Legionellosis risk management and Legionella control

Guidance for oil and gas facilities offshore platforms and refineries

2nd edition

LEGIONELLOSIS RISK MANAGEMENT AND LEGIONELLA CONTROL

GUIDANCE FOR OIL AND GAS FACILITIES OFFSHORE PLATFORMS AND REFINERIES

2nd edition

November 2012

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 leading chartered professional membership body supporting individuals and organisations across the energy industry. With a combined membership of over 14 000 individuals and 300 companies in 100 countries, it provides an independent focal point for the energy community and a powerful voice to engage business and industry, government, academia and the public internationally.

As a Royal Charter organisation, the EI offers professional recognition and sustains personal career development through the accreditation and delivery of training courses, conferences and publications and networking opportunities. It also runs a highly valued technical work programme, comprising original independent research and investigations, and the provision of EI technical publications to provide the international industry with information and guidance on key current and future issues.

The EI promotes the safe, environmentally responsible and efficient supply and use of energy in all its forms and applications. In fulfilling this purpose the EI addresses the depth and breadth of energy and the energy system, from upstream and downstream hydrocarbons and other primary fuels and renewables, to power generation, transmission and distribution to sustainable development, demand side management and energy efficiency. Offering learning and networking opportunities to support career development, the EI provides a home to all those working in energy, and a scientific and technical reservoir of knowledge for industry.

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
BP Exploration Operating Co Ltd
BP Oil UK Ltd
Centrica
Chevron
ConocoPhillips Ltd
EDF Energy
ENI
E. ON UK
ExxonMobil International Ltd
International Power
Kuwait Petroleum International Ltd
Maersk Oil North Sea UK Limited
Murco Petroleum Ltd
Nexen
Phillips 66
Premier Oil
RWE npower
Saudi Aramco
Shell UK Oil Products Limited
Shell U.K. Exploration and Production Ltd
SSE
Statoil Hydro
Talisman Energy (UK) Ltd
Total E&P UK plc
Total UK Limited
Valero
World Fuel Services

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.

ISBN 978 0 85293 630 6

Published by the Energy Institute

Further copies can be obtained from: Portland Customer Services, Commerce Way, Whitehall Industrial Estate, Colchester CO2 8HP, UK.
t: +44 (0)1206 796 351 e: **sales@portland-services.com**

Electronic access to EI and IP publications is available via our website, **www.energypublishing.org**.
Documents can be purchased online as downloadable pdfs or on an annual subscription for single users and companies.
For more information, contact the EI Publications Team.
e: **pubs@energyinst.org**

CONTENTS

Page

Acknowledgements **6**

Executive summary **7**

1 Introduction **8**

2 Legionellosis (Legionnaires' Disease, Pontiac Fever and Lochgoilhead Fever) **9**
2.1 Symptoms 9
2.2 Ecology of Legionella 9
2.2.1 Classification 9
2.2.2 Habitats 10
2.2.3 Epidemiology 10

3 The microbiology of a Legionellosis outbreak **11**
3.1 Inoculation 11
3.2 Multiplication (amplification) 11
3.3 Aerosol generation 13
3.4 Contact with susceptible individual(s) 13

4 Monitoring for Legionella **14**
4.1 Routine planktonic sampling and analysis 14
4.2 Guidline action limits 14
4.2.1 Hot and cold services 15
4.3 Microbiological monitoring 15
4.3.1 Laboratory reports 16

5 Controlling the Legionellosis risk **17**
5.1 The risk assessment 17
5.2 Mitigating Legionella growth 17
5.2.1 Temperature 17
5.2.2 Organic and inorganic deposits 18
5.2.3 Substrata that encourage Legionella biofilms 18
5.2.4 Stagnant areas (dead-legs) 19
5.2.5 Nutrients 19
5.2.6 pH 19
5.2.7 Aerosol generation 19
5.3 Remediating Legionella contamination 19

6 Water quality risk management – minimum requirements **20**
6.1 Assessing the risk 20
6.2 Managing the risk 20
6.3 Controlling the risk 20
6.4 Record keeping 21

7 Practical water management **22**
7.1 Fire ponds and sprinkler systems 22
7.1.1 Fire water sprinkler systems 22
7.2 Air conditioning systems 22
7.3 Offshore fresh water storage and distribution 23

Contents cont... **Page**

7.3.1 Continual disinfection of all stored fresh water 23
7.3.2 Biofilm and scale control 23
7.3.3 Dead-leg management 24
7.4 Emergency showers and eye wash stations 24
7.5 Domestic showers 24
7.6 Trace heating 24
7.7 Legionella sampling 25
7.8 Additional recommendations 25
7.8.1 Training and competence 25
7.8.2 Contractors' responsibilities 25

8 Check list: tasks and recommendations 26

9 References 30

Annex A Water system log book example 31

ACKNOWLEDGEMENTS

The Energy Institute (EI) would like to record its appreciation of the work carried out by Prof. Stephen Maxwell and his team at Intertek as authors of the original Guidelines and the 2011 working group who have since amended and updated this document.

