Guidance for optimising operator plant situational awareness by rationalising control room alarms

energy institute

GUIDANCE FOR OPTIMISING OPERATOR PLANT SITUATIONAL AWARENESS BY RATIONALISING CONTROL ROOM ALARMS

1st edition

July 2016

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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.

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

BP Exploration Operating Co Ltd
BP Oil UK Ltd
Centrica
Chevron
CLH
ConocoPhillips Ltd
DCC Energy
DONG Energy
EDF Energy
ENGIE
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Total UK Limited
Tullow Oil
Valero
Vattenfall
Vitol
World Fuel Services

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ISBN 978 0 85293 914 7

Published by the Energy Institute

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FOREWORD

Alarm rationalisation is often seen as the process of reducing the number of control room alarms that present to a control room operator (CRO), during normal and abnormal operating conditions, down to levels that are manageable, in that the CRO is able to respond to each alarm appropriately, timely and correctly, without the need for disengaging 'nuisance' alarms or resorting to other means. EEMUA 191 *Alarm systems: A guide to design, management and procurement* is a common standard many organisations work towards.

However, Energy Institute (EI) members have raised concern that conducting an alarm rationalisation is not a straightforward exercise, particularly when considering the human factors (HF) aspects of alarms, namely that alarms should be optimised to support CROs maintain situation awareness of the happenings of the plant. Whilst EEMUA 191 does contain guidance to help do this, additional guidance has been sought to help ensure that, in particular, high-priority alarms can be assessed against HF principles.

The EI Human and Organisational Factors Committee commissioned *Guidance for optimising operator plant situational awareness by rationalising control room alarms,* to do just this. This publication can be seen as a companion guide to EEMUA 191 to support organisations working towards the alarm targets set out in EEMUA 191. It provides:

- brief introductions to alarms and situation awareness;
- concise guidance on aspects of alarms that should be considered, other than the number of alarms, particularly in relation to situation awareness;
- brief overview and guidance in relation to EEMUA 191 alarm metrics, and
- a practical tool to help assess the usability of individual alarms.

The alarm usability assessment is the main deliverable of this publication. It is a simple tool, with accompanying guidance, allowing high-priority alarms (or problematic alarms) to be assessed against a simple five-stage model of how a CRO acknowledges, interprets and responds to alarms. Use of the tool will allow organisations to understand and prepare to make improvements to individual alarms and, in some cases, to the alarm system as a whole. This should be seen as a complementary approach to just simply reducing alarm numbers.

The EI welcomes feedback on its publications. Feedback or suggested revisions should be submitted to:

Technical Department
Energy Institute
61 New Cavendish Street
London, W1G 7AR
e: technical@energyinst.org

ACKNOWLEDGEMENTS

Guidance for optimising operator plant situational awareness by rationalising control room alarms was developed by Jamie Henderson (Human Reliability Associates Ltd.) and produced by the EI Human and Organisational Factors Committee (HOFCOM). At time of publication, HOFCOM members included:

Tony Atkinson	ABB
Ed Corbett	HSL
Alix Davies	EDF Energy
Bill Gall	Kingsley Management Ltd.
Peter Jefferies	Phillips 66 (Vice-Chair)
Stuart King	EI (Secretary)
Eryl Marsh	HSE
Richard Marshall	Essar Oil UK
Rob Miles	Hu-Tech Risk Management Services Ltd (Chair)
Simon Monnington	BP plc
Helen Rycraft	IAEA
Jonathan Ryder	ExxonMobil Corporation
Rob Saunders	Shell International
Gillian Vaughan	EDF Energy
Mark Wilson	ConocoPhillips
Razif Yusoff	Shell International

Management of this project and technical editing were carried out by Stuart King (EI).

Formatting was carried out by Jack Keaney (EI).

The EI also wishes to acknowledge the following individuals who contributed to the development and/or review of this project:

Andrew Fewster	HSE
John Burnett	RWE
Andy Geddes	Scottish Power
Peter Rutherford	BP plc

Affiliations are correct at the time of contribution.

1 INTRODUCTION

1.1 AIM

The aim of this publication is to provide accessible guidance to individuals interested in improving existing control room alarm systems or designing new ones. It summarises and organises relevant available guidance on how to conduct an alarm rationalisation (to reduce the number of alarms) and discusses why factors other than the number of alarms should be considered when attempting to improve alarm system performance.

Specifically, the publication aims to help operating companies answer three questions:

– What factors should be considered when trying to improve control room operator (CRO) situation awareness?
– Are there an acceptable number of alarms?
– Do the high-priority alarms maximise the probability of successful CRO response?

To help answer these questions:

– Section 2 introduces the topics of alarms and situation awareness.
– Whilst alarm system improvements often focus on the number of alarms, section 3 aims to raise awareness of some of the other factors that influence CRO situation awareness, and to encourage their consideration when undertaking alarm system design or improvement. From the perspective of a CRO, alarms provide just one input to 'knowing what is going on around you' – sometimes called situation awareness (Flin, et al., *Safety at the sharp end*).
– Section 4 discusses alarm rationalisation and the use of alarm metrics in order to determine the number of alarms that should be in place. Whilst rationalisation is often referred to in the context of existing alarm systems, more properly it should be considered to be a part of an alarm management life cycle (e.g. as described in ISA/ANSI, *Management of alarm systems in the process industries*), performed initially as part of the system design, where proposed alarms are compared with criteria outlined in an alarm philosophy. However, often when organisations seek to improve the performance of their existing alarm systems they use the term rationalisation to mean the reduction of alarm numbers to move closer to benchmark values. Typically, such interventions are performed as engineering processes, where software is used to aggregate data on alarm system performance, allowing comparison with benchmark targets (e.g. more than one per minute in a steady state is unacceptable). Consequently, less useful alarms, such as those that provide duplicate information, may be removed, or have their priority downgraded.
– Whilst reducing the overall number of alarms is useful, individual alarms should be designed to support CROs in identifying and acting upon threatening situations. Section 5 describes a process, and provides a practical tool, for conducting an alarm usability assessment of individual high-priority alarms. To this end, some of the guidance provided in EEMUA 191 *Alarm systems: A guide to design, management and procurement* has been organised into a tool to help users complete a human factors assessment of individual alarms.

It should be noted that EI *Guidance for optimising operator plant situational awareness by rationalising control room alarms*, in particular the usability assessment tool in section 5, draws heavily on the information presented in EEMUA 191, which is a fairly common standard that many organisations use. Information provided in the other relevant documents may be equally useful, such as IEC 62682 (*Management of alarm systems for the process industries*) and ANSI/ISA S18.2 (ISA, *Management of alarm systems in the process industries*). However, to make it as easy as possible for users of this publication to find further information, a decision was taken to draw primarily on one source. Therefore this publication can, in part, be seen as a companion guide to EEMUA 191.

1.2 WHO SHOULD USE THIS PUBLICATION?

This publication is intended to be used by individuals with responsibility for designing, maintaining and improving alarm systems (e.g. safety engineers, process engineers, plant operators and supervisors). The primary focus is the influence of human factors (HF) on alarm handling, rather than system engineering aspects, therefore, users of this publication should not require any specific technical background.