Guidance for the management of distribution terminal operations



GUIDANCE FOR THE MANAGEMENT OF DISTRIBUTION TERMINAL OPERATIONS

June 2015

Published by **ENERGY INSTITUTE, LONDON**

The Energy Institute is a professional membership body incorporated by Royal Charter 2003
Registered charity number 1097899

The Energy Institute (EI) is the chartered professional membership body for the energy industry, supporting over 20 000 individuals working in or studying energy and 250 energy companies worldwide. The EI provides learning and networking opportunities to support professional development, as well as professional recognition and technical and scientific knowledge resources on energy in all its forms and applications.

The El's purpose is to develop and disseminate knowledge, skills and good practice towards a safe, secure and sustainable energy system. In fulfilling this mission, the El addresses the depth and breadth of the energy sector, from fuels and fuels distribution to health and safety, sustainability and the environment. It also informs policy by providing a platform for debate and scientifically-sound information on energy issues.

The EI is licensed by:

- the Engineering Council to award Chartered, Incorporated and Engineering Technician status;
- the Science Council to award Chartered Scientist status, and
- the Society for the Environment to award Chartered Environmentalist status.

It also offers its own Chartered Energy Engineer, Chartered Petroleum Engineer and Chartered Energy Manager titles.

A registered charity, the EI serves society with independence, professionalism and a wealth of expertise in all energy matters.

This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

For further information, please visit http://www.energyinst.org

The EI gratefully acknowledges the financial contributions towards the scientific and technical programme from the following companies

BG Group Saudi Aramco BP Exploration Operating Co Ltd Scottish Power

BP Oil UK Ltd SGS

Centrica Shell UK Oil Products Limited

Chevron Shell U.K. Exploration and Production Ltd ConocoPhillips Ltd SSE

DONG Energy Statkraft EDF Energy Statoil

ENI Talisman Sinopec Energy UK Ltd

E. ON UK Total E&P UK Limited ExxonMobil International Ltd Total UK Limited

International Power Tullow
Kuwait Petroleum International Ltd Valero
Maersk Oil North Sea UK Limited Vattenfall
Nexen Vitol

Phillips 66 World Fuel Services

RWE npower

However, it should be noted that the above organisations have not all been directly involved in the development of this publication, nor do they necessarily endorse its content.

Copyright © 2015 by the Energy Institute, London.

The Energy Institute is a professional membership body incorporated by Royal Charter 2003.

Registered charity number 1097899, England

All rights reserved

No part of this book may be reproduced by any means, or transmitted or translated into a machine language without the written permission of the publisher.

ISBN 978 0 85293 739 6

Published by the Energy Institute

The information contained in this publication is provided for general information purposes only. Whilst the Energy Institute and the contributors have applied reasonable care in developing this publication, no representations or warranties, express or implied, are made by the Energy Institute or any of the contributors concerning the applicability, suitability, accuracy or completeness of the information contained herein and the Energy Institute and the contributors accept no responsibility whatsoever for the use of this information. Neither the Energy Institute nor any of the contributors shall be liable in any way for any liability, loss, cost or damage incurred as a result of the receipt or use of the information contained herein.

Hard copy and electronic access to El and IP publications is available via our website, **https://publishing.energyinst.org**. Documents can be purchased online as downloadable pdfs or on an annual subscription for single users and companies. For more information, contact the El Publications Team.

e: pubs@energyinst.org

CONTENTS

		Pa	age
Forev	vord .		. 7
Δckn	owled	lgements	9
ACKII	owieu	igements	. 0
Scope	e		. 9
1	Lead	ership and Management	10
•	1.1	Safety culture	
	1.2	Safety leadership	
	1.3	Learning organisation	
	1.4	Safety policy	
	1.5	Golden rules	
	1.6	Management systems	
		1.6.1 General	
		1.6.2 Plan	
		1.6.3 Do	
		1.6.4 Check	
		1.6.5 Act	16
	1.7	Process safety management	
2		identification	
	2.1	Hazard identification	
		2.1.1 Hazard identification studies (HAZID)	
	2.2	2.1.2 Hazard and operability studies (HAZOP)	
	2.2	Risk assessments	
	2.3	Bow-tie analysis and safety critical measures	
		2.3.1 Bow-tie analysis	
	2.4	Functional safety	
	2.4	2.4.1 Safety instrumented functions and systems	
		2.4.1 Safety instrumented functions and systems	
		2.4.2 Life cycle approach 2.4.2 Safety integrity levels (SILs)	
		2.4.4 Determining SILs	
		2.4.4 Determining Sits	20
3	Perso	onnel arrangements	29
	3.1	Roles and responsibilities	29
	3.2	Competence and training	29
	3.3	Staffing levels	30
	3.4	Shift work arrangements	
		3.4.1 Shift work	31
		3.4.2 Fatigue	34
	3.5	Human factors	
		3.5.1 Job	
		3.5.2 Individual	
		3.5.3 Organisation	
		3.5.4 Human factors in practice	
	3.6	Behavioural safety programmes	37

