

## IMPLEMENTING IMPROVEMENTS IN PROCESS SAFETY IN CORUS<sup>†</sup>

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This paper is a case study describing the implementation of improved arrangements for managing process safety within Corus.

Corus operates as one of the major international companies within the iron and steel sector. The importance of managing process safety in a structured and systematic manner throughout the organisation has been recognized by the company. Many of the operations within the chemical/petrochemical/oil and gas industry sectors have been subjected to major hazards legislation for several decades and leading companies have developed good practice. By comparison, Corus's operations have only been subject to major hazards legislation under the Seveso II Directive 96/82/EC since its implementation in 1999. Driven largely by the need for legal compliance at site operations level, Corus have progressively developed their arrangements for managing process safety at a rapid pace. More recently, there is a sharper awareness of the potential wide reaching impact on the business that a major accident can cause. This is illustrated by the company's own experience of the Blast Furnace explosion at its Port Talbot site in 2001 (reference 1) and as observed for other companies like the explosion on BP's Texas City refinery in 2005 (reference 2). In addition there is a strong recognition of the complementary nature of improved operational and asset integrity with improved operating equipment effectiveness for business performance improvement.

Corus have embarked upon a programme of improving the arrangements for managing process safety throughout the company. Such a programme has needed to address not just operational and asset integrity at site operations level, but also the assurance arrangements via corporate governance. It is a programme of significant organisational and culture change.

Corus engaged ABB Engineering Services to undertake an initial status review of the arrangements for managing process safety at 8 of its sites around Europe that represent a cross-section of the company's operations. Findings from this review have been embedded into an integrated safety improvement programme over the next few years, starting with 2 key thrusts:

- identification and assessment of all process-related hazards on the operating sites beyond that already done under the Seveso II Directive
- an integrated safety management system that includes pertinent standards for process safety.

KEYWORDS: Safety management systems, iron and steel industry

### INTRODUCTION

Corus is an international iron and steel company. Formed from the merger of British Steel and Koninklijke Hoogovens in October 1999, its manufacturing operations are based in Europe with major plants located in the UK, The Netherlands, Germany, France, Norway and Belgium. The company manufactures steel products and is Europe's second largest steel producer, Corus comprises of four Divisions – Strip Products, Long Products and Distribution & Building Systems and since 2nd April 2007, it has operated as a subsidiary of Tata Steel.

A key and integral part of Corus's continuous improvement efforts is striving for a performance level of its manufacturing assets that is amongst the best in the industry. Improving Overall Equipment Effectiveness, including on-line availability and costs of maintenance are key to securing and improving the company's competitive

position. Corus focuses considerable effort on achieving improved asset management, an integral part of which requires improvements in the management of asset integrity and the issues that arise from the continued operation of its assets, much of which are mature plant and equipment.

With the implementation of the Seveso II Directive, 96/82/EC across Europe since 1999, many of Corus's plants became subject to local national legal requirements for the control of major accident hazards. The larger integrated sites are amongst those that meet the criteria for "top tier" major hazard establishments. Some other sites meet the "lower tier" criteria.

Process safety in Corus was implemented as a means to attain compliance with the Seveso II Directive. The broader benefits were not immediately recognised.

The efforts leading up to mid-2008 were also never centrally governed. The IJmuiden works successfully

<sup>†</sup>ABB Engineering Services and Corus retain all registered and unregistered Intellectual Property Rights.

complied with BRZO (reference 3), but in the UK the situation was a little more complicated due to the number and spread of facilities that come under the COMAH Regulations. After submission of its first reports Corus came into some criticism from the Competent Authority as to the apparent inconsistency in its reports and the application of process safety in its operations.

To address this the Corus UK sites established the “COMAH Consistency Forum” which met regularly, and still does today, in order to try and get the required consistency. During this period a series of COMAH Policy documents were developed around various topics, including Major Accident Prevention Policy (MAPP) Auditing, Safety Reports and Management of Change systems. Particular emphasis was put on the auditing (bi-annual for “upper tier” sites) and on Management of Change.

Early on, around 2003, the central Corus Health & Safety Policy Group launched the Corus 8 Principles of good health and safety practice. This formed part of the central groups’ efforts to counter a wave of fatalities between 2000 and 2003, and also to bring the lost time injury rate (LTIR) down from a rate of around 16 per million hours worked in 2000. Within a 4 year period a frequency drop down to around 3 per million hours worked was realized – a tremendous success.

From 2004 to mid 2008 by means of a number of further central interventions the average LTI rate was reduced further to a rate of around 2 per million hours worked.

Occurrence of fatalities also reduced as a result of this effort but became more difficult to manage, while serious injuries were still occurring and had become erratic and hard to pin down.

While all this was going on Corus was still being plagued sometimes by serious process safety events, with

an observable increase around 2006 and 2007. Corus suffered an explosion on its No 5 Blast Furnace at its Port Talbot site on 8th November 2001. Whilst a process-related incident of major disaster proportions, it did not involve a “dangerous substance”. The hazards of molten metal and water reactions are a feature of the iron and steel industry and are the cause of serious incidents and even fatalities around the world. Exploding blast furnaces are also not that rare globally as shown by research done by Corus’ RD&T.

Not long after the No. 5 Blast Furnace incident a central Engineering function had been brought into being and the Corus Engineering Committee (CEC), made up of all the top-ranking Engineering Directors across the Company was established. Process Safety very quickly topped this group’s agenda and a lot of effort was put into getting it on the executive committee’s agenda.

