Guidance and a toolkit for training on emergency decision making in loss of containment incidents

energy institute

GUIDANCE AND A TOOLKIT FOR TRAINING ON EMERGENCY DECISION MAKING IN LOSS OF CONTAINMENT INCIDENTS

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FOREWORD

Major accidents have highlighted the critical importance of the decisions made on how to respond to a developing loss of containment (LOC). In particular, such decisions may have to be made with incomplete or even conflicting information on the immediate cause of the LOC, uncertainty about the potential for escalation, time, stress and fatigue pressures, and the possibility that all alternatives to mitigate the hazard carry risk. In addition, there may be limited opportunity to refer to emergency plans or other reference material to guide successful decision making. This may be compounded by a lack of 'willingness to act' (e.g. to shut down operations where there is an impact on production) in less mature safety cultures, even when the risk reduction solution is known.

This technical publication outlines the training on front line and managerial safety decision making and dynamic risk assessment in LOC incidents. It includes guidance and a toolkit to assist those involved in the management of emergencies at facilities with a potential for accidents involving LOC of hazardous materials, flammable or toxic, that may cause death or serious injury to people. The primary focus is facilities within the energy industry although the guidance may be relevant to all process industries with the potential for similar accidents.

This technical publication outlines a process and gives general guidance based on the lessons learned from past incidents, regulatory requirements for emergency response planning and training plus previous work on effective training methods. The guidance and toolkit are high level and generic, individual facilities should use and adapt this guidance and toolkit to develop their own plans, procedures and training that are specific to their situation.

The guidance provides information on:

– design of emergency response;
– training for front-line operators and management in incident response;
– design and running of exercises;
– methods of reinforcing training (drills, toolbox talks, etc.), and
– moving from generic guidance and toolkit to facility-specific procedures.

Suggested revisions are invited and should be submitted through the Technical Department, Energy Institute, 61 New Cavendish Street, London, W1G 7AR. e: technical@energyinst.org

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1 INTRODUCTION

This guidance and toolkit for emergency decision making in LOC incidents should help management and front line operations personnel make better safety decisions in incidents.

A review of past incidents identifies many common themes, including problems with:

– isolation;
– organisation, competence, training, and
– management of change.

The focus of this technical publication is on the oil and gas industry (upstream, midstream and refining) but the publication may be of relevance to other process industries.

The proposed approach to developing emergency response plans (ERPs) has been developed together with proposals for training, including refresher training and maintaining readiness. A necessary part of this is to define competence requirements for individuals with key roles and to assess team members against those competencies.

Guidance is provided on:

– development of ERPs;
– competence standards, and
– training, assessment and refresher frequency.

The guidance provides a model against which operating companies can assess their existing arrangements and identify gaps or areas for improvement. It can also be used where the emergency arrangements are being planned from first principles.

1.1 SCOPE

1.1.1 Determination of significant loss of containment

Identification of a significant LOC is the starting point in decision making. Errors of judgement made during the initial assessment of a leak can lead to decisions that subsequently expose personnel to severe risks. Facilities should have in place a method for determining whether a small leak is to be regarded as a 'LOC' (with potentialy significant consequences) or a 'fugitive emission', variously referred to as drip, weep, seep or similar classification (indicating that there is no acute significant hazard). The assessment should be made by suitably competent personnel with access to all the relevant information. The assessment method should consider the possibility of a minor (negligible) release pathway growing due to crack propagation through embrittlement or pre-existing conditions such as corrosion or erosion.

The operations team and managers should be alert for the degradation of barriers to prevent leaks, particularly findings of integrity assessments (monitoring corrosion, etc.) and the status of other safety critical equipment and tasks that are designed to prevent LOC. This implies that the operations team should be briefed on plant conditions, particularly those relating to integrity. The team should have ready access to reference information to inform decision making. The information provided to the operations team should be dynamic and therefore reviewed by specialists on a regular basis to note changes from the initial risk status.