Cont	ents co	ontinued	Page
4	Oper	rational controls	
	4.1	Operating limits	40
	4.2	Procedures	
	4.3	Alarm management	42
	4.4	Management of change (MoC)	
		4.4.1 General	44
		4.4.2 Plant and equipment changes	45
		4.4.3 Process and inventory changes	45
		4.4.4 Organisational and personnel changes	45
		4.4.5 Loss of a layer of protection	46
	4.5	Management of dangerous substances and explosive atmospheres	47
		4.5.1 General	47
		4.5.2 Dangerous substances and explosive atmospheres risk assessment	47
		4.5.3 Containment of flammable materials	
		4.5.4 Classification of hazardous areas	49
		4.5.5 Use of suitable electrical and mechanical equipment	
		4.5.6 Static electricity	
		4.5.7 Earthing and bonding	
		4.5.8 Work control systems to manage ignition sources	
		4.5.9 Site rules to manage ignition sources	
	4.6	Personal protective equipment (PPE)	
		4.6.1 General requirements	
		4.6.2 Precautions in use	
	4.7	Safety signage	
	4.8	Managing occupational health	
	4.9	Managing chemicals on-site	
	1.5	4.9.1 COSHH requirements	
		4.9.2 Chemical compatibility	
	4.10	Management of waste	
	4.10	4.10.1 Non-hazardous waste	
		4.10.2 Hazardous waste	
	A 11	Vehicle washes	
	7.11	venicie wasnes	02
5	Inspe	ection, testing and maintenance	
	5.1	Inspection, testing and maintenance	
	5.2	Return to service of plant and equipment	
	5.3	Electrical switch room maintenance and access	65
	5.4	Workshops	
		5.4.1 Road tanker maintenance workshops	65
		5.4.2 General workshops	
	5.5	Management of ageing plant	66
6	Man	agament of site contractors	60
0	6.1	agement of site contractors Selection and approval	
	6.2	Use of sub-contractors	
	6.3	Method statements and risk assessments	
		6.3.1 Method statements	
	<i>C</i>	6.3.2 Risk assessments	
	6.4	Plant and equipment requirements	
	6.5	Pre-start meetings	/0

Conte	nts co	ontinued	Page
	6.6	Contractor competence	71
	6.7	Contractor site induction	
	6.8	Permits to work	
	6.9	Supervisory requirements	73
7	Site s	security	75
	7.1	General	
	7.2	Security boundary fencing and gates	
	7.3	Security manning levels and site security patrols	
	7.4	Control of visitors and vehicle entry	
	7.5 7.6	Personnel checks	
0	Dua di		70
8	8.1	uct receipt, storage and loading operations	
	8.2	Product receipt	
	0.2	8.2.1 Import procedures	
		8.2.2 Ship receipt operations.	
		8.2.3 Pipeline receipt operations	
		8.2.4 Rail receipt operations	82
	8.3	Stock accounting	
	8.4	Management of product quality	
	8.5	Additives	
		8.5.1 General	
	8.6	8.5.2 2-Ethylhexyl nitrate (2EHN)	
	8.7	Loading bay operations	
	8.8	Management of road tankers	
	0.0	8.8.1 General	
		8.8.2 Safe loading pass scheme	
		8.8.3 Driver passports	90
		8.8.4 Driver site induction	90
9	Mana	agement of major accident hazards	91
	9.1	Overall management of major accident hazards	91
	9.2	Control of major accident hazard (COMAH) regulations	
	9.3	COMAH safety reports	92
10	Emer	gency planning	93
	10.1	On-site emergency plan	
	10.2	Off-site emergency plan	
	10.3	Public information	
	10.4	Domino impacts	
	10.5	Mutual aid	
	10.6	Emergency exercises	96
11		surement and review of performance	
	11.1	Active monitoring	
	11.2	Reactive monitoring	
	11.3	Audits	99

Contents continued Pa					
	11.4 11.5	Action tracking	99		
12	Reco	rds management	. 101		
Anne	xes				
Anne	хА	Glossary of terms	. 104		
Anne	х В	Abbreviations and acronyms	. 106		
Anne	хС	References	. 107		

FOREWORD

The purpose of this publication is to provide a general guide to safe practices in the management of operations of distribution terminals.