At the same time changes at board level meant that Corus now had a link into British Petroleum at a high level and soon the effects of the BP Texas City Disaster and the Baker report (reference 2) were being discussed across the length and the breadth of the Company.

At this stage the Corus Engineering fraternity and the Central H&S Policy Group began to discuss new ways of moving Corus H&S performance to higher levels. The low LTIFR and sporadic process safety incidents, and unfortunately fatalities, meant that the way it had been done up to that point was not valid anymore. Something far-reaching needed to be done and with urgency.

In November 2006, Corus engaged ABB Engineering Services to undertake an independent initial status review of the management of process safety in the company and ABB have continued to provide advice and support in implementing the necessary improvements. It was decided to have a Process Safety workshop event at the 2008 Group Senior

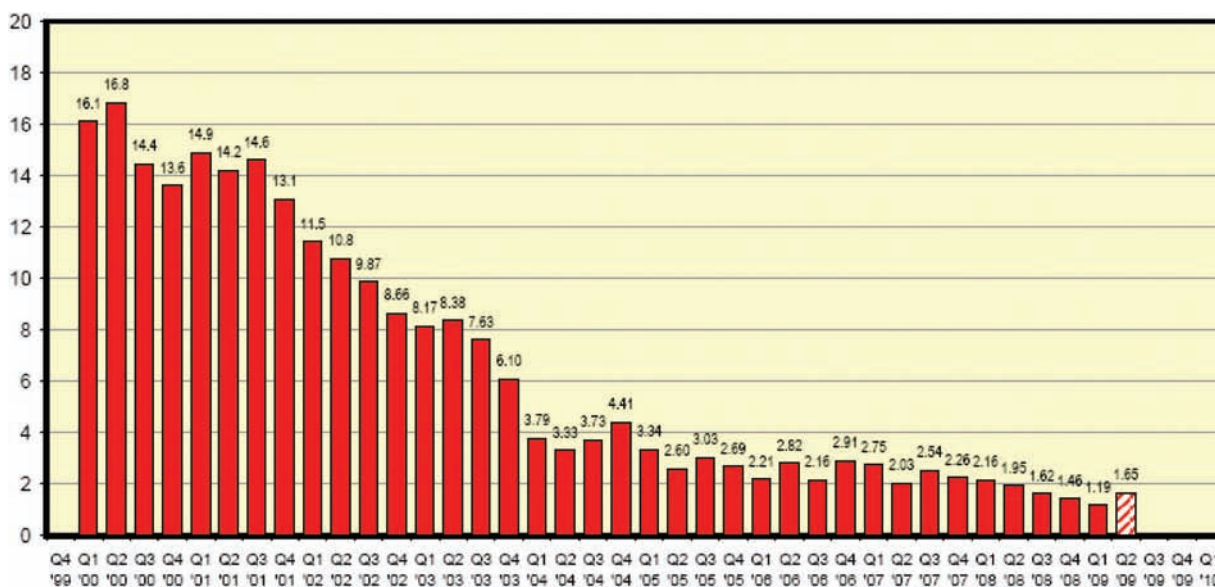


Figure 1. Lost time injury rate for Corus employees since 2000

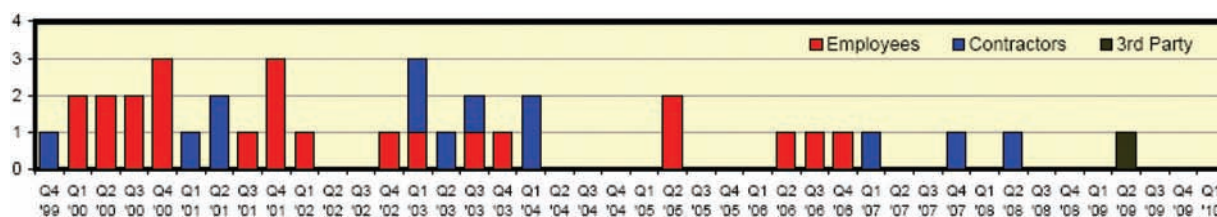


Figure 2. Fatal injuries by quarter since 2000

Manager (GSM) Conference. The intention was to explain the problem and extract a mandate from this level of management within the Company. This was a success and building on it not much later the Corus Executive Committee (ExCo) level *Process Safety Steering Committee* (PSSC) was formed. Its task was to implement arrangements for Process Safety Management (PSM) across Corus and topping its agenda was the creation one Safety Management System (SMS) for the whole of Corus and the establishment of a central team of experts to support this effort.

The mandate received at the GSM Conference still supports Corus efforts around PSM very powerfully.

**INITIAL STATUS REVIEW OF MANAGEMENT OF PROCESS SAFETY IN CORUS**

The initial status review was conducted at a number of Corus sites that represented a cross-section of the company’s operations so that a 3rd party view could be obtained of the arrangements in place for managing process safety. It included the “top tier” Seveso II sites at IJmuiden in The Netherlands, Scunthorpe and Trostre in the UK and Voerde in Germany. It also included the “lower tier” site of Corus Engineering Steels (now Corus Speciality Steels) at Rotherham and the Corus Distribution and Building Systems site at Steelpark, Wednesfield in the UK. At Scunthorpe there is a large integrated site forming part of Long Products Division. At IJmuiden there is also a large integrated site, mostly within the Strip Products Division; here the review was of the Energy Department. The Trostre site is located at Llanelli in South Wales and is part of the Corus Packaging Plus Business. Finally Voerde, at this stage part of Corus, have aluminium manufacturing operations.

