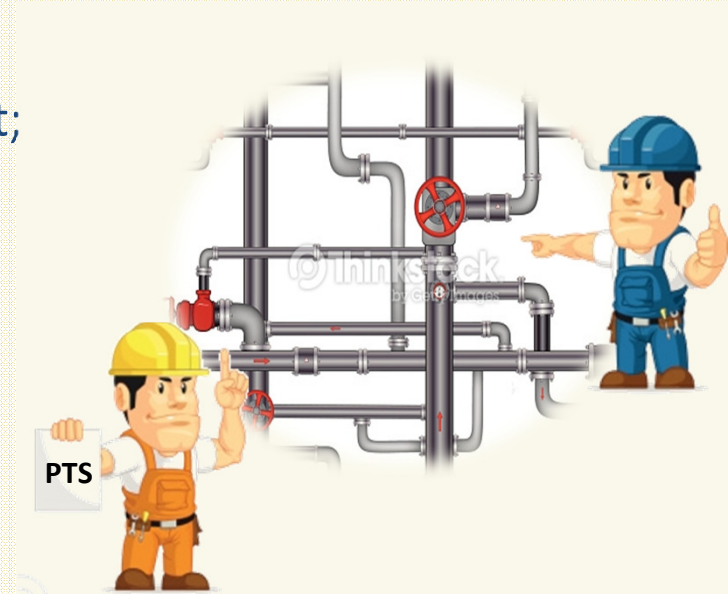
# Interface Operation/Maintenance

## Safety Work Permit

## Energy Source Isolation

## Positive Identification

- Operations Facility Representative present to point out the exact location of the break as each break is initiated;
- Temporary marking/tagging each break point;
- Line breaking: mark the local with red tape



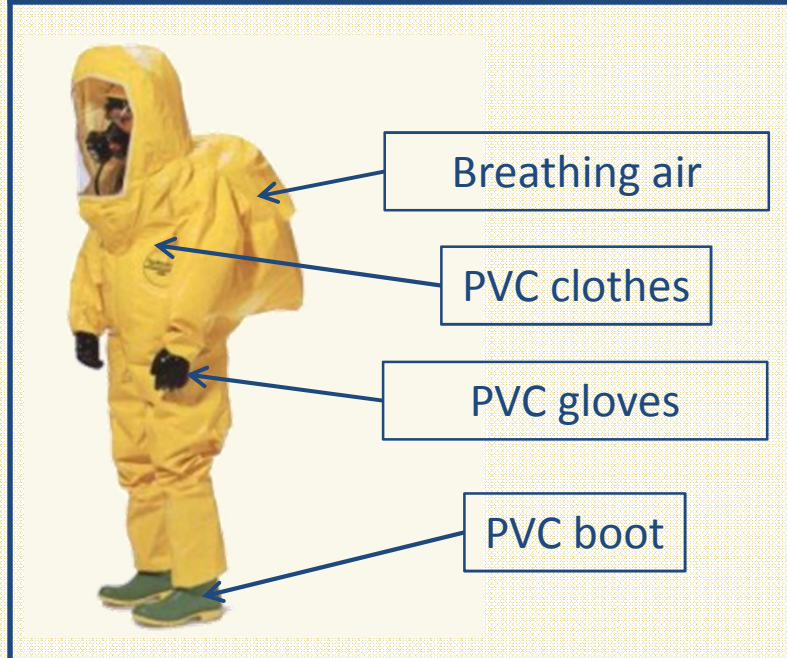
# Opening - Maintenance

## Personal Protective Equipment

- Hard hat
- Google
- Steel toe boot
- Ear Plug
- Gloves



## Especial Protective Equipment



# Opening - Maintenance

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## Maintenance Procedure

- Risk Analysis

## Breathing air during the opening

- Downgrading of PPE may be granted by the permit writer or their designee by writing on the permit.

## After Opening

- Line should be blinded or closed as soon as possible.  
Chlorine line opening is not done when it is raining.
- Before closing the line or equipment it is dried with air.



