

1 THE ENGINEERING EQUIPMENT AND MATERIALS USERS ASSOCIATION

GUIDE FOR ESTABLISHING OPERATING PERIODS OF SAFETY VALVES

PUBLICATION N° 188 : 1999

THE ENGINEERING EQUIPMENT AND MATERIALS USERS ASSOCIATION

GUIDE FOR ESTABLISHING OPERATING PERIODS OF SAFETY VALVES

PUBLICATION N° 188 : 1999

Copyright © 1999 The Engineering Equipment and Materials Users Association

ISBN 0 85931 056 6

45 Beech Street
LONDON
EC2Y 8AD

Telephone: 0171-628 7878
Fax: 0171-628 7862
e-mail: sales@eemua.demon.co.uk



THE ENGINEERING EQUIPMENT AND MATERIALS USERS ASSOCIATION

The Engineering Equipment and Materials Users Association—EEMUA—was formed in 1983 by the Amalgamation of the Oil Companies Materials Association (OCMA) and the Engineering Equipment Users Association (EEUA). It is an organisation of substantial purchasers and users of engineering products, whose members include leading national and multi-national companies in the petroleum, gas, chemical and energy industries. A list of Full and Associate Members (the latter being limited to membership of three technical committees) is given below. EEMUA is concerned with the design, installation, operation and maintenance of the engineering plant used by members in pursuing their business activities.

The Association aims to reduce members' costs by providing the opportunity for them to share resources and expertise in order to keep abreast of technological developments and improve the effectiveness and efficiency of their engineering activities. EEMUA supports the British Standards Institution, works with other institutions, associations, government departments, regulatory authorities and the Confederation of British Industry, and is also actively involved with other standards-making bodies, both national and international, such as the American Petroleum Institute.

Work, which is carried out in-house by members alone or with the help of other organisations, may lead to the production of Association publications. These are prepared primarily for members' use, but are usually offered for sale and thus for more general use. Such publications may also be submitted, normally through the British Standards Institution, as bases for appropriate national, European or international standards.

A list of current EEMUA Publications which may be purchased from the Association is given at the end of this document.

Full Members

Associated Octel
BG
BP Amoco
Caltex Petroleum
Conoco
Dow Corning
Eastern Generation
Esso/ExxonMobil
Eutech
Foster Wheeler Energy
Lindsey Oil Refinery
National Power
PowerGen
Shell

Associate Members

AstraZeneca
BASF
D&C Engineering/MERCON [Netherlands]
Elf Exploration UK
Flexsys
Phillips Petroleum UK
Pilkington Technology
Royal Vopak (was Royal Pakhoed)
[Netherlands]
Texaco
UOP

ABOUT THIS PUBLICATION: LEGAL ASPECTS

In order to ensure that nothing in this publication can in any manner offend against or be affected by the provisions of the Restrictive Trade Practices Act 1976, the recommendations which it contains will not take effect until the day following that on which its particulars are furnished to the Office of Fair Trading.

As the subject dealt with seems likely to be of wide interest, this publication is also being made available for sale to non-members of the Association. Any person who encounters an inaccuracy or ambiguity when making use of this publication is asked to notify EEMUA without delay so that the matter may be investigated and appropriate action taken.

It has been assumed in the preparation of this publication that the user will ensure selection of those parts of its contents appropriate to the intended application and that such selection and application are correctly carried out by appropriately qualified and experienced people for whose guidance the publication has been prepared. EEMUA does not, and indeed cannot, make any representation or give any warranty or guarantee in connection with material contained in its publications, and expressly disclaims any liability or responsibility for damage or loss resulting from their use. Any recommendations contained herein are based on the most authoritative information available at the time of writing and on good engineering practice, but it is essential for the user to take account of pertinent subsequent developments or legislation.

All rights are reserved. No part of this Publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means: electronic, mechanical, photocopying, recording or other.

Infringement of copyright is not only illegal, but also reduces the Association's income thereby jeopardising its ability to fund the production of future publications.