Shorter reviews were also undertaken at the Long Products Division site at Port Talbot and the Strip Products Division site at Teesside.

The initial status review was undertaken in two parts:

- (i) a systems review of the arrangements for managing process safety, and
- (ii) a review of the need, readiness and motivation for change

The systems review was primarily to identify the most significant gaps in the local arrangements by comparison with good practice. It was not an in-depth audit involving a multi-function team that would typically be deployed in

gaining a fully comprehensive understanding of the arrangements in detail for assessing how effective they are. However it followed a typical protocol of such an audit with a pre-site visit review of available documentation, a formal opening meeting, a schedule of discussions with selected Corus personnel, selected sampling for on-site inspection/observation/verification and a formal close-out meeting.

As with any business change programme, implementing improvements effectively to the arrangements for managing process safety throughout Corus will involve a degree of organisational and culture change. Therefore a review of the need, readiness and motivation for change was conducted to assess how prepared Corus would be to ensure that the appropriate changes in supporting systems, attitudes and focus could be implemented in practice. The review was undertaken via a process of “affirmative inquiry”, using semi-structured face-to-face interviews with a cross-section of personnel at each of the sites. The cross-section was a mixture of the personnel from senior management, engineering and operations. All of whom are involved in managing and carrying out process safety activities on the site, including the operating personnel. It produced insights into the collective perceptions of issues such as:

- the degree of receptiveness to adopt and embrace change
- the scope, opportunity and ability to identify improvement
- the relative priority of the improvement envisaged
- the current level of understanding of process safety
- the barriers to implementation of change.

Further information on the importance and purpose of such a review as a ‘business practices assessment’ is described in reference 4.

A summary of the key steps of the initial status review and their purpose is shown in Figure 3.

In common with other large companies with hazardous work activities, Corus has focused a lot of attention on improving its health and safety performance and there have been major achievements in the reduction of employee and contractor injuries. In the discussions with everyone involved, the documents and information reviewed as well as the work area observations, there was found to be strong evidence of Corus taking its corporate responsibilities seriously here. This performance improvement has been achieved through strong leadership directly from the Chief Executive and the Executive Committee in implementing eight key policy principles for health and safety, fostering

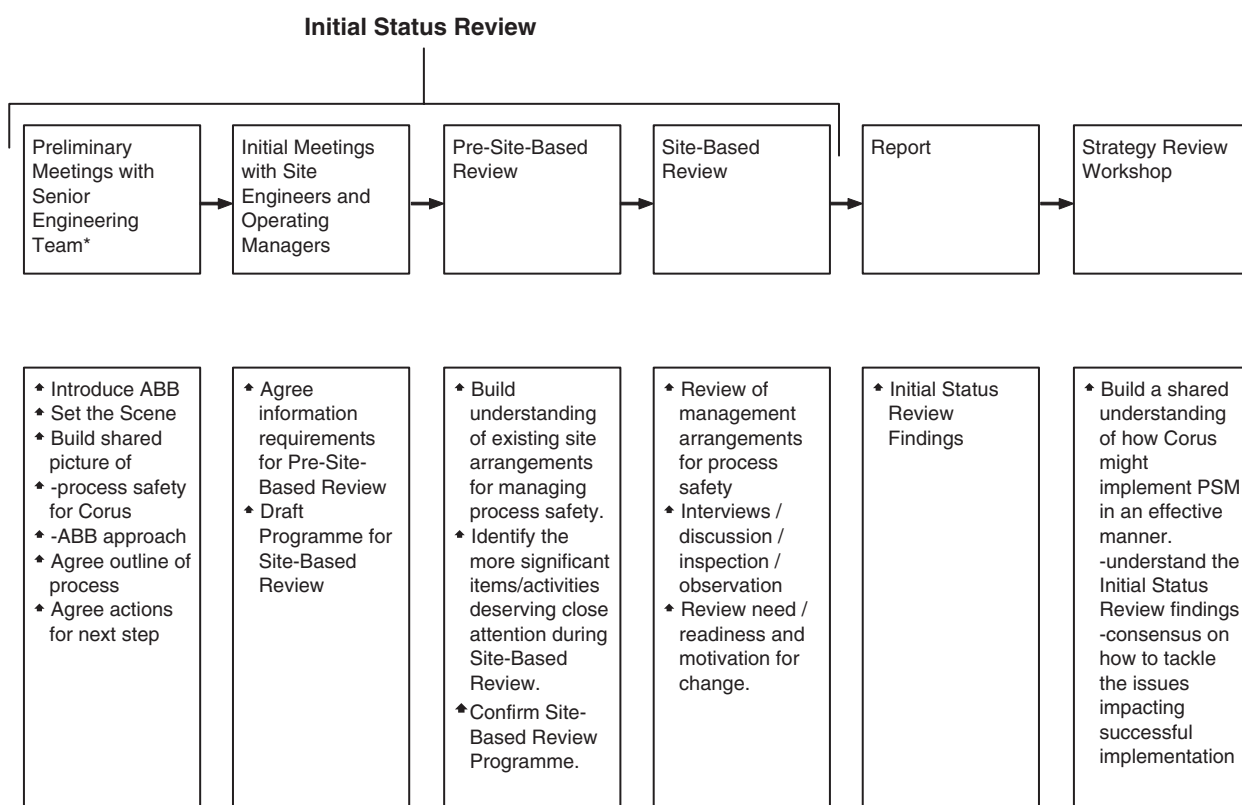


Figure 3. Initial status review – summary of key steps

a culture of continuous improvement and personal responsibility at all levels.

