



## **FY23/Feb/PSM/01/Loss of containment/FN**

### **Description of incident:**

A Mechanical Learner Artisan and an Electrician were accidentally exposed to EDC (Ethylene Dichloride) from GA1401A (feed EDC pump) discharge manual isolation valve gland packing.

### **What went wrong?**

#### **Underlying causes**

- A fitter (in training) reported that he was doing preparation (scoping) before installation of the packing, that is, checking the gland size prior to determining the need for a permit to start the task.
- The removal of the packing follower was determined as an acceptable risk during preparation for the task to be executed later.
- During the process of trying to stop the leak, the artisan (in training) inadvertently disturbed the valve gate, resulting in an unintended escalation of the release.

#### **Root causes**

- (RC1) The artisan (in training) intended to merely do preparation scoping, and not to complete the primary task at this stage (Human failure). The aforementioned preparation, in lieu of preparation, followed by immediate task execution, attributed to the artisan's (in training) lack of consideration for his actions, that is, loosening of the gland guide to determine the size of packing material required to complete the primary task later. The artisan's (in training) unintentional misapprehension of the risk (low perception) involved in his actions may primarily be attributed to the following factors:
  - (RC2) Training on the installation of gland packing (done at the training centre) is conducted in a safe/isolated environment, without direct supervision. This is due to a general aversion to, and mitigation of risk of injury if the training is done on a live simulation plant. Additionally, the content of the training material, for reasons unbeknown to the investigation team, does not align perfectly with the reality of how the task is conducted on an operational plant. (Management System failure – Training and Risk Management).
  - (RC3) The task of packing of a valve gland is not currently part of the task risk assessments for the Mechanical team. There is a need for including a standardised, documented process/ procedure for the packing of glands which covers the task from preparation to execution and completion. (Management System failure – Learning and Risk Management).
  - (RC4) The perceived control of “learners never doing work without supervision” appears to be misunderstood, due to the following factors:
    - Difference in interpretation of supervision. In the learner training book, the supervisor signs that he/she will ensure general supervision. Per definition, it is simply irrational and a practically impossible expectation to have direct supervision for each task which a learner will perform, and hence, learners may be allowed to do certain low risk tasks without direct supervision.

- During periods of limited availability of maintenance artisan resources (due to leave, acting arrangements, vacancies and/or new employee appointments), there is currently no documented process on which tasks can be allocated to be done alone by the learner. Another practical approach may be considered to entrench a culture where learners can request supervisory assistance for tasks that the learner perceives as high risk.
- Process Learners are allowed to perform specific tasks alone once they have signed off the applicable plant module and is declared competent to perform that specific task. There currently is no equivalent system for maintenance learners.

## **In the case of SEO: What do we need to do to prevent recurrence?**

### **Control improvement recommendations**

- The learning programme for learners need to be reviewed to consider the following:
  - The re-instating of the live simulation plant needs to be reviewed. Performing maintenance tasks on a live simulation plant with non-hazardous product will give learners a more realistic experience when doing certain tasks. When performing the task incorrectly, the learner will have water leaking from the equipment and they will realise the mistake without the dire consequences when doing it in a live production environment.
- The plant needs to develop a programme to gradually introduce and declare learners competent to do tasks, taking into consideration the risks. This can entail the following:
  - Do a task risk analysis and assign a risk ranking for every task (low, medium, and high-risk tasks).
  - Controls will then need to be identified appropriate to the level of risk, i.e. for high-risk tasks a written safe work procedure must be in place, the learner must be trained in it and the task must be performed under direct supervision of an artisan, if required. For a low-risk task the artisan can show the learner how to do the task, let the learner do the task once or twice under direct supervision and once demonstrated competence, be allowed to do the task without direct supervision (tasks like topping up oil etc.). This will include a culture of learners requesting supervision and/or assistance with tasks which the learners, after training still perceives as difficult and/or high risk.
- Based on the observed alarm response philosophy to the pre-alarms logged by the system (from LEL detectors) at the time of the initial release a review of the set points and appropriate response actions to alarms should be carried out. Additionally, the lag time from the toxic detection alarms (20min before water was sprayed and five hours after water was sprayed) should be reviewed to determine whether sufficient protection is in place.
























