

## THE PREPARATION OF A SET OF PROCESS SAFETY PROCEDURES FOR A GLOBAL CHEMICAL COMPANY

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Following the well publicised incidents at Texas City and Buncefield, Huntsman, a leading global manufacturer of chemicals, decided that a review of compliance with the company process safety standards was required. Whilst Huntsman has had a single set of Global EHS Standards in place for some years, audits demonstrated that there were varied and differing approaches to their implementation, particularly in the area of process safety.

The conclusion was that a set of Global Process Safety Procedures were required in order to establish the minimum level of compliance for all our sites by providing 'how to' guidance.

The task of preparing 23 Global Process Safety Procedures, which would be equally applicable to 84 manufacturing facilities in 22 countries, was commenced in 2007. All the procedures were issued and piloted in 2008 and are now being globally implemented.

This paper will describe the process of selecting, writing, and implementing these procedures and will highlight some of the lessons learned.

### INTRODUCTION

During recent years high profile incidents, particularly at Texas City and Buncefield, have raised our awareness of the importance of process safety to the safe operation of our facilities. This was further emphasised by a major fire at the Huntsman Port Arthur facility in Texas (Figure 1).

Although this incident did not result in any fatalities or injuries it served as a reminder, if one was needed, that process safety incidents are not just something that happens to someone else.

In addition, analysis of our Process Safety Management audits demonstrated that the facilities had a differing and varied approach to our Global Process Safety Standards.

From the combination of these factors it was evident that more specific guidance was necessary to ensure that all Huntsman facilities followed the standards in a consistent manner. Hence a project was launched to prepare a set of Global Process Safety Procedures which would be equally applicable to all our facilities wherever they are located.

### HUNTSMAN

In order to understand some of the difficulties and challenges in preparing the procedures it is necessary to understand the background and composition of the company.

The company is divided into five businesses:

Performance Products  
Polyurethanes  
Advanced Materials  
Textile Effects  
Pigments.

The range of products produced by each division is illustrated in Figure 2.

There are 84 manufacturing facilities located in 22 countries around the world, the headquarters being located in Houston, Texas.

The company has grown by acquisition including plants purchased from CIBA, ICI, Albright and Wilson, Vantico and Texaco. There is therefore a diversity of cultural and technical interests within the company.

In addition to having to respect national and local requirements, different heritages bring their own ways of working developed according to their historical issues and values.

The range of operations varies tremendously from large continuous processes to small multi purpose batch plants and all combinations between. Again the modes of operation and the required degrees of operating flexibility have a significant impact on the approach to process safety.

With specific regard to process safety the batch plants tend to have a strong focus on chemistry whereas the continuous plants concentrate on engineering. Therefore their existing process safety procedures strongly reflect this aspect.

Hence, the preparation of a set of Global Safety Procedures, which can be applied to all our facilities, has stretched the 'one size fits all' concept to the limit.

### PROCESS SAFETY IMPROVEMENT VISION

Huntsman implemented a series of Global EHS Standards during 2001 and a number of these are relevant to process safety. These are listed below.

- EHS-700 Management of Change (MoC)
- EHS-701 Process Safety Information (PSI)
- EHS-702 Process Equipment Integrity
- EHS-703 EHS Critical Mechanical and Pressurized Systems Integrity
- EHS-704 EHS Critical Structural and Civil Systems Integrity
- EHS-705 EHS Critical Control and Instrumented Systems Integrity
- EHS-706 Hazard Identification and Analysis
- EHS-707 EHS Considerations for Capital Projects
- EHS-708 Electrical Safety and Equipment Integrity



Figure 1. Port Arthur fire – April 29th 2006

both management and associates to operate safe, clean, and efficient facilities in an environmentally and socially responsible manner.

The standards establish the basic requirements, for example EHS-706, Hazard Identification and Analysis, states that:

Businesses shall establish systems to ensure that appropriate Hazard Identification and Analysis techniques are applied to new designs/projects and modifications to existing designs.

