A. Introduction

The Abnormal Situation Management® Joint Research and Development Consortium (ASM Consortium) conducts research and shares experiences about factors contributing to the successful reduction of abnormal situations in petrochemical processes. The Consortium develops, evaluates, and proves new solutions to reduce risks even further. The development of an understanding of effective operations practices was the initial area of study for the ASM program. In fact, the first six studies led to the establishment of the ASM Consortium. The initial study results were published as an internal technical report. As additional studies were conducted, both within Consortium member companies and within other company plants, the Consortium compiled a list of ASM effective operations practices including six guidelines on procedural operations practices.

Effective procedural practices have been an important focus of research and development for the ASM Consortium since it originated in 1994. The initial guidelines document was published as an internal Consortium proprietary document in 2003. Following this initial publication, ASM Consortium members conducted several additional investigations within the member operating plants including the use of mobile devices to support field collaboration, the use of automation to support procedure execution, understanding the influence of plant culture, and the analysis of root causes associated with procedural operations failures in process industry incidents. The current guidelines capture the key learning from this cumulative 15 year history of investigating effective procedural practices.

The purpose of this document, as an ASM Consortium Guidelines Document, is to communicate the ASM Consortium recommendations for the effective development and use of procedural practices. These guidelines can be used to assess the quality of a company's procedural practices from the perspective of their potential impact on abnormal situation management. The main focus of the guidelines is for procedures that operators uses while operating, but the guidelines are generally applicable to all types of procedures used on site.

Individuals who establish company policies and operations work processes are the primary audience for this document, including individuals with supporting roles in safety, engineering, and maintenance. In the context of this document, an operations team includes all individuals associated with the management of a process, including (as examples): plant operators, shift supervisors, operations and control engineers, maintenance staff, scheduling and process engineers, and superintendent. This audience includes both manufacturing and product development companies that deliver solutions for the operations work environment. However, this document is not intended to be a *how to guide* to the design of the plant policy or work processes.

A.1 Business Drivers

Procedural operations are perceived as important to achieving business objectives. Without hesitation, ASM member company representatives report multiple business drivers for

effective procedural operations. The top business drivers captured in our 2002 study (Bullemer and Hajdukiewicz, 2003) are:

- Safety
- OSHA Process Safety Management (PSM) regulation compliance
- Operating effectiveness and efficiency
- Environmental
- Training
- Accountability

Despite the keen awareness of the importance of procedural operations to business objectives, only three of five sites in the 2002 study could actually report the financial impact of procedural operations on operator and plant performance metrics. The plant incident reporting systems have been designed primarily to monitor and track events with safety and environmental impacts. Hence, the typical incident reporting system provides only a general indication of the extent of the impact of procedural operations. For the few sites that actually captured data on procedural operations breakdowns, evidence showed that up to 30% of all reports had procedural operations as one of the causes, and an impact of up to 8% of all reported financial losses. Based on the limited nature of the 2002 study, the typical impact is potentially significantly greater than 8% of losses (See results of the 2009 analysis in Appendix 3).

A.2 Guideline Development Process

The ASM Consortium used a participatory, iterative decision-making process with three drafts of the ASM Consortium Guidelines document. For each draft, the first two authors were primary authors of the guidelines document. These authors wrote the design guidelines and conducted critical review sessions with member company representatives to obtain approval of the guideline content. Each draft went through three critical review cycles prior to being released to member companies. This guideline document has gone through three major release cycles.

A criterion for acceptance of guideline content was that the recommended practice needed to be based on actual, observed design practices and not based solely in theory. Hence, the individuals selected to lead as authors had significant experience in observing and assessing the effectiveness of operator interface design practices. Another criterion for acceptance was the potential impact on the operators' ability to prevent and respond to abnormal situations.

A.3 Acknowledgements

For each major release of this document, many individuals have participated as members of the critical review teams. These individuals typically were experienced practitioners and study investigators. The following individuals and their ASM member company affiliation at the time of their participation on a critical review team are acknowledged for their significant contributions:

- Ric Barreth, Human Centered Solutions
- Jamie Errington, Human Centered Solutions
- Kerry Hargreaves, NOVA Chemicals
- Andy Hart, NOVA Chemicals
- John Kok, ExxonMobil
- Tim Montgomery, Chevron
- Kevin Smith, TTS Performance Systems

A.4 Guidelines Overview

The procedural practices guidelines are organized under five categories:

1. **Development** guidelines include processes and methods for creating procedures, defining types, documenting competencies requirements, and ensuring effective tools.

2. **Content and Format** guidelines address the scope of procedures, the type of information, and the appropriate content and formats for conditions of use.

3. **Deployment** guidelines suggest approaches and techniques to enable effective access and use of procedures including the use of performance support and automation.

4. **Maintenance** guidelines cover how procedures are prioritized and maintained through the Management of Changeprocess, review processes, and the use of procedure-based metrics.

5. **Training** guidelines include instruction on site policies, learning about procedural changes, certification, and use of simulator-based solutions.

The relative importance of each guideline is indicated in terms of priority ratings:

- Priority 1—the **minimum** set of guidelines for achieving an ASM **good** quality practice.
- Priority 2—a **comprehensive** set of guidelines for achieving an ASM **high** quality practice.
- Priority 3—an **advanced** set of guidelines for achieving an ASM **best** practice.

Table A-1 summarizes the guidelines presented in this document. The table demonstrates that the guidelines cover the entire breadth of the categories and the whole range of priorities.

Table A-1. Guideline summary showing the number of guidelines by category and priority.

Categories	Total	Priority 1	Priority 2	Priority 3
1: Development	7	4	3	0
2: Content and Format	11	7	3	1
3: Deployment	8	2	1	5
4: Maintenance	6	2	3	1
5: Training	7	3	2	2
All Categories	**39**	**18**	**12**	**9**