

Integration of the SASOL Solvents, Secunda SHEQ Management System with Corporate Process Safety Management

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Mini dissertation submitted in partial fulfilment of the requirements for the
degree of Master in Environmental Management

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Potchefstroom
2008

ACKNOWLEDGEMENTS

The author hereby wishes to express his sincere gratitude towards the following people for their support throughout the project.

Supervisor : Prof Kobus van der Walt

Technical assistance : Maurice McEvoy (Sasol Solvents RSA)
Johan Vermaak (Sasol Solvents RSA)
Ilze Swanepoel (Sasol Solvents Secunda)

Financial Support : Sasol

ABSTRACT

Sasol Solvents, Secunda is a leading global supplier of detergent raw materials, fatty alcohols, Hexene, Octene, Penete, detergent ingredients and synthetic high purity aluminas. Sasol Solvents produces ketones, methanol, ethanol, C3 and C4 alcohols, esters, acids, blends and hydro carbons, aldehydes, glycol ethers and acrylates. These products are supplied to Sasol Solvents, Secunda global customers.

Sasol Solvents, Secunda exports most of their product to international markets. Sasol Solvents, Secunda implemented ISO 9001, ISO 14001 and OHSAS 18001 due to market pressure to obtain international certification for Safety, Health, Environmental and Quality. In 2004 Sasol Solvents, Secunda integrate their Quality, Environmental and Health and Safety Management Systems.

Sasol Limited implemented the Process Safety Management Standards to prevent the release of, or exposure to hazardous substances or their energy (e.g., spillages, gas releases, fires and explosions) that could result in death or irreversible health effects, significant property damage, or significant environmental impact. The Process Safety Management Standards were designed to develop the necessary capability, experience and judgment to minimize the frequency and impact of chemical hazards.

Sasol Solvents, Secunda must establish and implement written plans for compliance with the requirements of the Sasol PSM Standards in the pertinent areas of their business, while simultaneously complying with the requirements of the existing SHEQ Management System in order to maintain certification.

The primary objective of this study is to identify commonalities between the integrated SHEQ Management System (ISO 9001, ISO 14001 and OHSAS 18001) and the new mandatory corporate initiative called 'Process Safety Management (PSM) System' for Sasol Solvents, Secunda in order to integrate the current integrated SHEQ Management System and PSM.

In evaluating the possible integration of the current integrated SHEQ Management System and PSM, a literature review was conducted to obtain a broad overview and key concepts / definitions related to the SHEQ Management System (ISO 9001, ISO 14001 and OHSAS 18001) and Process Safety Management. This was done to identify SHEQ Management System and PSM elements that can be integrated and to group appropriate elements to propose an unique element numbering system for Sasol Solvents, Secunda.

The literature review conducted indicated that objectives were reached in this study and that the Sasol Solvents, Secunda SHEQ Management System and PSM elements can successfully be integrated due the nature of the system requirements. It is a very simple principle, since the Sasol Solvents, Secunda SHEQ Management System is based on the Deming cycle of plan-do-check-act. This principle forms the basis for ISO 9001, ISO 14001 and OHSAS 18001, and can also be applied to PSM.

For effective management and operational control, it was essential to integrate the Sasol Solvents, Secunda SHEQ Management System and PSM elements.

OPSOMMING

Sasol Solvents, Secunda is een van die wêreld se voorste verskaffers van oplosmiddels, alkohole, Hekseen, Okteen, Penteen, asook bestandele vir oplosmiddels en syntetiese aluminas. Sasol Solvents vervaardig ketones, methanol, ethanol, C3 en C4 alkohole, esters, sure, mengsels van kool waterstowwe, aldehydes en akrulate. Die produkte word wêreldwyd aan Solvents, Secunda se internasionale klante gelever.

Sasol Solvents, Secunda voer die meeste van hul produkte uit na internasionale markte. Sasol Solvents, Secunda het besluit om internasionaal erkende bestuurstelsels soos ISO 9001, ISO 14001 en OHSAS 18001 te implementeer. Sertifisering is ontvang vir Veiligheid, Gesondheid, Omgewing en Kwaliteit Bestuur Stelsels as 'n vereiste vanaf internasionale klante. Sasol Solvents, Secunda het in 2004 hulle Veiligheid, Gesondheid, Omgewing en Kwaliteit (VGOK) Bestuur Stelsels geïntegreer.