However, it does not give guidance as to what these techniques may be. The purpose of the process safety procedures is to fill this gap and so ensure consistent compliance with the standards.

The vision for the future, commencing in 2007, was therefore to:

- Prepare a set of Global Process Safety Procedures to support the Standards
- Establish a structured and globally consistent approach for the implementation of the new procedures
- Establish, monitor and report process safety performance (KPI's)
- Verify compliance by means of audits
- Establish a Global Process Safety Group to provide on-going support.

These standards support the company EHS policy:

Huntsman is committed to achieving excellence in Environmental, Health and Safety (EHS) protection. It is the responsibility of

**PROCEDURE PREPARATION**

A Huntsman Advisory Group (HAG) was established which comprised of a senior engineering representative from each of the businesses. This group was led by a senior member of the Global EHS team.

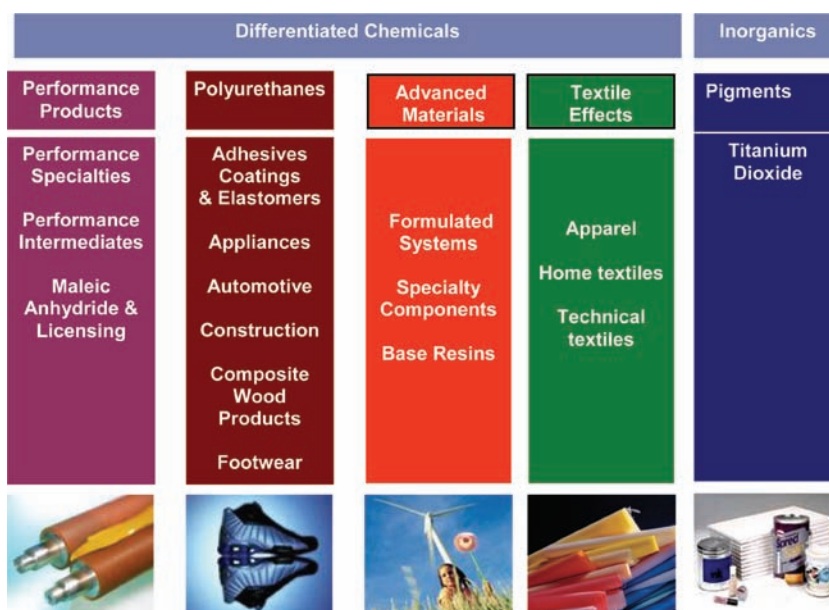


Figure 2. Five Huntsman divisions

|        |                         |  |
|--------|-------------------------|--|
| Set 1  | PS-001                  | Appointment of Qualified Persons           |
|        | PS-002                  | Process Hazard Analysis                    |
|        | PS-004                  | Process Hazard Analysis (PHA) Revalidation |
|        | PS-005                  | EHS Criticality Assessment                 |
|        | PS-006                  | Risk Management Procedure and Matrix       |
|        | PS-007                  | SIL Target Assessment Methodology          |
|        | PS-008                  | Facility Siting                            |
|        | PS-029                  | Management of Actions                      |
| Set 2  | PS-003                  | Operating Procedures                       |
|        | PS-010                  | Engineering Design Verification            |
|        | PS-011                  | Pressure Relief System Design              |
|        | PS-013                  | Organisational Change Management           |
|        | PS-014                  | Management of Change                       |
|        | PS-017                  | Mechanical Integrity                       |
| Set 3  | PS-018                  | Pre-Start-Up Safety Review                 |
|        | PS-023                  | Process Safety Information                 |
|        | PS-012                  | Fire Protection                            |
|        | PS-016                  | Area Classification and Management         |
|        | PS-021                  | Design & Maintenance of SIFs (Plant Trips) |
|        | PS-022                  | Alarm Management                           |
|        | PS-026                  | Incident Investigation                     |
| PS-030 | Variance Procedure      |  |
| PS-031 | Control System Security |  |

Figure 3. Procedure titles

To support the HAG a number of Subject Matter Experts (SME's) were identified, once again from the businesses or from one of the central groups.