Different fluids will give rise to different hazards and different ranges of effects depending upon their hazardous properties and the physical conditions within the equipment. The operations team and management should understand the hazards from hydrocarbons, hydrogen, sulfur compounds, fluid catalysts, combustion products, water treatment chemicals and steam in a variety of oil, gas and energy-producing facilities. Knowledge of these hazards will inform the identification of the threshold size of a significant leak.

The focus of this technical publication is on the initial response phase, which is typically from the first 30 minutes to an hour after the LOC occurs. The guidance and toolkit the guidance and toolkit should be used when a significant LOC is identified or declared until the facility is in a 'safe state'. A 'safe state' could be a complete facility-wide shutdown, a single unit shutdown, emergency venting or flaring. Each facility should define its 'safe state' end points.

1.1.2 Dynamic risk assessment

Recent incidents have highlighted the critical importance of decision making and decisive action in response to LOC of hazardous materials in both the upstream and downstream oil and gas industries. Decisions may have to be made based on incomplete or even conflicting information on the immediate cause of LOC, uncertainty about the potential for escalation, time, stress and fatigue effects on personnel and the possibility that all options for mitigating the consequences carry risk. There may be cultural issues over willingness to shut down or challenge managers and a mindset of persistence that the situation is not out of control. Corporate policy should state clearly that protection of people is the first priority so there is a need to align the response to this commitment.

The desired approach to emergency response is to design plans in advance to cover all identified scenarios that are flexible enough to apply to other scenarios and allow for change as an incident evolves. It is good practice to respond initially as if the incident is worst case from the information available and refine the response when a known safe state is reached. The default response to an LOC is likely to be isolation and depressurisation of the affected section, including ignition sources. If this is not possible then shutdown of the plant is likely to be the default response. There may be some exceptions to this approach but these should be identified in the pre-planning.

1.2 INCIDENT TYPES

This guidance is focused on LOC of liquids and gases that may be flammable or toxic or both. LOC may occur from:

- process equipment (vessels, columns, reactors, heat exchangers, filters, PIG receivers/ launchers, etc.);
- storage tanks;
- pipes (including risers, flowlines, transfer lines etc. and their fittings, including flanges, instrument connections);
- pumps, compressors, turbines;
- valves, and
- transportable containers, road/rail tankers, isotainers, drums, intermediate bulk containers, cylinders, etc.

Other generic incident types are not considered but should be included in emergency planning, training, exercises and drills. These should include:

For offshore:

– structural damage (e.g. ship collision, extreme weather);
– helicopter accident;
– fire in accommodation and/or process areas;
– dropped load;
– person overboard, and
– malicious action.

For onshore:

– structural damage (vehicle or other impact on equipment, extreme weather);
– transport accident (moving vehicle collision with people);
– fire in a building or other area not involving process fluids;
– incident on neighbouring facility;
– natural catastrophic events such as storms and flooding, and
– malicious action.

Some elements of emergency response are common to all these situations and therefore LOC incidents should be considered along with other emergencies.

1.3 USE OF THIS PUBLICATION

The guidance given in this technical publication is generic and should be adapted to meet the requirements of each specific facility. The primary focus is facilities within the energy industry although the guidance may be relevant to all process industries with the potential for similar accidents. This technical publication references some European directives as well as regulations applicable in Great Britain (GB); these are used to provide context. However, the intent is that this technical publication should be applicable to operating companies and their facilities worldwide. Local or national legislation should be observed. Each facility should use the guidance set out here to develop its own procedures, processes, competence requirements, training and assessment methods.

This guidance can be used for existing and new facilities and is specifically aimed at assisting:

– process safety engineers;
– safety advisors;
– operations trainers;
– emergency response specialists;
– front-line operators and
– managers.

Section 2 contains guidance and a description of a systematic approach to developing emergency response capability, emergency training and maintaining readiness to respond. Section 3 is a toolkit that gives high level, generic prompts and other checklists to assist those

responsible with the different parts of the development of emergency response. Sections 2 and 3 may be read separately. However, the checklists in section 3 (toolkit) purposefully repeat some information already given in section 2. Operating companies should take advice from their training and development advisers on the organisation and facilitation of workshops, and then follow company guidance on the layout of training materials.