Sasol Beperk het Proses Veiligheid Bestuurstandaarde ontwikkel om vrylatings of blootstellings aan gevaarlike produkte of energie (bv. verspillings, gas vrystellings brande of ontplofings) wat kan lei tot sterftes, onomkeerbare gesondheid impakte, ernstige beskadiging van eiendom of omgewing risikos te voorkom. Die Proses Veiligheid Bestuurstandaarde was ontwikkel om die nodige bevoegdheid en ondervinding te ontwikkel om chemiese gevare te beperk.

Sasol Solvents, Secunda moet geskrewe planne ontwikkel en implementeer om aan die Sasol Beperk se Proses Veiligheid Bestuurstandaarde te voldoen terwyl daar aan bestaande Veiligheid, Gesondheid, Omgewing en Kwaliteit bestuurstelsels voldoen word om sertifisering te behou.

Die oorhoofse doelwit van hierdie studie is om gemeenskaplike elemente tussen die geïntegreerde Solvents, Secunda VGOK Bestuurstelsel en die verpligte Proses Veiligheid Bestuur (PVB) Standaarde te identifiseer om sodoende die twee selsels ten volle te integreer in 'n enkel stelsel.

Tydens die evaluering van die moontlike integrasie van die VGOK Bestuurstelsel en die PVB Standaard is daar 'n literatuur studie gedoen om 'n algemene oorsig te kry oor die hoof konsepte en definisies ten opsigte van VGOK Bestuur Stelsel (ISO 9001, ISO 14001 and OHSAS 18001) en PVB Standaard. Die doel was om gemeenskaplike elemente te integreer en te groepeer om 'n enkel stelsel numering te ontwikkel vir Solvents, Secunda.

Die literatuur studie wat uitgevoer is het aangedui dat die doelwitte bereik is. Die Solvents, Secunda VGOK Bestuur Stelsel en PVB Standaard kan suksesvol geïntegreer word. Die Solvents, Secunda VGOK Bestuur Stelsel is gebaseer op die Demingsiklus van "plan-do-check-act". Die beginsels vorm die basis van ISO 9001, ISO 14001 en OHSAS 18001 en kan ook toegepas word in die PVB Standaard.

Vir effektiewe bestuur en beheer was dit noodsaaklik om die Solvents, Secunda VGOK Bestuur Stelsel en PVB Standaard te integreer.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Sasol Solvents is a leading manufacturer and supplier of a diverse range of solvents, co-monomers and associated products. These products are supplied to customers in over 110 countries for use in several industries, namely printing, packaging, plastics, pharmaceutical, fragrance, aerosol paint and adhesive sectors, as well as polish, cosmetics, agriculture and mining chemicals. There are six world-class production facilities which are situated in South Africa (Secunda, Germiston and two in Sasolburg) and Germany (Moers and Herne). The product range includes butanol, methanol, ethanol, n-propanol, iso-propanol, alcohol blends, ketones, esters, acetic acid, propionic acid, glycol ethers, fine chemicals, co monomers (including Hexene, Octene, pentene and Safol) and mining chemicals. Joint venture operations with the Mitsubishi Chemical Corporation and Huntsman Corporation, respectively produce acrylic acid and acrylates and maleic anhydride.

Sasol Solvents, Secunda is a leading global supplier of detergent raw materials, fatty alcohols, surfactants, detergent ingredients and synthetic high purity aluminas. Sasol Solvents produces ketones, methanol, ethanol, C3 and C4 alcohols, esters, acids, blends and hydro carbons, aldehydes, glycol ethers and acrylates. These products are supplied to our global customers.

Sasol Solvents, Secunda implemented a Quality Management System in 1994. ISO9001 certification was achieved in the same year. In 1996 Sasol Solvents, Secunda implemented an ISO14001 Environmental management system, for which certification was achieved in 1996. These systems were run as separate systems in different departments.

Sasol Solvents exports most of their products to European markets. Due to market pressure to obtain international certification for Health

and Safety, Sasol Solvents, Secunda replaced their existing Health and Safety system with OHSAS 18001 in 2001. Certification was obtained in December 2001, and a decision was then made to integrate the Quality, Environmental and Health and Safety systems. Sasol Solvents, Secunda integrated their three management systems into one integrated management system in 2004.