# SASOLBURG & EKANDUSTRIA OPERATIONS

Safety Health and Environment

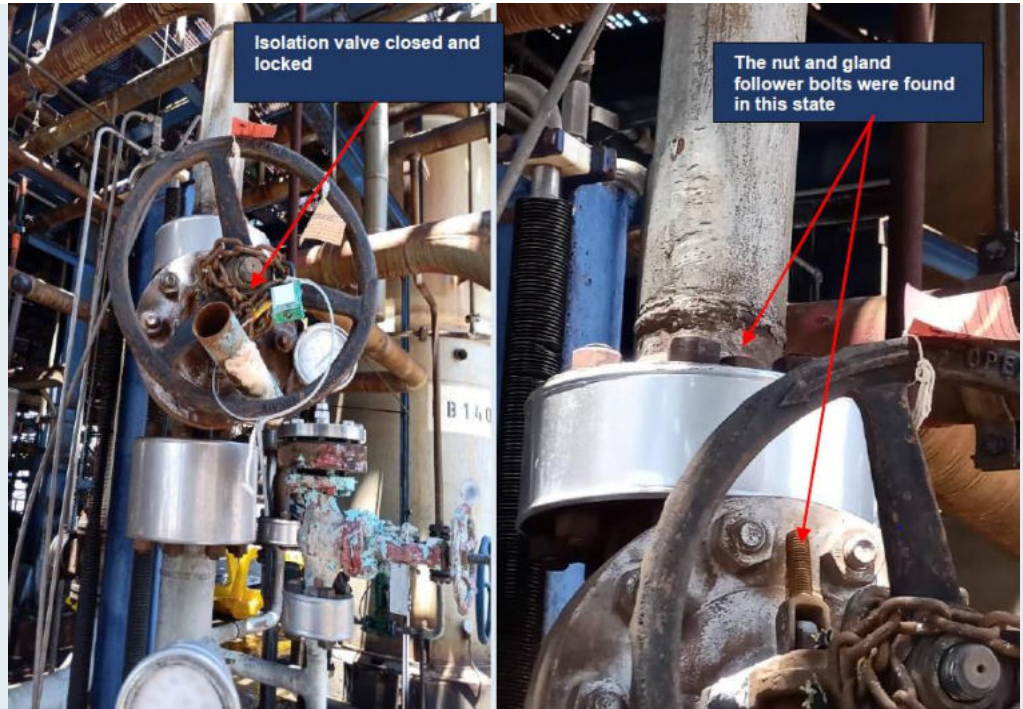
SO-SHE-LOG-015

## SHE incident learnings logsheet

### OME SHE Learning

<b>Incident number</b>		5454										
<b>Operating Entity</b>		Sasolburg & Ekandustria Operations										
<b>Date of incident</b>		6 February 2023				<b>Severity of incident</b>		FER = Significant Occupational Safety = LWDC x 2 Environmental = Minor				
<b>Incident type</b>	Occupational Safety	Process Safety	Environment	Product Transportation	Health	Security	Equipment Damage	PSF				
	X	X	X									
<b>Relevant Life Saving Rules (LSRs)</b>												
		X										
<b>Relevant Process Safety Fundamentals (PSFs)</b>												
			X				X					
<b>Key Undesirable Event (KUE)</b>	KUE 1: Major loss of containment of hazardous material and associated chemical energy. KUE 5: Significant contamination of the environment (land, air, water).											
<b>Description of the incident</b>	A Mechanical Learner Artisan and an Electrician were accidentally exposed to EDC (Ethylene Dichloride) from GA1401A (feed EDC pump) discharge manual isolation valve gland packing.											

Add pictures



## Underlying and root causes

### Underlying causes

- A fitter (in training) reported that he was doing preparation (scoping) before installation of the packing, that is, checking the gland size prior to determining the need for a permit to start the task.
- The removal of the packing follower was determined as an acceptable risk during preparation for the task to be executed later.
- During the process of trying to stop the leak, the artisan (in training) inadvertently disturbed the valve gate, resulting in an unintended escalation of the release.