**BROAD FINDINGS OF THE INITIAL STATUS REVIEW**

Consistently across all sites, the health and safety management arrangements for preventing employee and contractor injuries were found to be well structured and generally well implemented. If any one major criticism was forthcoming however, it would be that Corus were mainly focused on workplace/occupational health and safety, as opposed to process safety. Even so, in accident and investigation there was evidence that process safety issues were being considered, since process-related incidents impacting employees and contractors were investigated with the same high degree of rigour as individual accidents and “near misses”.

In complying with the local Member State requirements enacted under the Seveso II Directive, it was also found that Corus’s major hazard installations have been progressively developing arrangements for managing process safety. However, the plants had not been subject to the first Seveso Directive, EC 82/501/EEC prior to 1999 and as a result the culture of managing process safety had not been established as they had in other major hazards industries. Seveso II compliance has therefore been a significant challenge and the Corus major hazard installations have

developed their arrangements for managing process safety at a rapid pace. The higher degree of attention given to the company’s “top tier” establishments by the local Competent Authority and the requirement to submit Safety Reports had generally led to the arrangements being more developed at these sites. However they had primarily been developed for legal compliance at site operations level and further work was needed to adequately cover the major accident risks that broadly impact on the business. Particularly notable in this regard is how the degree of rigour that had generally been applied to the assessment and management of process-related risks associated with molten metal did not compare well with that applied on major hazard installations where Seveso II “dangerous substances” are involved.

Each of the eight Corus sites included in the initial status review was evaluated against the following broad criteria in each of 13 elements of process safety management:

- 0 – No management systems in place. No evidence of good process safety management practice.
- 1 – Informal systems with poor structure. Practice is patchy or inconsistent.
- 2 – Some process safety management systems in place, but fall significantly short of good practice.
- 3 – Process safety management systems in place covering the most important elements of good practice. Some non-conformance.

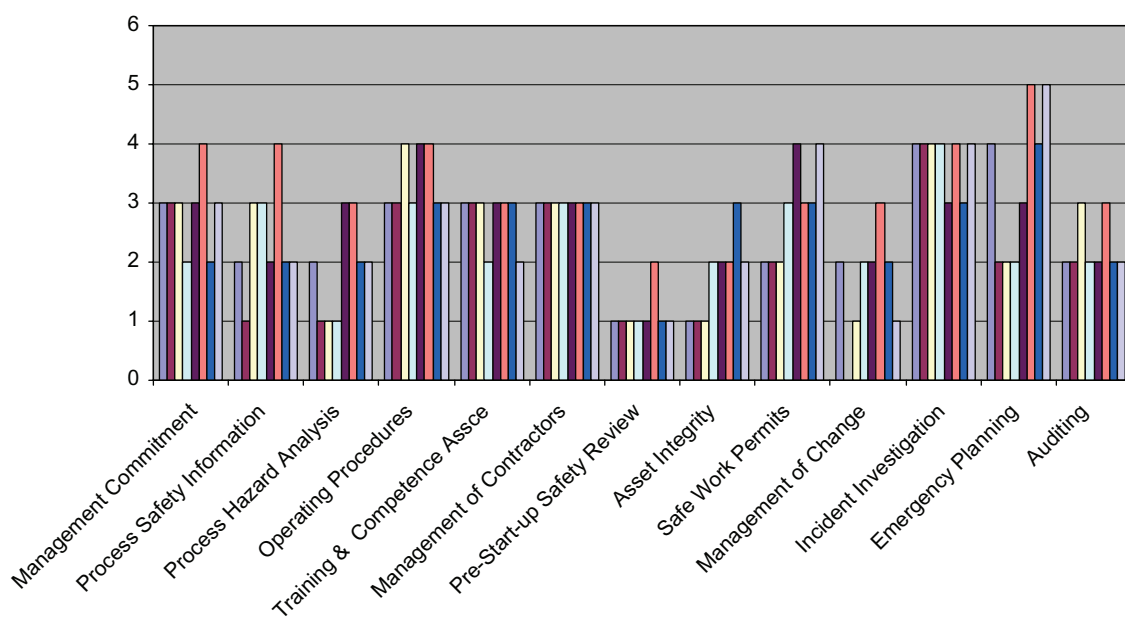


Figure 4. Initial status review evaluation of all eight sites

- 4 – Robust process safety management systems in place and practiced. Scope for some further improvement.
- 5 – World class systems for process safety management in place, used for continuous improvement.

Figure 4 illustrates the variation of this evaluation across the eight sites and the 13 elements via a measure (0–5) of the assessed degree of good practice being implemented.

The arrangements for demonstrating management commitment were generally well established. However a process safety awareness programme across the company was recognized as important. All sites had a number of Key Performance Indicators (KPI) for safety, both lagging and leading, but further development of those for process safety was recognized as important and their application in driving improvement was an area considered worthy of more attention.

Management responsibilities for process safety are defined in Safety Reports for top tier establishments; however generally management responsibilities focused on occupational health and safety. Generally the broad structure established for defining health and safety responsibilities provided a sound basis for more specific process safety responsibilities to be added. Key to the change process for implementing process safety at operational level was considered to be the clarity and reinforcement of the roles and accountabilities/responsibilities at Team Leader and Shift Manager level.

