CDOIF

Chemical and Downstream Oil Industry Forum

Guideline

Terminal Loading Operations Hazard Awareness

Foreword

In promoting and leading on key sector process safety initiatives, CDOIF has developed through its members a guideline on hazard awareness during tanker loading operations at distribution terminal loading racks.

It is not the intention of this document to specify the training or competency needs of drivers or distribution terminal staff, nor replace any existing corporate policies or processes. The intent is to provide a reference for those organisations developing or wishing to review their existing distribution terminal loading operational training and competency needs.

There are no limitations on further distribution of this guideline to other organisations outside of CDOIF membership, provided that:

1. It is understood that this report represents CDOIF's view of common guidelines as applied to hazard awareness during distribution terminal loading operations.
2. CDOIF accepts no responsibility in terms of the use or misuse of this document.
3. The report is distributed in a read only format, such that the name and content is not changed and that it is consistently referred to as "CDOIF Guideline – Terminal Loading Operations Hazard Awareness".
4. It is understood that no warranty is given in relation to the accuracy or completeness of information contained in the report except that it is believed to be substantially correct at the time of publication.

This guidance is not intended to be an authoritative interpretation of the law; however Competent Authority (CA) inspectors may refer to it in making judgements about a duty holder's compliance with the law. This will be done in accordance with the CA's published enforcement policies (refer to www.hse.gov.uk/pubns/hse41.pdf) and it is anticipated that this document will facilitate a consistent national approach.

It should be understood however that this document does not explore all possible options for hazard awareness training, not does it consider individual site requirements – Following the guidance is not compulsory and duty holders are free to take other action.

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1. Executive Summary

A number of overfilling incidents have occurred during the loading of gasoline into road tankers. Overfilling has occurred due to the failure of people and equipment, resulting in an uncontrolled flow and significant quantities of gasoline being lost from containment[1]. In each case there were unrecognised deficiencies in the architecture of the loading system which were exposed by a single failure. The deficiencies in the loading system have included the inability of the emergency shutdown system to stop gasoline flow. The majority of these occurrences were due to failure of the flow control valve.

Personnel have been exposed to risks of serious injury during overfilling incidents due to their presence in the spill area. In some cases personnel have purposely entered the spill area during attempts to diagnose faults and to stop the flow of gasoline.

A working group was commissioned under CDOIF to develop a guideline for hazard awareness during terminal loading operations. This guideline is not intended to be prescriptive in defining the individual training and competency needs, but aims to raise awareness within industry of existing good practice, and highlight where appropriate key areas against which duty holders may review their existing systems.

A second working group was commissioned to look into the architectures of overfill prevention systems, this guidance can be found in the CDOIF publication entitled 'CDOIF Guideline – Automatic Overfill Prevention Systems for Terminal Loading Racks'.

Note 1

Each tank compartment's overfill prevention sensor is set to provide ullage of not less than 150 litres between the point of it being tripped and overfilling. This is to ensure that all the product passed by the gantry flow control valve from the triggering of the overfill prevention sensor until flow is ceased will be contained within the compartment (even if the event is triggered at the maximum flow rate)

Note that the overfill prevention system plays no part in ensuring that the tanker is not overloaded nor in ensuring that the maximum degree of filling (ADR 4.3.2.2) has not been exceeded

2. Scope

This document provides guidance to help in raising hazard awareness of all those involved in filling operations at fuel distribution terminals.

Those involved in filling operations can be defined as:

- Drivers – employed through hauliers or directly with oil companies
- Distribution terminal staff and contractors.

This guideline should not be considered a full and comprehensive plan of training or competency requirements, but instead provide an overview of good practice for

- Raising awareness of hazards
- Recognising hazardous scenarios
- Dealing with an incident

Normal filling operations are out of the scope of this document. It is assumed that drivers have the necessary training and competency in the operation of the vehicle and its connections to the distribution terminal loading equipment.

For the purposes of this guidance overfilling means filling a compartment to the point that gasoline flows out of that compartment, for example into a vapour recovery system or through a pressure relief valve.