The guidance provides recommendations for safe practices rather than a set of rigid rules. It is stressed that the specific circumstances of each terminal should be taken into account when considering this document. It is not intended that the recommendations of the guidance should be applied rigidly where for a variety of reasons it may not be practical to comply with them.

Attention is drawn to the fact that in many countries statutory requirements exist, both local and national, pertaining to the petroleum industry, and this guidance should be regarded as being complementary to such requirements.

The information contained in this publication is provided for information only and while every reasonable care has been taken to ensure the accuracy of its contents, the Energy Institute (EI) cannot accept any responsibility for any action taken, or not taken, on the basis of this information. The EI shall not be liable to any person for any loss or damage which may arise from the use of the information contained in any of its publications.

The above disclaimer is not intended to restrict or exclude liability for death or personnel injury caused by one's own negligence.

Suggested revisions are invited and should be submitted to the Technical Department, Energy Institute, 61 New Cavendish Street, LONDON, W1G 7AR.

ACKNOWLEDGEMENTS

This publication was prepared by Mr James Coull on behalf of the El Distribution and Marketing Committee. The El would like to extend thanks to the following committee members:

Tony Brown F.P.S
Peter Davidson UKPIA
Dave de Halle Phillips 66
Robert Harris Consultant
lan Goldsworthy Valero
Mark Palmer Exxonmobil
Barrie Salmon TSA

The El would also like to thank those external to the Distribution and Marketing Committee, who provided input into the draft version of this guidance:

David Hughes Valero
Robe Miles HU-Tech
Robbie Reid Petroineos
Charles Stuart Nustar Energy

SCOPE

The object of this guidance is to recommend good practices for the safe management of the operation of petroleum distribution terminals, including the receipt, storage, handling and loading of petroleum products.

It is not intended to preclude the use of alternative methods where these provide equivalent standards of safe operation.

The guidance does not specifically cover environmental protection, health, or product quality, although sections of this guidance may also prove useful in managing these aspects.

1 LEADERSHIP AND MANAGEMENT

1.1 SAFETY CULTURE

An organisation's culture can have a significant influence on how people behave at work. Safety culture is a subset of this overall organisational culture and can be described as the values, attitudes and patterns of behaviour that the members of an organisation share about the organisation's hazards, risks, and accidents. Safety culture should be considered to be an important aspect of managing terminal operations as it provides the context within which members of the organisation assess the appropriateness of their behaviour.

Safety culture can often be considered just in terms of how employees comply with rules and whether they act safely or not. However, it should be seen as being more than this, and in particular, safety culture should be considered to include the way an organisation is managed. Examples include whether a distribution terminal operator is perceived to have a bias for production over safety, or a tendency to focus on short-term cost reductions rather than longer-term safety improvements. The role of senior terminal management should therefore be seen as being vital to the development of a positive safety culture within distribution terminals.

When trying to influence a terminal's culture, change can take several years. As such, terminal operators should consider starting any culture change programme by measuring their existing safety culture using safety climate surveys or interviews. Safety climate refers to how people feel about an organisation's safety and is used to identify the perceptions of the safety culture. Measuring safety climate can therefore help identify weak areas within the terminal's culture.

When measuring safety climate terminal operators should ensure that they do not just focus on their more junior employees. Senior managers should also be required to participate in any surveys and interviews.

Once the survey and/or interviews have been completed then feedback of the findings should be provided to all employees, and the findings acted upon. If individuals feel that their responses have resulted in management implementing improvements then this can have a positive impact on the terminal's safety culture. Conversely, if they feel that their opinions are ignored then this can have a detrimental effect on the culture.

When considering what initiatives should be implemented within a terminal it can often be most effective to focus on specific areas of weakness that have been identified. Targeted initiatives can then be put into place which aim to improve the specific issues identified rather than trying to implement generic culture improvement programmes.

The Health and Safety Executive's (HSE) *Human factors briefing note no. 7. Safety culture* highlights some of the main factors that contribute to a positive safety culture, along with the features that would indicate that these factors are in place, and some practical steps that management can take to develop a positive safety culture. This is shown in Table 1.