# Hot L&EO

The act of opening a line or equipment, for maintenance or servicing activity, that is **not isolated from a hazardous energy source**; such as when there is no isolation device or when the isolation devices are not fully isolating the energy source.

Hot L&EO's require

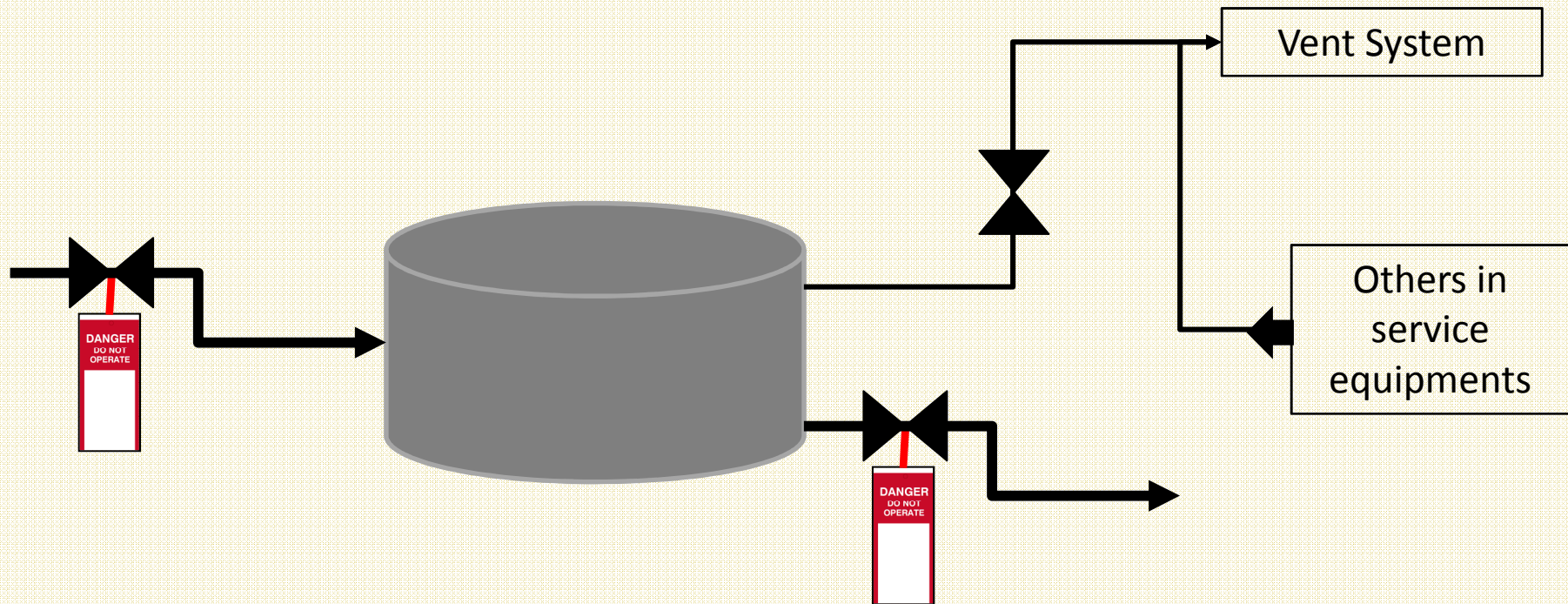
- CRITICAL L&EO Procedure,
- Additional leadership approvals and
- Completion of the additional hazard analysis.



Hot L&EOs shall only be executed when all of the following conditions are met:

- Continuity of service is essential
- Shutdown of the system is impractical
- Isolation of the energy source could increase the likelihood of an EHS unplanned event.

# Hot L&EO - Example



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# WORLD chlorine council<sup>®</sup>

Ana Caroline Teixeira Trindade

Improvement Engineer

Dow Chemical – Chlor/Alkali Plant – Candeias /Bahia

[trindade@dow.com](mailto:trindade@dow.com) / 7136495126