Some good examples of arrangements for emergency planning and response were evident, although there was significant variation in standards across the sites. Arrangements for operating procedures and incident investigation were generally good and consistent. Arrangements for

process hazard analysis were not strong but Corus recognizes that an improved understanding of its process-related risks is fundamental to enabling a more effective approach to managing process safety. Arrangements for the management of asset integrity have been receiving significant attention, especially via the development of risk based inspection programmes and the assessment and verification of the integrity of functional safety systems via the application of the international standard IEC61511 (reference 5). Corus are implementing an Asset Management Framework, an integral part of which addresses asset integrity. The arrangements for pre-start up safety review were recognized as needing more attention, in particular to ensure that risk controls and safeguards are fully functional.

**SUPPORT IN IDENTIFYING AND ASSESSING PROCESS-RELATED HAZARDS**

Corus recognize that understanding process-related hazards and the associated risks is key to providing the focus on which process safety can be effectively managed. In complying with the local Member State requirements enacted under the Seveso II Directive and at the time of the initial status review, Corus’s “top tier” major hazard installations had generally carried out a process hazard identification and risk assessment exercise, especially where “dangerous substances” were involved. These exercises were generally fit for purpose and included the application of HAZOP, Failure Mode and Effect Analysis (FMEA) and Fault Tree Analysis (FTA) where it was considered appropriate.

At some Corus sites a more structured and consistent approach was recognized as beneficial and ABB Engineering Services were engaged to facilitate a study



using ABB's technique for process hazards review – PHR. ABB has facilitated a large number of PHR studies for COMAH clients (reference 6) and the technique is widely recognized as a time efficient and cost effective means of identifying and assessing the more significant process-related hazards on existing plants/processes. In conducting the PHR studies in Corus it readily became clear that in some instances the risks associated with molten metal processing were greater than those presented by “dangerous substances”.

Substantial PHR programmes have been completed for the COMAH “top tier” sites at Teesside, Port Talbot and Scunthorpe. These have provided the information needed for completing assessments of the safety integrity levels (SILs) of pertinent functional safety systems in accordance with Part 3 of IEC61511 (reference 7). Many such assessments have been completed via the application of layers of protection analysis, although where a more in-depth analysis has been required (for SIL > 1), FTA has been applied. Generally the number of SIL assessments on Corus plants are rather less than would typically be required on major hazard chemical plants.

Like many other operators of mature plants/processes, up-to-date plant/process drawings and other supporting process safety information were not fully available. To a large part PHR still enabled an effective study to be conducted but where it was identified by the PHR team to be safety critical, a number of PHR actions raised therefore related to a check/confirmation of key data/information, especially where this could not be determined reasonably confidently by observation or inspection in the field.

Quite commonplace within Corus's operations is the engagement of suppliers of potentially hazardous chemicals or on-site third-party operators of potentially hazardous plant/processes that could have a significant adverse impact locally, either on-site or even off-site. Examples of these include:

- water treatment chemical supplies
- raw material supplies
- steam raising boilers.

Such suppliers/third-party operators possess expert knowledge and experience of the chemicals/materials/processes and the associated hazards involved. They should be able to demonstrate relevant safeguards and competencies in order to conduct their own activities safely. However it was also important to consider the impact on the local environment/surroundings of any hazardous events directly caused by the suppliers/third-party operators on-site. In addition, the potential for hazardous interaction or adverse knock-on effects with other operations/processes on-site were important aspects considered in the PHR studies. In both circumstances the local Corus management have responsibilities to their employees and other personnel on-site as well as to the public off-site. As such, the PHR studies provided Corus with what it needs to be an “intelligent customer” for these suppliers/third-party operators.

In order to examine the degree to which significant process-related hazards might compare on a Corus site that isn't a “top tier” COMAH establishment, a PHR programme was undertaken at the Rotherham and Stocksbridge sites of Corus Engineering Steels (now Corus Speciality Steels). Here the majority of the processes involved steel movements/processing in solid form and guideword prompts were added for the PHR so as to cover:

- movement/processing at high momentum
- movement/processing at elevated positions
- movement/processing involving significant stored energy,

in considering the effects of:

- extreme temperature (very hot metal)
- impact damage
- excess loading
- long term weakening
- maloperation
- loss of containment of oils.

The programme identified a number of process-related hazards that are significant in nature and required due assessment and management of the risks. Consequently PHR has been shown to be an effective and time efficient technique for applying to all iron and steel making/processing activities like those undertaken by Corus.

#### **THE NEW CORUS HEALTH & SAFETY MANAGEMENT SYSTEM**

The initial work of the ExCo PSSC revolved around a number of strategic efforts, mainly driven by the mandate received at the 2008 GSM Conference:

1. The development of the Management System
2. Putting in place the central PSM team headed up by a PSM Director
3. An initial site-wide assessment of process safety hazards and arrangements at Corus Manufacturing sites
4. Development of the first standards and policy documents
5. Putting in place a central PSM auditing capability

The mandate received from the 2008 GSM Conference covered delivery on the 10 priority issues listed in Table 1, but the main work that the PSSC concerned itself with was the first four issues and some additional work on other issues.

By July 2008 an initial management system framework had for all intent and purpose been developed and needed to go through a number of successive approval rounds. This process was completed by October and the first draft of the management system framework was issued to all Corus Business Units before end 2008.