3. Distribution Terminal Loading Operations

3.1 Loading Rack Equipment

During normal operation, the distribution terminal automation system will transfer product into the tanker compartment, automatically stopping the flow of fuel when the preset volume has been transferred.

The introduction of an overfill prevention system greatly reduces the risk of an overfill. Typically these systems will automatically close a solenoid valve located on the loading rack on detection of any of the following conditions:

- High level detected by the earth/overfill prevention system
- High level in the vapour recovery knock-out pot
- Manual initiation via Emergency Shut Down (ESD) button

The override of these automated systems should be prohibited unless for planned maintenance or repair.

Further information on the design of overfill prevention systems can be found in the CDOIF publication 'CDOIF Guideline – Automatic Overfill Prevention Systems for Terminal Loading Racks'.

Should an overfill or other spill occur, it may be necessary for the driver, or other distribution terminal personnel to take action. Consideration should be given to the following:

- Installation of Emergency Shut-Down (ESD) activation points which are connected to the overfill prevention system. ESD activation points should be positioned and signed appropriately.
- Installation of audible/visual alarms which are activated on initiation of the ESD.
- Installation of Closed Circuit Television (CCTV), with images fed to the Central Control Room (CCR). The CCTV may provide a further mechanism by which a spill can be identified remotely by distribution terminal personnel.
- Installation of a loudspeaker system at each of the loading racks allowing two way communications with the CCR. The loudspeaker system should be positioned appropriately.
- Training of personnel to ensure that they remain vigilant during loading operations (refer to sections 3.2.1, and 3.2.2 for further information).

3.2 Loading Rack Processes

Loading rack processes can be complex, and may well differ from site to site even where those sites are owned and operated by the same company. Understanding how to use the equipment, and the procedures to follow should an incident occur or be suspected is critical to maintaining a high level of safety.

3.2.1 Training

Training is used to provide all those involved in the loading process at a distribution terminal with the necessary skills and knowledge to understand the safe operation of the loading system, emergency procedures, and occupational health and safety requirements. Operators should have processes in place to validate the effectiveness of these training programmes.

Where drivers have not completed a terminal's normal induction procedures (for example "spot loaders") they should be supervised throughout the loading process by a suitably qualified member of the terminal staff.

Reference should be made to the relevant standards, guidance and legal requirements when developing, maintaining and delivering competence based training. Consideration should be given to the following:

- Adopting a standardised training program for companies operating multiple sites to ensure commonality of processes.
- Local differences between sites where standardised training programmes have been adopted; for example the location of ESD push buttons.
- Providing information on how overfills can occur, and how early signs and potential causes can be identified. For example:
    - filling a compartment that already contains fuel that the driver is unaware of or does not take account of,
        - Known returns, where the customer did not take delivery
        - Unknown returns, due to delivery system failure or driver error
    - filling the wrong compartment,
    - failure of equipment intended to automatically stop fuel flow
- A clear procedure of what to do in case of overfill
- A clear procedure of what to do in the event of an ESD and/or Alarms
- Descriptions of the fuel types handled by the distribution terminal Sources of ignition. Examples of what can happen when these are ignited, distinguishing the special hazards presented by gasoline. Subject to risk assessment and the establishment of suitable protocols, these should be accompanied by demonstrations. The use of actual video evidence from incidents can also be used to reinforce safety messages.
- The use of video (for example CCTV footage) evidence may also be used to highlight unsafe practices, for example walking through product spills.

- Recognising the signs that overfill has occurred, through sensory detection and through identification that the automation has not operated as expected (for example meter overrun).

- The importance of reporting any loading problems, near misses and equipment defects to the terminal control room and/or tanker operating company. For example, an overrun of a preset during a loading procedure may be an indication that a flow control valve requires maintenance.

- Positioning of the vehicle. A vehicle parked too close or too far away from the loading gantry may cause manual handling issues when connecting and disconnecting, but could also place undue stress on loading arms and couplings leading to premature failure.