Two consultancies were also appointed, one in Europe and one in the USA. The European consultancy was given the task of writing the procedures whilst that from the USA prepared the implementation and training packages. There was obviously a large degree of overlap between the two companies concerned.

Initial meetings of the HAG proposed to the Steering Committee that 23 Process Safety Procedures be prepared.

Our consultants were provided with the list of procedures, divided into three separate phases, and asked to nominate an author for each. All the Huntsman sites were then contacted and asked for copies of any procedures relevant to these titles. These were then forwarded to the nominated author.

Typically three or four weeks later, the authors of the Phase 1 documents were invited to attend a meeting of the HAG and SME's and make a presentation which contained their proposed scope for the new procedure. The scope was debated in this forum and the author left the meeting with a clear understanding of the required document contents. At the same time the authors were informed of our standard format for each of the procedures:

1. Purpose
2. Scope
3. Requirements
4. Clarifications
5. References

Attachments – Glossary, Methodologies – the 'how-to' section.

Approximately four weeks later a draft procedure was issued for comment and this was circulated to all our sites. Comments were then collated, reviewed to eliminate duplication, and forwarded to our consultants. A short period later each of the authors were invited to attend a review meeting with the HAG and SME's and the comments discussed and agreed or rejected. The consultant then left to produce a further draft.

All of the procedures had at least three revisions and some had many more. This was to be expected given the diverse backgrounds of our facilities.

The final drafts of the first Phase of the procedures were approved and issued mid-2008, approximately 12

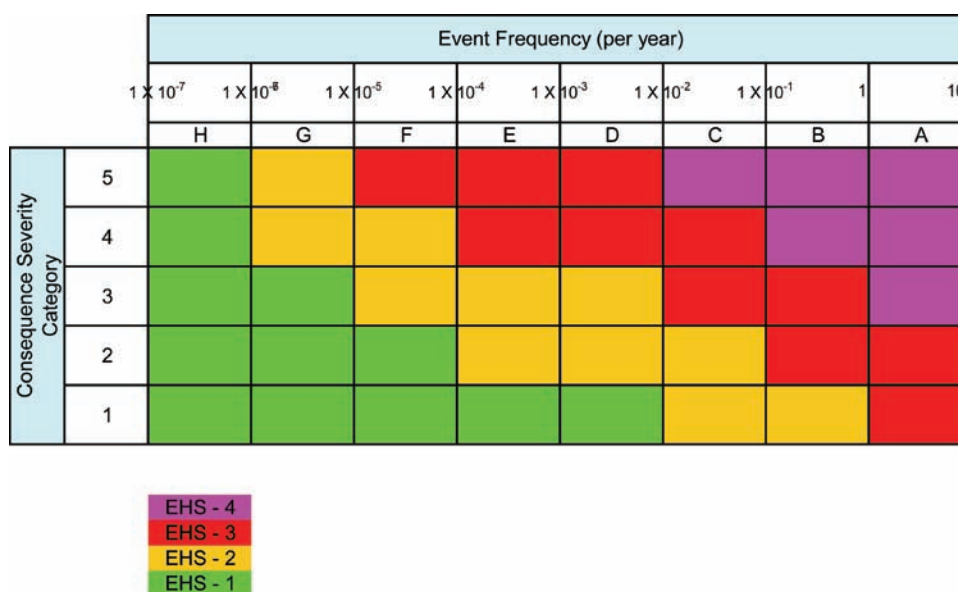


Figure 4. Risk matrix

months after the process had commenced. Phases 2 and 3 were off-set with Phase 1, with a four week gap between each. By Q4 of 2008 all the procedures had been issued to all our sites.

### IMPLEMENTATION

The next phase of the process was to implement the procedures. A small number of trial sites were selected to represent each business and each geographical area with one full week set aside for each of the Phase 1, 2, and 3 procedure implementation events.

Our USA consultant prepared a training package for each of the procedures and a gap analysis protocol such that we could judge the extent of existing compliance with the new procedures.