### Root causes

- **(RC1)** The artisan (in training) intended to merely do preparation scoping, and not to complete the primary task at this stage (Human failure – IF1, IF2, IF3, IF4). The aforementioned preparation, in lieu of preparation, followed by immediate task execution, attributed to the artisan's (in training) lack of consideration for his actions, that is, loosening of the gland guide to determine the size of packing material required to complete the primary task later. The artisan's (in training) unintentional misapprehension of the risk (low perception) involved in his actions may primarily be attributed to the following factors:
  - **(RC2)** Training on the installation of gland packing (done at the training centre) is conducted in a safe/isolated environment, without direct supervision (OF2). This is due to a general aversion to, and mitigation of risk of injury if the training is done on a live simulation plant. Additionally, the content of the training material, for reasons unbeknown to the investigation team, does not align perfectly with the reality of how the task is conducted on an operational plant. (Management System failure – Training and Risk Management).
  - **(RC3)** The task of packing of a valve gland is not currently part of the task risk assessments for the Mechanical team. There is a need for including a standardised, documented process/procedure for the packing of glands which covers the task from preparation to execution and completion. (Management System failure – Learning and Risk Management (WF2)).
  - **(RC4)** The perceived control of "learners never doing work without supervision" appears to be misunderstood, due to the following factors (OF2):
    - Difference in interpretation of supervision. In the learner training book, the supervisor signs that he/she will ensure general supervision. Per definition, it is simply irrational and a practically impossible expectation to have direct supervision for each task which a learner will perform, and hence, learners may be allowed to do certain low risk tasks without direct supervision (WF2, OF2).
    - During periods of limited availability of maintenance artisan resources (due to leave, acting arrangements, vacancies and/or new employee appointments), there is currently no documented process on which tasks can be allocated to be done alone by the learner (WF1). Another practical approach may be considered to entrench a culture where learners can request supervisory assistance for tasks that the learner perceives as high risk.
    - Process Learners are allowed to perform specific tasks alone once they have signed off the applicable plant module and is declared competent to perform that specific task. There currently is no equivalent system for maintenance learners (WF2, OF2).

### Key learning and control improvement recommendations

#### Learning

- Execution of all work should not commence without authorisation.
- Ensure that learners understand the difference between preparation and execution of work and the associated requirements for each.
- All individuals must report to the control room/permit office before entering the plant.
- Ensure that ambulances are guided to ambulance points and not taken into classified areas.
- Ensure that injured person is decontaminated before being transported to the Medical Centre.
- Ensure that a plan is in place to decontaminate a person that is unconscious.
- In absence of an Area Emergency Controller (AEC), ensure that the most senior employee on site understand and fulfil the role of an AEC.
- Practical emergency exercises can add more value to emergency scenarios.
- Ensure that the KUE critical controls performance criteria effectively manage the relevant critical control.

#### Control improvement recommendations

- The learning program for learners need to be reviewed to consider the following:
  - The re-instating of the live simulation plant needs to be reviewed. Performing maintenance tasks on a live simulation plant with non-hazardous product will give learners a more realistic experience when doing certain tasks. When performing the task incorrectly, the learner will have water leaking from the equipment and they will realise the mistake without the dire consequences when doing it in a live production environment.
  - The plant needs to develop a program to gradually introduce and declare learners competent to do tasks, taking into consideration the risks. This can entail the following:
    - Do a task risk analysis and assign a risk ranking for every task (low, medium, and high-risk tasks).
    - Controls will then need to be identified appropriate to the level of risk, i.e. for high-risk tasks a written safe work procedure must be in place, the learner must be trained in it and the task must be performed under direct supervision of an artisan, if required. For a low-risk task the artisan can show the learner how to do the task, let the learner do the task once or twice under direct supervision and once demonstrated competence, be allowed to do the task without direct supervision (tasks like topping up oil etc.). This will include a culture of learners requesting supervision and/or assistance with tasks which the learners, after training still perceives as difficult and/or high risk.
    - Based on the observed alarm response philosophy to the pre-alarms logged by the system (from LEL detectors) at the time of the initial release a review of the set points and appropriate response actions to alarms should be carried out. Additionally, the lag time from the toxic detection alarms (20min before water was sprayed and 5 hours after water was sprayed) should be reviewed to determine whether sufficient protection is in place.

### Identification of standard or good practice related to the incident

- The Electrician was quick to respond to the emergency by calling for help.
- Employee assistance program initiated.
- Ambulance response time was commendable.

To prevent future incidents, it is recommended that this incident learning is appropriately shared and implemented by relevant persons in your Operating Model Entity, where applicable.

Together towards ZERO HARM and SUSTAINABILITY