Process Safety is one of the key elements of Safety Management in Sasol. Different legal requirements across the world have resulted in various levels of Process Safety Management (PSM) implementation in the company. Whilst legal requirements regarding PSM in the United States and in Europe are well defined and audited, similar requirements are in some cases not well developed or enforced in Asia, Africa and the Middle East. Therefore, Sasol recently introduced a mandatory new management system applicable to all existing and new entities, carrying out hazardous chemical processes at any Sasol chemical or petroleum process plant, nationally and internationally. Process Safety Management system (PSM) is also applicable to joint venture operations in instances where Sasol has management or operational control. This system also applies to any third party service provider, operating or in control of any aspect of Sasol's hazardous chemical processes. In the case of joint venture operations not under Sasol management, the application of this system will be negotiated with the relevant joint venture partner(s).

1.2 WHAT IS PROCESS SAFETY MANAGEMENT (PSM)?

Process Safety can be defined as critical components, equipment, or systems whose failure could result in, allow, or contribute to, the release of or exposure to hazardous substances or their energy (e.g., spillages, gas releases, fires and explosions) that could result in death or irreversible health effects, significant property damage, or significant environmental impact (Sasol Process Safety Management System Guideline (2007).

PSM is to pro-actively ensure process integrity by preventing loss of containment of hazardous chemicals, the loss of control of energy, and the prevention of associated adverse consequences. PSM requires contingency plans to be in place to mitigate as far as reasonable and practicable, the potential consequences of such incidents. This standard sets the minimum requirements for PSM for the Sasol Group of Companies. The standard furthermore sets PSM governance and assurance requirements (PSM Management Standard S1, 2007).

A PSM guideline was developed earlier by the global Sasol PSM Community of Practice, and approved by the relevant Sasol SH&E committees (Sasol Process Safety Management System Guideline). Similarly, as part of the development of the SH&E Risk Management Process Guideline, several PSM risk assessment tools were also documented to ensure a consistent risk management process.

This PSM Guideline serves to further define how PSM will be practiced in Sasol. It is based on the US OSHA PSM methodology.

PSM is fully consistent with Sasol Safety Value (Sasol Safety Value, 2001), which is: "We commit to eliminate all incidents and work to world-class safety standards". In doing so:

- We recognize that all accidents can be prevented and consider safety as the first priority in planning any task.
- We develop and reward safety attitudes and behaviours that support a world-class safety culture and recognize the key role that leadership plays in setting the example.
- We do not ignore any safety malpractice and promote interactive dialogue and action on safety matters ("Zero tolerance").
- We expect the same competence and safety performance from service providers as we do from our own employees.
- We are all, individually and collectively, accountable for our own safety and of those around us

The Sasol PSM standards are internal mandatory requirements and are not intended to replace any existing internal PSM guidelines. It

should be applied and implemented, taking cognisance of all applicable local legislation, internal SH&E and Sustainable Development (SD) policies, strategies, principles, minimum requirements, standards and guidelines. However, in the event of conflict with any of the above mentioned internal documents (but not local legislation) in so far as PSM is concerned, the requirements of the PSM standards take precedence (PSM Management Standard S1, 2007).

Where necessary, clarity must be sought from the PSM Steering Committee and the SH&E Centre on the interpretation, application and implementation of these standards.

The SH&E and Sustainable Development Minimum Requirements propose the development of SH&E Integrated Management Systems at Business Unit (SBU) level, at some future date. However, to accelerate implementation, PSM is supposed to initially be implemented as an independent program and only later be integrated into other SH&E systems (Sasol SH&E Minimum Requirements 1.4, 2006)

1.3 PROBLEM STATEMENT

Sasol Solvents, Secunda must establish and implement written plans for compliance with the requirements of the Sasol PSM Standards in the pertinent areas of their business, while simultaneously complying with the requirements of the existing SHEQ management system in order to maintain certification. For effective management and operational control, it is necessary to integrate these two systems.

1.4 RESEARCH OBJECTIVES

The main objective of this research is to identify commonalities between the integrated SHEQ Management system (ISO 9001, ISO 14001 and OHSAS 18001) and the new mandatory corporate initiative called Process Safety Management (PSM) System for Sasol Solvents, Secunda in order to integrate the current integrated SHEQ Management System and PSM.