TABLE OF CONTENTS

	Page
FOREWORD	1
1 SCOPE	3
2 INTRODUCTION	5
3 OPERATING AND DESIGN PHILOSOPHIES	7
3.1 Plant Operating Philosophy	7
3.2 Pressure Relieving System Design Philosophy	7
4 ESTABLISHING SAFETY VALVE OPERATING PERIODS	9
4.1 General Considerations	9
4.2 Empirical Approach	10
4.3 Risk-Based Approach	10
5 MANAGEMENT PROCEDURES AND RECORDS SYSTEMS	13
5.1 General	13
5.2 Procedures	13
5.3 Records: Categorisation of Data	13
5.3.1 Design and Installation Data	13
5.3.2 'Unique' Safety Valve Data	13
5.3.3 Safety Valve Performance and Overhaul/ Test Data	13
5.3.4 Overhaul, Inspection and Test Schedules	14
5.4 Recorded Information	14
6 REFERENCES	17
6.1 Abbreviations	17
7.2 List	17
7.2.1 Codes and Standards	17
7.2.2 Other Publications	17
APPENDIX	19
A1 SET PRESSURE DEFINITIONS	19
A2 EFFECT OF RELIEF SYSTEM DESIGN	19
A3 GUIDELINES FOR ACCEPTING NEW SAFETY VALVES PRIOR TO USE	19
A4 REMOVAL, INSPECTION AND RE-INSTALLATION	20
A5 WORKSHOP MAINTENANCE	20
A6 FLUID CATEGORISATION AND PLANT OPERATING ENVIRONMENT	22
A7 FACTORS TO BE CONSIDERED IN THE REVIEW PROCESS	22
A8 IN-SITU TESTING AND CHECKING	23
A8.1 Visual Inspection	23
A8.2 Verification of Safety Valve Operability Using Easing Gear	24
A8.3 On-line Verification of Safety Valve Set Pressure	24
A8.4 Acoustic Emission Leak Detection	26
A9 ACTION TO BE TAKEN WHEN A SAFETY VALVE LIFTS	26

LIST OF EEMUA MEMBER COMPANIES	27
EEMUA PUBLICATIONS—SUMMARY LIST	29

FOREWORD

Note on terminology.

The terms 'relief valve', 'safety valve' and 'safety relief valve' are widely used in industry and have specific meanings in US standards. However only safety valve is defined in British and ISO standards, and is the term used, generically, in this text without the American distinctions.

The term safety valve operating period generally means the period, between successive examinations, in which the valve is in service (precise definitions may vary—see 4.1.5). It is synonymous with 'inspection interval'.

'Plant operating period' is the period between successive overhauls.

This Guide sets out the issues to be considered in determining and reviewing operating periods for safety valves. This is a crucial area for operators of pressure containing plants because it impacts upon both the safe operation of pressure systems and the cost of safety and environmental compliance.

If safety valves are not inspected with sufficient frequency they may not operate when called upon to do so, or they may leak. Conversely, unnecessary shutdowns need to be avoided as plant down-time and maintenance are costly. Ideally, a safety valve will be overhauled immediately before it 'fails'. In practice, plant operators endeavour to have safety valve inspections coincide with plant outages necessary for other reasons such as pressure vessel examinations.

There is little published guidance to date on establishing valve operating periods, and the principal considerations are not widely appreciated. This Guide seeks to provide the important first step in recognising the main issues, and suggests how companies might proceed towards a managed system of review.

The information provided reflects good practice. Compliance with this, however, does not imply compliance with any particular legislative requirements. Users should satisfy themselves that they comply with the relevant legislation and statutory regulations relating to pressure systems and the use of safety valves. It should also be noted that in certain countries compliance with particular codes or standards may be mandatory.

In the UK the governing regulations are *The Pressure Systems and Transportable Gas Containers Regulations 1989 (SI 1989 No. 2169)*, commonly referred to as the 'PSRs'. Although not specifically mentioned in the PSRs, safety valves come under the category of 'protective devices', and their set pressures are dependent on the 'safe operating limits' of the pressure systems and equipment they protect. (The terms in quotation marks are defined in the PSRs.)

The EEMUA Pressure Relieving Safety Systems Technical Committee has developed this Guide from the experience and practices of its member companies in the petroleum, chemical and power industries. The document deals with and expands on issues not fully covered in other publications such as API RP 576 and IP Code Part 12. It is not intended to be prescriptive.

Publications referred to in this document are listed in Sec 6.