Each of the implementation events followed the same format:

- basic introduction to the procedures, their purpose and their content
- two hour overview of all the procedures in that phase
- two hour presentation of the contents of each procedure
- gap analysis for each procedure.

At the present time all 23 procedures are available on the Huntsman intranet in a number of languages and implementation is continuing, prioritising sites with respect to their perceived process safety risk. It is anticipated that implementation will be completed across all facilities during 2011.

### CONCLUSIONS AND LEARNING

#### PREPARATION

The selection of the procedures and the phased approach was excellent but two procedures were quickly realised to provide the foundation for all the others:

- The Appointment of Qualified Persons
- Risk Management Procedure and Matrix.

It is essential that the roles of Qualified Persons are clearly defined, in order to establish individual competency and the accountability and responsibility for each procedure on each site.

Equally important is the definition of the company risk criteria in the form of a risk matrix and incident tolerability criteria. The preparation of this procedure probably produced the most heated debates amongst the SME's.

The HAG team members were appointed by their respective businesses and attended all their regular review meetings. However the SME's were not formally appointed and differed according to the procedure being reviewed. This resulted in many SME reviews being by telephone conference which, in the case of the more technical procedures, were often long and difficult. Experience showed that the process could have been smoother if SME's had been formally appointed for each procedure and that

formal review meetings had been scheduled along similar lines to the HAG review meetings.

Many thousands of comments were received on the procedures due to the wide circulation of the draft documents. Review and assimilation of the comments took a long time.

Inevitably, due to a combination of language difficulties and differing levels of technical understanding, the meaning of many comments was not clear and therefore these were often rejected. In addition, due to the large number of comments it was not possible to reply to each one although every effort was made to do so. Therefore a number of sites were left with the feeling that their comments had not received any consideration whereas this was not the case. With hindsight it would have been better to restrict the number of people who were asked to comment on the procedure and to impose a better screening system.

### IMPLEMENTATION

The implementation process has so far worked well. Some of the sites have advanced understanding and use of the process safety procedures whereas some start with no knowledge at all. Therefore the implementation presentations sometimes needed to be reshaped according to the specific audience.

At the larger plants the audience for the implementation presentations could contain as many as fifty people whereas at the smaller sites it could consist of as few as five.

A smaller number of people were invited to the gap analysis sessions as these were clearly of a specific nature. On sites where there are a number of independent operating units it was often appropriate to ask the site management to nominate a single unit, typical of the remainder of the plant, on which to perform the gap analysis.

### COMMON THEMES

Questions from the audiences, comments from the presenters, and issues arising from the gap analyses identified a number of common themes.

Shortage of competent people to perform the process safety studies, for example Hazard Studies, Facility Siting, SIL Target Assessment and Fire Management was often raised as a concern. How could each site comply with the procedures without adequate and competent resources? At a time of severe financial constraint this was a very difficult question to answer satisfactorily.

Understanding of how to assess consequence and frequency of a potential incident was also difficult for many sites to comprehend and training is being developed in order to resolve this issue.

The implementation training and gap analyses proved to be a good test of the clarity and validity of all the procedures. On the whole the procedures were found to be excellent, knitting together well such that all aspects of

the Huntsman process safety requirements are covered. However, inevitably, there were some areas of ambiguity, some requirements were found to be excessive and there were some errors.

This led to a review of the procedures after the first round of implementation and an issue of Revision 1 Procedures in Q1 2009.

There was extensive interest in the procedures at all the sites and a demand to know how training was to be provided to raise the competency of personnel to the required level. At the present time a PHA leader training course has been produced in-house and will be delivered in 2009.

## CONCLUSIONS

The preparation and implementation of 23 world class Process Safety Procedures to suit the needs of a divergent, global chemical company has been long and expensive and is still not complete.

However, by providing our 84 worldwide manufacturing facilities with a set of procedures Huntsman has been able to establish a consistent approach to Process Safety.

Although this does not guarantee that we will never have a major incident it does go a long way to reducing the risk of harm to people and the environment from our activities.