This management system framework was designed with two main end-points in mind (1) full process safety implementation must be enabled and (2) integration of occupational health and safety and process safety must be

**Table 1.** Corus priority issues – 2008 GSM conference

Priority	Top 10 priorities for process safety – 2008 GSM conference
1	Skills, competence, training and resources (esp. for HAZOPs)
2	Uniform Standards and UWPs with a ‘toolkit’
3	To develop a management system eg ISRS and have a targeted approach to risk
4	Internal and external audit of processes, systems and procedures
5	Benchmarking and sharing best practices
6	To define and understand our processes and their related hazards
7	To be supported within the business financially eg for required ‘down time’
8	Central role-out system for communication
9	Develop relevant leading and lagging KPIs
10	Greater understanding of behavioural issues

possible. The system itself, in its principle requirements, builds on many areas of experience and benchmarking with DNV (ISRS-7), ABB, BP and Du Pont.

As with most of these types of systems one never really knows what you have got until the day you have finalised development and now need to implement. Throughout the development process a sense of urgency kept building which necessarily changed the deployment mechanisms quite dramatically.

Additionally, when the system was initially launched into the Company a form of exit-strategy for the former 8-Principles needed to be found and in communications the phrase “an evolution, not a revolution” was constantly used in conjunction with slides demonstrating the evolution of the new management system.

It was evident that the former 8-Principles had really embedded themselves deeply into the organisation through the number of interventions instituted by the Health and Safety Group in previous years. Also, businesses had not waited for an integrated management system to arrive, and in many cases pseudo-systems based around the former 8-Principles were already in place. Negotiating these hurdles proved a significant obstacle.

In reality the two systems, old and new, are vastly different with the new integrated management system consisting of 15 Principles and 140 mandatory requirements.

Figure 5 depicts the original 8 Principles.



**Figure 5.** Original Corus principles for health and safety

In evolving to the new system the main changes were:

- Adding ‘Accountability’ in Principle 1
- Splitting Principle 2 into two new principles
- Complete integration of Principle 3
- Splitting of Principle 8 into two new principles
- The addition of 6 new principles, that now form the new 15 Principle System

The new Management System is depicted in Figure 6:

The governance structure around the operation and maintenance of the management system is two-fold. Firstly the operation and linkages are depicted in Figure 7:

Secondly, maintenance and custodianship of the management system is delegated to the Group Health & Safety Director, by the CEO (Chief Executive Officer) and ExCo, and the current structure of Group Health and Safety is depicted in Figure 8:

One of the most difficult aspects around implementing such a management system is been the concept of the “Toolbox”. The “Toolbox” (see Figure 9 for its formal structure) is the suite of standards and how-to documents and guides that enable the various aspects to be understood and implemented within the Principles and requirements. It is also a place of ‘coming-together’ around best practices that exist in Corus, and indeed outside Corus.

The design, testing, approval and deployment of the various standards and tools can be a harrowing prospect. Some organisations may work away at it pragmatically and others will churn out such a “Toolbox” in record time. The solution for Corus sits somewhere in-between. Given the decentralised nature of Corus the problem is compounded.

The key thing to keep in mind is that the management system is there to enable some form of standardisation around “the way we do things”. As such having an empty, overfull, or stagnating “Toolbox” is a dangerous situation to be in. Once the framework is there the organisation then needs standardised guidance quite quickly as people grapple with this new system, making it work.

The custodians of the management system need to take the lead in this, or it will not happen and the organisation will revert to previous ways before any significant change can be accomplished.

Our learning in Corus has been that the need for the management system was so huge that there was no time to fully develop the “Toolbox” and Corus are now working very hard behind the scenes to get that part of the work done as rapidly and effectively as possible.



Figure 6. New Corus health & safety management system – overview

Importantly, the management system is already taking effect out in the operations.

**NEXT STEPS/CURRENT ACTIVITY**  
**SELF ASSESSMENTS**

In the first quarter of 2009 a series of facilitated self-assessments at business unit level were held across the whole company. The intention was to engage the senior

management teams at business unit level around the working of the management system and, to a large degree, this effort was successful in further embedding the management system into Corus. Most business units also ran a series of self assessments down through their organisations at least at tactical and operational levels to gauge performance and engage personnel further.

Results were then used to re-focus health and safety plans around the new management system.

Averaged results across Corus are shown in Figure 10 below. This does not include functional parts of the organisation, although specific functions were included in the assessments.

It is absolutely crucial to remember that the aim of such assessments is twofold: (1) management engagement and (2) providing management teams with an idea of their focus areas that can be used to feed into business health and safety improvement plans.

Not surprisingly the basic results of this first round of self assessments for Corus tended to point to process safety critical principles and as a result have had the effect of directing businesses to begin closing these new gaps and also then maintaining or improving on existing areas of performance around process safety, without any additional intervention required.

