TECHNICAL REPORT
ISA-TR18.2.5-2012

Alarm System Monitoring, Assessment, and Auditing

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Foreword

In June 2009, ANSI/ISA-18.02-2009, Management of Alarm Systems for the Process Industries, commonly referred to as ISA-18.2, was issued. In that same year the ISA18 committee established working groups to develop a series of technical reports with guidance on how to implement the practices outlined in ISA-18.2. The six technical reports are listed below with a brief overview.

- TR1 – Alarm Philosophy – provides guidance on the alarm philosophy. TR1 is limited to the scope of ANSI/ISA-18.02-2009 Clause 6. The alarm philosophy provides guidance for successful management of the alarm system. It covers the definitions, principles, and activities by providing overall guidance on methods for alarm identification, rationalization, classification, prioritization, monitoring, management of change, and audit.
  - Methods for rationalization activities are documented in TR2.
  - Methods for monitoring are documented in TR5.

- TR2 – Alarm Identification and Rationalization - provides guidance on alarm identification and rationalization. TR2 was limited to the scope of ANSI/ISA-18.02-2009 Clauses 8 and 9. Identification and rationalization covers the processes to determine the possible need for an alarm or a change to an alarm; systematically compare alarms to the alarm philosophy; and determine the alarm setpoint, consequence, operator action, priority, and class.

  Activities include, but are not limited to, identification, justification, prioritization, classification, and documentation.

- TR3 – Basic Alarm Design - provides guidance on basic alarm design. TR3 focuses on the scope of ANSI/ISA-18.02-2009 Clause 10 and may include other clauses as needed (e.g., operations and maintenance). Basic alarm design covers the selection of alarm attributes (e.g., types, deadbands, and delay times) and may be specific to each control system.

- TR4 – Enhanced and Advanced Alarm Methods - provides guidance on advanced and enhanced alarm methods. TR4 focuses on the scope of ANSI/ISA-18.02-2009 Clause 12. Enhanced alarm design covers guidance on additional logic, programming, or modeling used to modify alarm behavior. These methods may include: dynamic alarming, state-based alarming, adaptive alarms, logic-based alarming, predictive alarming, as well as most of the designed suppression methods.

- TR5 – Alarm Monitoring, Assessment, and Audit - provides guidance on monitoring, assessment and audit of alarms. TR5 focuses on the scope of ANSI/ISA-18.02-2009 Clauses 16 and 18. Monitoring, assessment, and audit cover the continuous monitoring, periodic performance assessment, and recurring audit of the alarm system.

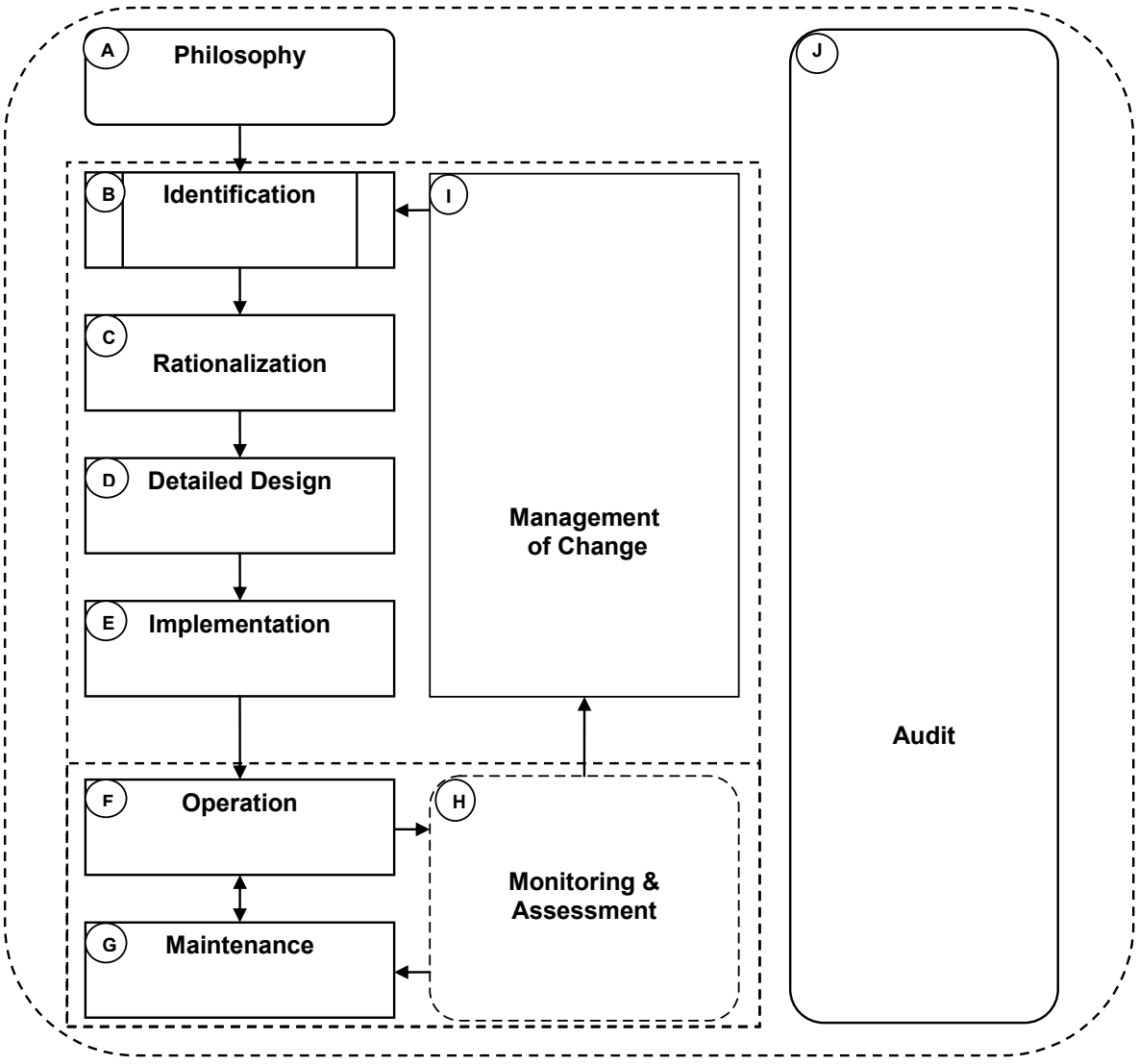
- TR6 – Alarm Systems for Batch and Discrete Processes - provides guidance on the application of ANSI/ISA-18.02-2009 alarm life cycle activities to batch and discrete processes, expanding on multiple clauses of ANSI/ISA-18.02-2009.