3.2.2 Maintaining Competency

Training is essential in highlighting the hazards associated with filling operations, however it should not be seen as a single activity that needs to be performed only once for new drivers, staff or contractors. Maintaining a high level of competence is an important factor in ensuring a high level of hazard awareness. Consideration should be given to the following:

- Repeating training at pre defined intervals for all personnel.

- Providing refresher training for those who have not visited the distribution terminal for a significant period of time, irrespective of the defined interval for repeat training.

- Periodic assessments to ensure operational tasks are carried out correctly (for example rack loading). This should include an assessment of what to do following overfill or activation of an ESD and/or other alarms.

- Utilising safety observations techniques to ensure correct procedures are being followed. Where unsafe practices are observed, additional training needs should be identified where appropriate.

- The use of regular tool-box talks and where appropriate periodic questionnaires (for example safe unsafe act [SUSA] reporting) to verify that competency has been maintained. Such techniques may also highlight deficiencies in the training program, or areas were further additional training is required.

- A periodic review of the training program to ensure that it is still relevant to current processes and legislation, and takes account of any trends identified during safety observations, tool box talks and assessments.

- Promoting shared learning between companies and other relevant industry sectors, for example through trade association initiatives.

3.2.3 Dealing with a Hazard

Training should provide the necessary information for drivers, staff and contractors at a distribution terminal should overfill occur during a filling operation. Unsafe acts may be due to safety culture issues with those involved in loading activities, rather than deficiencies in training programmes. Good communication and understanding between all parties involved in loading operations should be promoted at all levels. Key messages should include:

- Promoting a 'no blame culture' for initiation of ESD. If there are doubts concerning the equipment or the loading activity the first action should always be initiate the ESD.
    - If loading has not stopped automatically by the preset volume being reached, or via the earth/overfill protection system, the most appropriate action to take is to initiate the ESD.
    - Initiation of the ESD at the first signs that the loading process has not stopped automatically may ensure that overfill is averted, or at least minimised.
- The overriding principle in the event of an overfill is that personnel should leave the risk area, and not return until it is safe to do so. Any necessary emergency response should be by suitably trained and equipped teams. In addition:
    - It is important that all personnel on site are aware that an overfill has occurred so that the emergency plan can be safely activated.
    - Because gasoline presents particular hazards (such as those arising from large vapour clouds) it is essential that all loading gantries are evacuated until such time that the risk can be properly assessed. Attempting to start a vehicle on the loading gantry will provide an ignition source.
- Informing all those involved in loading activities that there is no expectation that the driver is to attempt to stop flow other than to initiate an ESD and inform the distribution terminal control room.
    - Informing the control room ensures that the correct personnel can be informed and initiate an appropriate action plan
    - Where it is safe to do so, the driver should consider closing the vehicle foot valves. Precise action will be dependent on the vehicle fittings and any specific site circumstances and loading processes
- ESD initiations will be investigated with a view to identifying ways for improving the system. These could include redesigning of arrangements to reduce inadvertent operation, improving procedures for loading and identifying where better training may be needed. Note that trend analysis of ESD initiations may reveal key leanings that could be shared externally through trade association initiatives.

- Simple signage on what to do if a hazard is detected or suspected should be provided in clear view of all personnel carrying out loading operations. Further information can be found in section 4.

3.3 Monitoring Performance

Ensuring the long term effectiveness of training and safe working practices during tanker loading operations can be achieved through performance monitoring. The following techniques may be employed to measure success:

- Any incidents reported during loading operations should be reviewed at regular stakeholder meetings. There may be a need for further training, or updates to existing training programs.