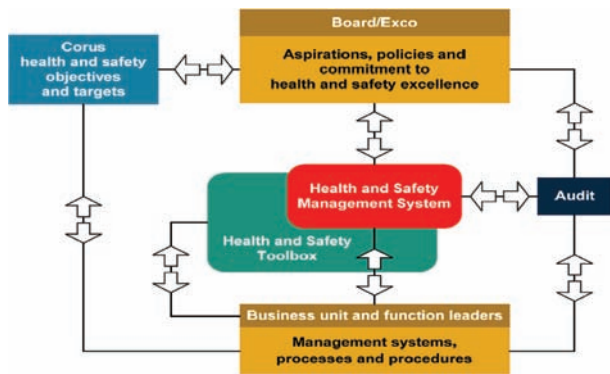


Figure 7. New governance structure

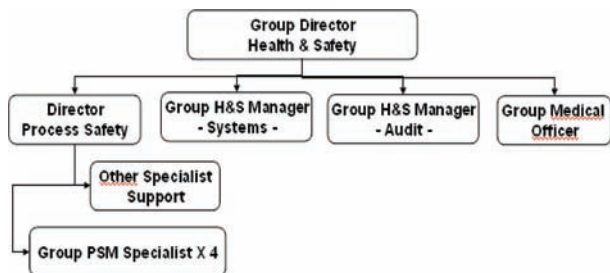


Figure 8. Responsibilities for maintaining the management system

**AUDITING**

One of the biggest changes brought about by the new management system, other than process safety implementation, was the creation of a central function concerned with auditing.

During 2009 a number of pilot audits will be held in order to test the new auditing methodology for Corus, as well as provide our first real intensive look at how the management system works and whether there are any real sticking points that may need amending.

Full, scheduled 2nd Party auditing is set to commence in 2010.



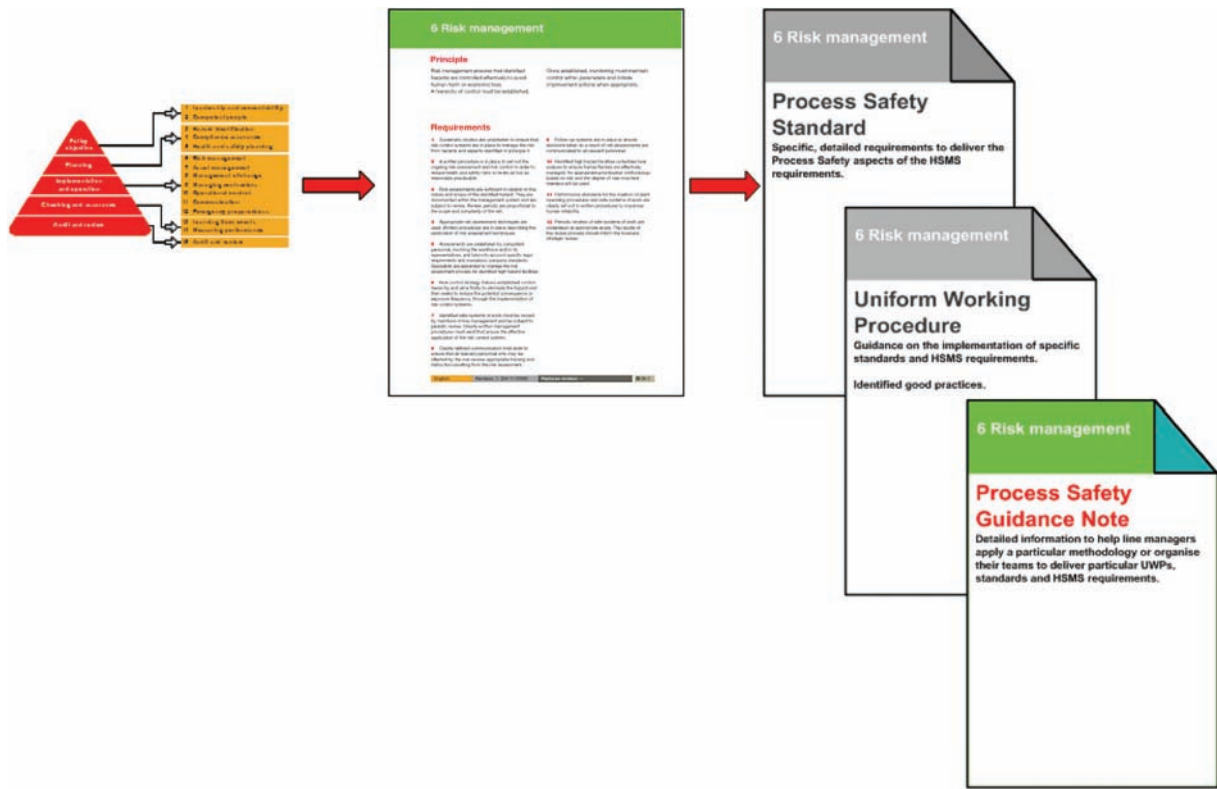


Figure 9. Corus “Toolbox” of standards, how to documents and guides

Auditable Units within Corus will be gauged on a number of criteria which will define their risk profile and, based on this, it will be decided where in the audit schedule they will fit. Sites will then drop in and out of the schedule over time, but a limit is set as to the maximum amount of

time a unit is allowed to go without an audit, based on their profile.

Designing and implementing an integrated management system in-house is a daunting task for any company to undertake. The pitfalls are many and varied, but as



Figure 10. Averaged self assessment results across Corus

opposed to an off-the-shelf-system (combined with 3rd party auditing) it is probably one of the most exciting things in which to be involved in terms of the energy and changes it generates within the Company.

Finally, so where is process safety in all this really?

This question was posed a lot prior to the launch of the management system and even now. The answer is once-again two-fold in nature:

- (1) The management system has 15 Principles because those are what are needed to enable process safety to be addressed effectively in the organisation. Any activity around these Principles will therefore by nature of their design lead to process safety being addressed relevant to the nature and complexity of risk, and
- (2) Based on risk, there are certain parts of the management system that should be receiving focussed attention where process safety hazards are encountered. These are sometimes depicted in Corus in the form of “the Wheel” shown in Figure 11 (mostly within the

process safety community), and sometimes depicted in other ways depending on the observer. All of them point to the core of the wheel, and include *Leadership & Accountability* and *Competent People*.