In order to achieve the main objective, a literature review will be conducted to obtain a broad overview and define key concepts / definitions related to the SHEQ Management system (ISO 9001, ISO 14001 and OHSAS 18001) and Process Safety Management. The purpose of the literature review will be to acquire answers to the following questions:

- What is a SHEQ Management System and Process Safety Management?
- Why is there a need for a SHEQ Management System and Process Safety Management?
- What is the relation between SHEQ element requirements and Process Safety Management?
- When evaluating Sasol Solvents, Secunda on process safety incidents for the previous year against PSM elements, is it possible to identify any shortfalls in the SHEQ Management System?
- Is it possible to identify SHEQ Management System elements that can successfully be integrated into the SHEQ Management System?
- Is it possible to group relevant elements and to create an unique element numbering system for Sasol Solvents, Secunda?

1.5 RESEARCH METHODOLOGY

In order to achieve the study objectives, the following methodology will be followed:

- A literature review will be conducted as an initial step to obtain a broad overview and key concepts / definitions related to SHEQ Management system (ISO 9001, ISO 14001 and OHSAS 18001).
- Literature will be analysed to obtain a broad overview and key concepts / definitions related to the fourteen PSM elements.
- Appropriate background in terms of the SHEQ Management system (ISO 9001, ISO 14001 and OHSAS 18001) at Sasol Solvents, Secunda will then be provided.

- On completion of the literature review and analysis of the PSM elements the author will:
 - List SHEQ Management System and PSM elements that can be successfully be integrated.
 - Group appropriate elements and propose an unique element numbering system for Sasol Solvents, Secunda.

CHAPTER 2: THE HISTORY OF SASOL SOLVENTS, SECUNDA SHEQ MANAGEMENT SYSTEM

In this chapter, the historic development of the Sasol Solvents, Secunda integrated SHEQ Management System will be described.

2.1 WHAT IS ISO?

ISO is the International Organization for Standardisation (ISO) and is a worldwide federation of National Standards Bodies with their headquarters based in Geneva. Many ISO Standards have been adopted as National Standards in various countries, including South Africa (US EPA, 2006:1).

Each member body interested in a subject for whom a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization (International Organization for Standardization, 1999).

Preparation of standards is carried out by ISO Technical Committees, on which each member body has a right to representation. Draft international standards adopted by the technical committees are circulated to the member bodies for voting. Agreement must be reached between a minimum of 75% of voting members for a standard to be published (ISO 14001:2004:iv).

2.2 WHAT IS ISO 9001?

The ISO 9000 Quality Management System series is probably the best-known Management System Standard. It was first published in 1987, revised and published in July 1994 and again in December 2000, when it was also approved and published as a SA National Standard. The

system has as goal to achieve the consistent production of high quality products (Matias & Coelho, 2002:3860).

2.3 WHAT IS OHSAS 18001?

Occupational Health and Safety Assessment Series (OHSAS) is not an ISO International Standard. A consortium of international organizations led by the British Standards Institute compiled OHSAS. It was developed in order to satisfy the pressure from organizations around the globe to have a common standard to benchmark their Occupational Health and Safety Management Systems. OHSAS 18002 is the Occupational Health & Safety Management System Guidance document (OHSAS 18001 Occupational Health and Safety Zone, date unknown).

This system was published in April 1999, launched by the British Standards Institute in South Africa in May 1999, and various certification bodies around the world are now certifying organizations to OHSAS 18001 (OHSAS 18001 Occupational Health and Safety Zone, date unknown).

OHSAS 18001 is modelled on the structure of the ISO 14001 Environmental Management System, and there are many areas of similarity and overlap. Organizations needed to address line management responsibilities through integration of systems, rather than the confusion of duplication or running systems in isolation with the risk of missing important issues (OHSAS 18001:ii).

One of the main reasons that ISO was slow to adopt Health and Safety as an International Standard was the International Labour Organization (ILO), who stated that it required more input from labour. They commissioned an international survey and in May 2001 published their Draft ILO Technical Guidelines on Occupational Health and Safety Management Systems, which can be accessed via their website: www.ilo.org (Safe work and Management Systems).

2.4 WHAT IS ISO14001?

A brief history of environmental management and management systems is needed to fully appreciate how environmental management developed and where it is today. The following summary provides insights about what has worked well and where improvements have been needed over the years.