Each technical report is written to be a standalone document. In an effort to minimize repetition, the technical reports have cross references.

The guidance as presented in this document is general in nature, and should be applied to each system as appropriate by personnel knowledgeable in the manufacturing process and control systems to which it is being applied.

Introduction

ANSI/ISA-18.02-2009 gives requirements that address alarm systems for facilities in the process industries to improve safety, quality, and productivity. The general principles and processes in ANSI/ISA-18.02-2009 are intended for use in the lifecycle management of an alarm system based on programmable electronic controller and computer-based human-machine interface (HMI) technology. These requirements are presented in the standard using the alarm management lifecycle shown in ANSI/ISA-18.02-2009, Figure 1.



Note 1: The box used for stage B represents a process defined outside of this standard per ISA-18.2, 5.2.1.2.
Note 2: The independent stage J represents a process that connects to all other stages per ISA-18.2, 5.2.1.10
Note 3: The rounded shapes of stages A, H, and J represent entry points to the lifecycle per ISA-18.2, 5.2.2.
Note 4: The dotted lines represent the loops in the lifecycle per ISA-18.2, 5.2.4.

ANSI/ISA-18.02-2009 Figure 1

Clause 16 of ISA-18.2 covers Alarm System Monitoring and Assessment. Clause 18 covers Alarm System Auditing. Measurement is fundamental to control and improvement. Effective management of the alarm system requires ongoing measurement of its performance.

An alarm system that performs well may experience deterioration over time as sensors and process conditions change, or if an alarm change management policy is not in place and enforced. A system designed in accordance with good practices may still have poor performance when brought online. Ongoing performance measurement is needed to identify such situations in order to ensure a properly functioning alarm system.

This technical report has been written to aid in the collection of alarm system data, the analysis of that data, and the application of that analysis to improvement in the operation of the process. Sections of the report explain the calculation of the alarm system performance metrics and the basis for performance targets.

The work process of alarm system monitoring, assessment, and audit are the subject of this report. These terms as used herein have these specific meanings.

a) Monitoring is the measurement and reporting of quantitative (objective) aspects of alarm system performance.

b) Assessment is the comparison of information from monitoring and additional qualitative (subjective) measurements, against stated goals and defined performance metrics.

c) Audit is a comprehensive assessment that additionally includes the evaluation of the effectiveness of the work practices (such as management of change) used to administer the alarm system.

Monitoring typically occurs at a higher frequency than assessment. The monitoring of some aspects of the alarm system performance is based upon continuous measurement. The intent of monitoring is to identify problems and take corrective actions.

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1 Scope

This technical report was written in support of the standard ANSI/ISA-18.2-2009, Management of Alarm Systems for the Process Industries (June 2009).

This technical report is designed to provide guidance, rationale, and examples of Alarm Monitoring and Assessment, (Clause 16 of ISA-18.2) and Audit (Clause 18 of ISA-18.2). This technical report provides guidance and information supplementing ISA-18.2 on the use of alarm system analysis for both ongoing monitoring and periodic performance assessment. Monitoring, assessment, and audit are essential to achieving and maintaining the performance objectives of the alarm system. These activities can identify improvement opportunities in the other lifecycle stages, such as philosophy, rationalization, detailed design, implementation, operation, maintenance, and management of change.

Alarm system performance analysis can also play a part in overall plant performance metrics and be used as an input to process improvement efforts. This is typically in conjunction with process historian data and control loop effectiveness data. However, analysis of control system data, process data, and operator actions are not included in this report except to note the relationship between alarm metrics and other process metrics.

The focus of the assessment process is to apply engineering judgment and review to determine whether the alarm system is performing properly. The evaluation of work processes relative to the alarm system is covered in the audit section.

2 Normative references

ANSI/ISA-18.02-2009, Management of Alarm Systems for the Process Industries

3 Definitions

3.1 General

These defined terms are used in this technical report. Synonymous terms, which are not used in this report, are listed in parentheses.

3.2 Definitions

For the purposes of this technical report, all terms defined in ISA-18.2 Subclause 3.1 are used with their identical meaning. For ease of reference, these are repeated in this section. Subclause 3.2 defines terms used in this document that are not specifically defined in ISA-18.2.

3.2.1 absolute alarm

an alarm generated when the setpoint is exceeded

3.2.2 activate

the process of enabling an alarm function within the alarm system

3.2.3 adjustable alarm (operator-set alarm)

an alarm for which the setpoint can be changed manually by the operator