- Periodic review of safety observation reports may indicate where improvement to training programmes or additional tool box talks are required. Further information relating to behavioural safety observation techniques can be found in the following publications:

    - Human factors: Behavioural safety approaches - an introduction, http://www.hse.gov.uk/humanfactors/topics/behaviouralintor.htm

    - Step Change in Safety, Safety Observation System – Look this way, http://stepchangeinsafety.net/ResourceFiles/Look%20this%20Way%202003.pdf

- Performance indicators (or Key Performance Indicators [KPI's]) should be identified to measure performance and identify trends which may indicate where improvement to training programs, equipment maintenance or additional tool box talks are required. KPI's should be reviewed at regular stakeholder meetings. Examples of KPI's may include :

    - Number of wet probe alarm activations

    - Number of contaminations due to product left on board or crossovers

    - Percentage of drivers with up to date training

    - Number of incidents related to equipment failures

    - Percentage of maintenance procedures carried out on time

4. Loading Rack Signage and Information

Clear signage on the actions to take on detection of overfill may be a useful aid in raising hazard awareness with drivers, contractors and distribution terminal staff. Consideration should be given to providing a simple checklist displayed either at the loading arm or in the drivers cab. Care should be taken to ensure that the purpose and intent of the signage is fully understood by all those involved in loading operations.

The signage adopted should be dependent on individual site requirements, however one example could be:

- Activate ESD
- Notify other personnel in the area
- Evacuate the area
- Notify the control room
- Await further instruction

Abbreviations

Abbreviation	Description
CA	Competent Authority
CDOIF	Chemical and Downstream Oil Industry Forum
CCR	Central Control Room
CCTV	Closed Circuit Television
COMAH	Control of Major Accident Hazards
ESD	Emergency Shut Down
KPI	Key Performance Indicator
SUSA	Safe Un-Safe Act

Glossary of Terms

Loading	Loading is synonymous with the ADR related term 'filling'
Gasoline	low flashpoint liquid fuel, also known as petroleum spirit or petrol, including where blended with ethanol, where there is a significant probability of flammable vapour being present at normal loading temperatures and pressures.
Meter overrun	An alarm resulting from the preset/batch controller (the equipment used to transfer product into the tanker) detecting an overrun beyond the programmed volume of product to transfer.
Overfilling, Overflow	For the purposes of this guidance overfilling is considered to be filling a compartment to the point that gasoline flows out of that compartment, for example into a vapour recovery line or through a pressure relief valve .

Legal Context

In the context considered by this CDOIF Guideline the principal legal considerations are as follows. Note that this list is not exclusive but references those elements of legislation which are likely to be most relevant.

Act or Regulation	Main relevant sections	Notes
Health and Safety at Work etc Act 1974		The overarching legal framework and "enabling" Act under which H & S Regulations are made.
	Sections 2 (1)	Employers' duty to ensure, sfairp, the health, safety and welfare of his employees
	2(3)	Health and safety policy, organisation and arrangements
	3(1)	Employers' duty to ensure, sfairp, that "non-employees" are not put at risk
Control of Major Accident Hazards regulations 1999 (COMAH)		Implements in GB the Seveso directive
	Regulations 4	Prevent major accidents Mitigate their effects
	5	Major Accident Prevention Policy (MAPP)
	7	Safety report (SR)
	9	On site emergency plan
	Schedules 2	Principles underlying the MAPP
	, 4	Contents of SR
	5	Emergency plans
Management of Health and safety at Work Regulations 1999	Regulation 3	Risk assessment
	7	H & S Assistance
	8	Emergency procedures
	10	Information for employees
	11	Cooperation between employers
	12	Persons working in "host employers'"
	13	undertakings
	15	Capabilities and training Temporary workers
Provision and Use of work Equipment regulations 1998 (PUWER)	Regulation 4	Suitability of work equipment
	5 – 6	Maintenance and inspection
	7	Identification and control of specific risks
	8	Information and instructions
	9	Training
Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG)	Regulation 5	Implements ADR in GB See ADR 1.3 for requirement in relation to "Function specific" training, which covers more than the driver. Consignors and fillers/loaders have obligations.
Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR)	Regulation 5	Risk assessment
	6	Elimination or reduction of risk
	7	Area classification, selection of equipment, marking and "verification" of areas Antistatic clothing
	8	Incidents accidents and emergencies
	9	Information, instruction and training
	10	Coordination between employers

Reporting of Injuries Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)	Regulation 3 Schedule 2	Duty to report Dangerous occurrences Most relevant are DOs 16, 19, 20 and 21

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