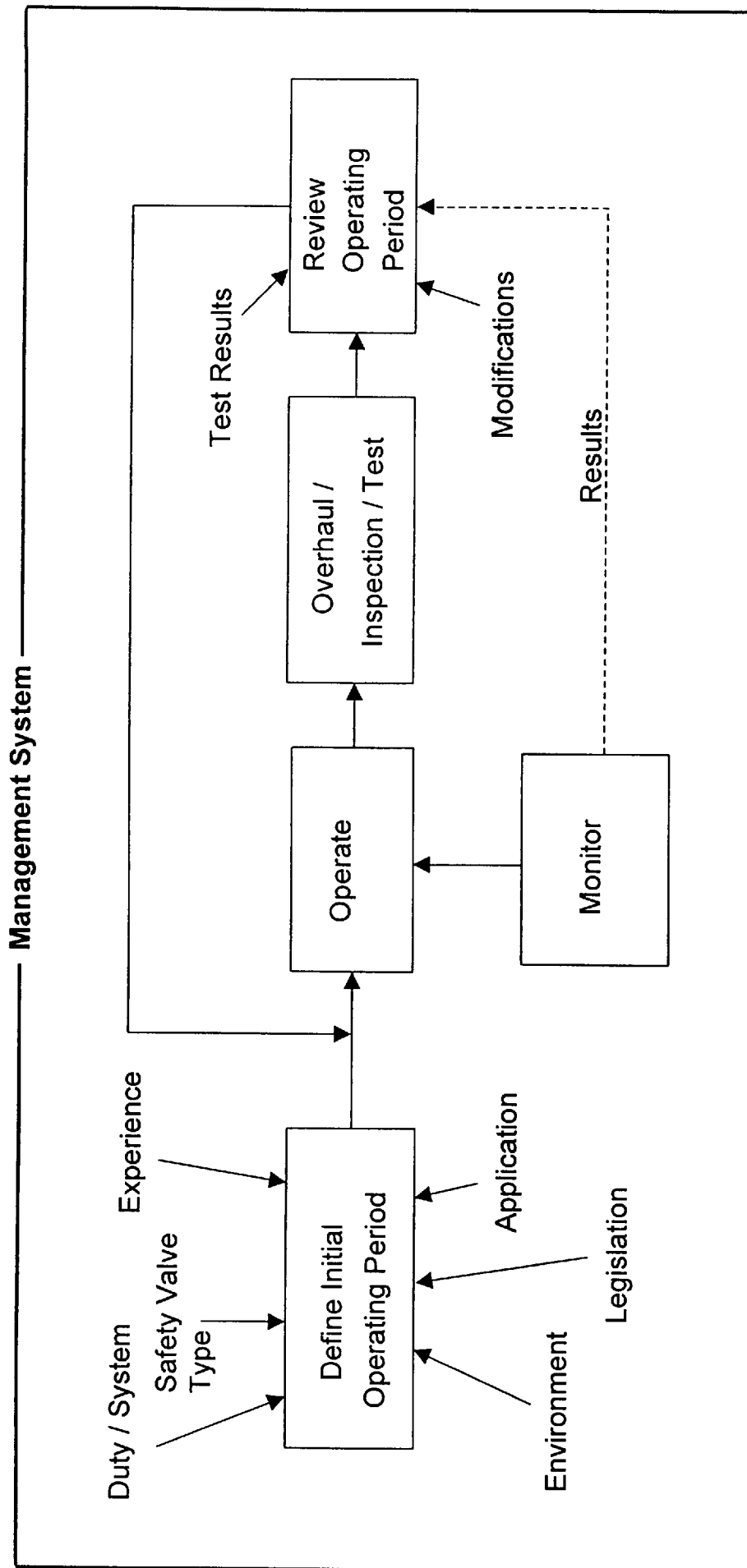
1 SCOPE

This document provides guidance on establishing operating periods of safety valves and gives further information, beyond the relatively simple statements contained in national codes, to provide a basis for the review of such operating periods. It covers a number of points which may be used as a basis for user company procedures. The main part offers general guidance, whilst the Appendix goes into more detail in certain areas, not necessarily referred to in the main text, such as the effect of relief system design (A2), acceptance of new valves prior to use (A3), inspection, maintenance and testing (A4, A5 and A8), and advice on what should be done if a safety valve lifts (A9).

The Guide applies to most pressurised fluid systems and safety valves, including thermal relief and pilot-operated valves, but with the exception of pressure-vacuum (tank breather) type valves.

2 INTRODUCTION

- 2.1 Safety valves are items critical to ensuring the integrity of pressurised systems and are often the ultimate protection against excessive pressure. As mechanical devices, usually with fine tolerances, they may fail to operate, or to operate properly, for a number of reasons (see Appendix, A7.4). It is therefore necessary that a safety valve undergoes periodic inspection/overhaul to ensure that when required to operate it does so under the conditions and within the limits specified for the particular installation.
- 2.2 Although installed primarily for over-pressure protection, a valve may lift below its set pressure, with detrimental environmental or commercial consequences.
- 2.3 The process of setting the operating period of a safety valve should begin with determining an initial operating period followed by subsequent reviews based on operating experience. It is important to appreciate that the operating period selected should be that which is suitable for each safety valve in its specific location. The overall concept is illustrated in the figure on p. 6.



Model for Reviewing Safety Valve Operating Periods