In the 1980's there was an "explosion" of environmental regulations, industry code of practices which rolled over into the 1990's. In 1990 the International Chamber of Commerce formulated its Business Charter for sustainable development. It was launched at the 2nd World Industry Conference on Environmental Management in April 1991 to assist enterprises around the world fulfil their Commitment to Environmental Stewardship and improve their environmental performance in a comprehensive way (Quality Network, date unknown).

Throughout the following 10 years, global awareness and public pressures on environmental issues have increased, and international and South African legislation has undergone major changes for protection of the environment by means of sustainable development (Quality Network, date unknown).

The ISO 14000 series emerged primarily as a result of the Uruguay round of the GATT negotiations and the Rio Summit (Quality Network, date unknown). GATT concentrates on the need to reduce non-tariff barriers to trade. In 1992, trade ministers from world governments met in Rio de Janeiro for the Earth Summit, where they agreed to support sustainable development and to generate a commitment to protect the environment (Bansal and Bonger, 2002:269).

ISO 14001 was argued to be the next logical step forward given the successes of the quality standard ISO 9000 and its automotive industry

variant QS 9000 (Melnik *et al.*, 2003:330). ISO 14001 was published in September 1996, and approved and published as a South African National Standard in October 1996. Subsequently over 22000 organizations implemented ISO 14001 and were certified by 31 December 2000 and by the mid-2001 more than 30300 organizations worldwide were ISO 14001 certified. After the first five years of implementation there were over 250000 organizations certified internationally and this figure is growing by at least 50000 per year (Melnik *et al.*, 2003:330) and (Corbett and Kirsch, 2001). In 2005, SANS 14001:2005 replaced SABS ISO 14001:1996. SANS 14004:2005 was published and is the Environmental Management System's (EMS) General Guidelines on Principles, Systems and Supporting Techniques.

2.5 WHAT IS THE NEED AND USE OF ISO 14001(2004)?

ISO 14001 is applicable to any organization that wishes to:

- implement, maintain and improve an environmental management system,
- assure itself of its conformance with its stated environmental policy,
- demonstrate such conformance to others
- seek certification of its environmental management system by an external organization,
- make a self-determination and declaration of conformance with the standard (Hillary 2004:562) and (Melnik *et al.*, 2003:333-334).

When corporations follow the spirit of ISO 14001 they can experience attitudinal, managerial, and operational changes and their attendant benefits. The ISO 14001 standards can provide good 'common sense' guidelines for reducing the negative environmental impacts of industrial operations, thereby saving companies money from waste reduction and pollution prevention and at the same time contribute to the environmental quality of the communities in which they operate (Bansal and Bogner, 2002:270).

2.6 ENABLING FUNCTIONS OF AN EMS

Hillary (2004:563) states the effects of a formal ISO 14001 standard enable management to:

- Establish an environmental policy appropriate to the organization, including a commitment to the prevention of pollution.
- Facilitate planning, controlling, and monitoring to ensure policy is complied with and remains appropriate for the organization.
- Identify the legislative requirements and environmental aspects of the organization's products, services and activities to determine impact, significance, priorities, and objectives.
- Establish a program to implement these policies and objectives with a disciplined process of evaluating and achieving target performance levels while seeking improvements where appropriate.
- Develop management and employee commitment to the protection of the environment, with clear assignation of accountability and responsibility.
- Encourage environmental planning throughout the full range of the organization's activities, from raw materials acquisition to product distribution.
- Provide resources, including training, to achieve targeted performance levels on an on-going basis.
- Establish a management process to review and audit the Environmental Management System's and to identify opportunities for improvement of the system and resulting environmental performance.
- Establish and maintain appropriate communications with relevant internal and external parties.
- Encourage contractors and suppliers to establish an EMS.

External benefits may be grouped into three categories:

1. Commercial benefits- attraction of new business and customers and the satisfaction of customer requirements

2. Environmental benefits- improved environmental performance, assured legal compliance, energy and material efficiencies, reduced energy consumption and waste minimization.
3. Communication benefits- image-enhancement and improved dialogue and relationships with stakeholders.