Keeping the focus of the wheel (above) and the results of the initial round of facilitated self assessments in mind, the current process safety activity in Corus (as directed by the ExCo and PSSC) is focussed on the following items of work:

- (1) High Hazard Facility (HHF) & Installation (HHI) Classification
  - Corus has a detailed central HHF/HHI register
  - The HHF Register is also an input source into the criteria for determination of the Company health and safety audit schedule
- (2) Implementation of robust management of change (MOC) Systems and roll-out of training and support technology (tools).
- (3) Conducting of Process Hazard Reviews

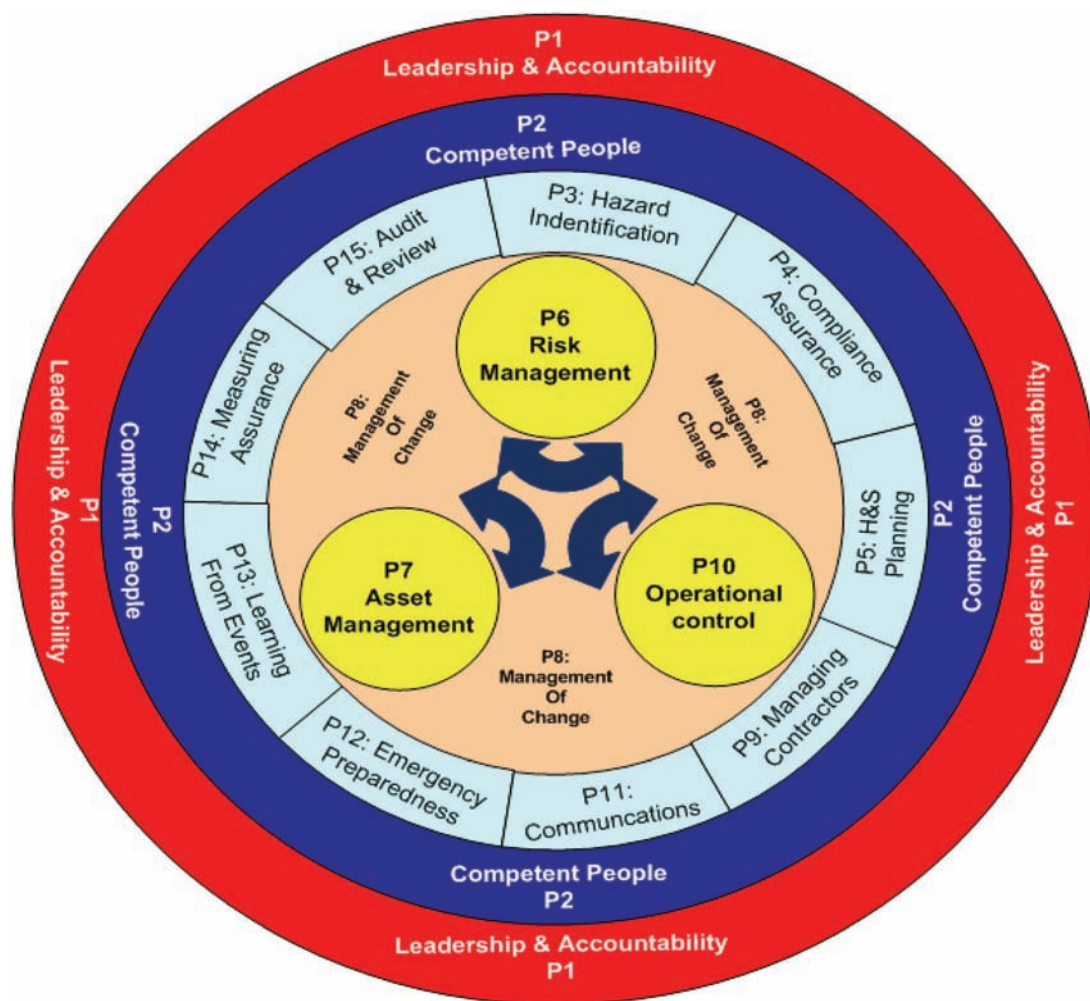


Figure 11. Depiction of the parts of the management system for focussed attention where process safety hazards are encountered

- Completion for all HHFs
  - Development of competence in Corus (with assistance from ABB)
- (4) Input into Process Safety Plans
- Plans to address hazard study needs, i.e. HAZOPs or other.
  - Development of BOPS (Basis of Process Safety) and LOA (Letters of Assurance) documents for HHFs
- (5) Completing the “Toolbox” supporting the Management System
- At least 55 new instruments identified for the PSM part of the “Toolbox”

### CONCLUSION

Process Safety has been elevated in status in Corus in a number of ways, the most important of which is the new management system. This is all showing good results but it is important to never forget why we are on this journey. It is a quest for perfection in Health & Safety Management in that we don't want people hurt or killed and that at the same time we want the business to excel.

A continued myopic focus on occupational safety as an easy means to show good performance must be guarded against. This is a difficult thing and requires special focus around other disciplines such as true occupational health and process safety.

The impact of the above is considerable and must be thought through well before embarking on the journey. Central governance and line ownership of process safety must be strong and must be constantly nurtured.

Doing it yourself is tough but it means one gets buy-in and we take people with us, which is good for everyone in the long run.

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