The update of these Guidelines has been steered by a sub-committee of the Energy Institute's Occupational Health and Hygiene Committee, and the EI wishes to thank members of this sub-committee for guiding this to completion and the original contributors as well. In particular:

Dougie Collin	C-CHEC Ltd representing BOHS
Mark Elsome	ConocoPhillips
Darren Hawkes	Hawkes Associates
Beate Hildenbrand	Energy Institute
Sarah Leeson	ExxonMobil
Graham McPherson	BP
Lynne Morgan	EI Morgan Ltd
Lindsay Ross	BP
Andrew Singleton	Jaguar and Land Rover

The Institute wishes to also thank Ron Gardner from Hawkes Associates for his contribution and his technical editing.

EXECUTIVE SUMMARY

This document has been commissioned by the EI to provide supplementary guidance on the management and control of Legionella in oil and gas facilities such as offshore platforms and refinery fresh water distribution systems including, but not limited to, potable water services. For a full interpretation of the requirements set out by the UK Health and Safety Executive (HSE), readers must refer to the HSE Approved Code of Practice and Guidance Document, *Legionnaires' disease: The control of Legionella bacteria in water systems* (from now on referred to as L8). The aim of the EI's document is to provide more specific and practical guidance than that provided in L8, which gives broad guidance suitable for a range of industrial (e.g. cooling towers) and commercial (e.g. hotels and office buildings) facilities. Often, however, the facilities design and particular operating practices on some oil and gas facilities can lead to uncertainty as to what actions or precautions need to be taken to meet both legislative requirements of Legionellosis risk management and practical control of Legionella contamination.

While these designs may be peculiar to the oil and gas industry, they are common to many operating companies. Therefore, it should be possible for each operator to benefit from the development of a consistent approach throughout the industry.

This document provides similar information to that in other HSE publications, but is set in the context to offshore installations and downstream refinery operations in the oil industry. It is designed to assist users to develop a Legionellosis Management System and Legionella Control Programme(s) and is not a replacement for current or future HSE guidance.

Legionellosis Management System: A documented risk assessment and monitoring program which aims to minimise the opportunity for a Legionellosis outbreak from a water system (legislative requirement managed through guidance from L8).

Legionella Control: A documented procedure (or set of procedures) that offers guidance on the prevention and, as necessary, eradication of Legionella contamination in water systems.

The control of Legionellosis is a legislative requirement under the UK Control of Substances Hazardous to Health (COSHH) Regulations. Every company that has a water system must maintain an evergreen documented system to demonstrate how the risk of an outbreak of Legionnaires' disease is to be minimised. In the context of this guidance this is Legionellosis Risk Management. Additionally, many operators are interested in how best to control the growth and activity of Legionella should their system become contaminated.

Additional guidance on Legionella in cooling towers is now available in the EI document *Cooling tower maintenance and other controls for the effective management of Legionella risk* (2012). To avoid duplication, much of the information originally in this document pertaining to cooling towers has now been removed.

1 INTRODUCTION

The disease was first recognised in July 1976 when an outbreak occurred at an American Legion convention held at the Belle Vue Stratford Hotel in Philadelphia, USA. The cause of the outbreak took scientists until January 1977 to isolate the bacterium responsible which they named Legionella pneumophila. The bacterium was thought to have been present in the hotel's cooling towers. Water droplets in the form of an aerosol contaminated the hotel's air conditioning systems allowing the bacterium to come into contact with the convention guests, a highly susceptible population.

Since that time records have been maintained of cases throughout the world. From 1980 to 2010, UK records have indicated a gradually increasing incidence of the disease. The incidence rate in Europe is at its highest since records began (European Legionnaires Disease Surveillance Network). It is possible that this is related to an increased awareness of the disease by medical practitioners. The scale of the problem is not currently fully understood and is overshadowed by the large number of deaths from pneumonia in general. However, fresh water supplies can become contaminated with potentially lethal bacteria and this risk must be managed

According to the UK Drinking Water Inspectorate 'It is understood that poor system design and inadequate operating practices were implicated as the main factor in most outbreaks'. The inference is, therefore, that Legionella contamination of a water system to the extent that results in infection of members of the population is avoidable if 'good practice' in design and operation is followed. Legislation requires the control of risks from Legionella, L8 provides guidance on 'good practice'.

Criminal proceedings initiated against corporations and individuals following outbreaks of Legionellosis in the UK highlight the need for all those who manage water services to ensure that the risk from Legionella is controlled to at least the minimum required standard.