2.7 CONTINUAL IMPROVEMENT PROCESS

The ISO 14001:2004 standard consists of seventeen clauses and five main elements:

1. Environmental policy
2. Planning
3. Implementation and operation
4. Checking
5. Management review

The five elements of the ISO 14001 standard provide a framework for continually improving the organizations environmental performance. The standard does not contain absolute requirements for environmental performance beyond the level of management capability for compliance with relevant local legislation. (ISO 14001:2004)

It was agreed from the outset that ISO 14001 should not specify performance levels such as air or water quality performance levels that are to be enforced on a global scale. As a compromise, it was agreed that the legal environmental requirements of each individual country would define the minimum performance levels for organizations that operate within that country. (Nel and Du Plessis, 2002:52)

However, the organization must make a commitment to continual improvement of the system in line with its own environmental policy. ISO 14001 sets requirements for the organization's structure, responsibilities, practices, procedures, processes and resources.

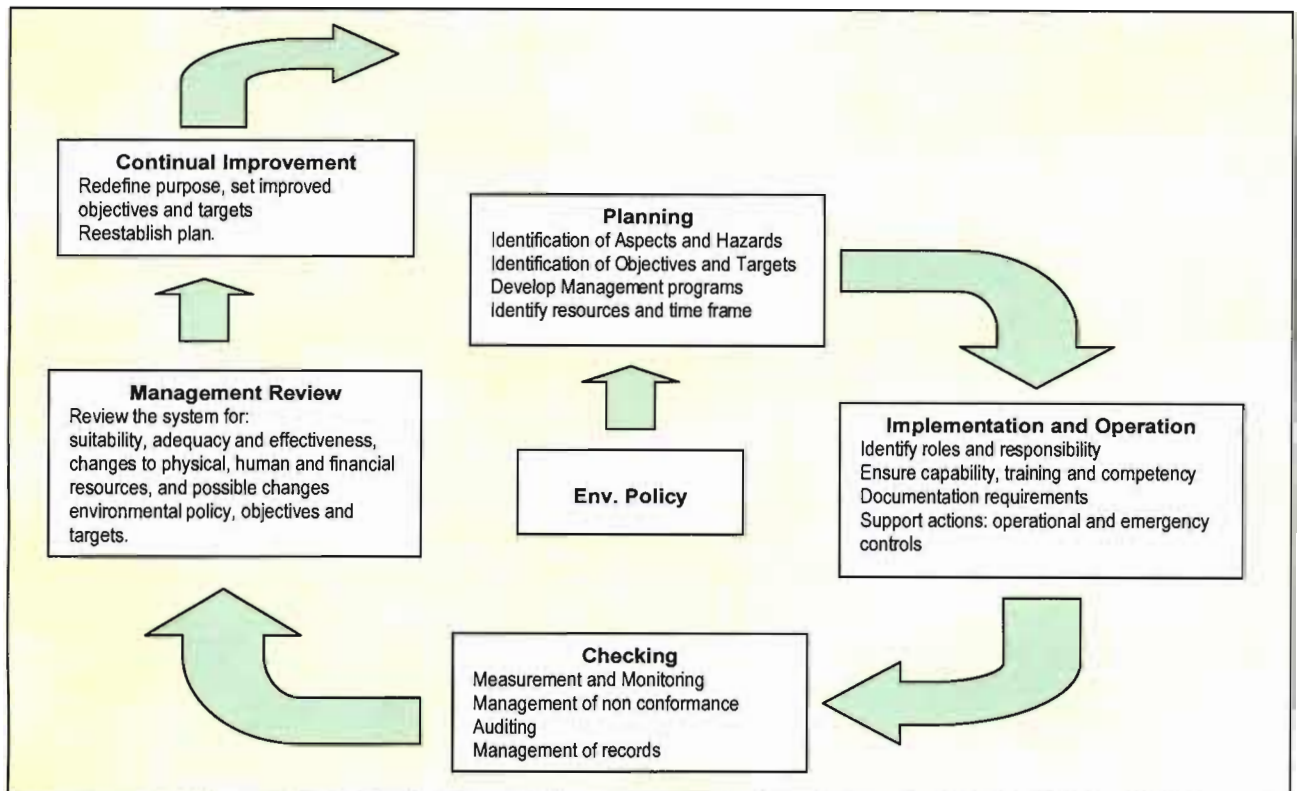


Figure 2.1: Environmental management system model for ISO14001 (2004) (ISO 14001:2004)

ISO 14001:2004 defines “**environment**” as the surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelations. Geographic surroundings extend from an organization to global, encompassing people's culture, social, value and economic systems as well as eco-systems.

ISO 14001 does not focus on specific outcomes but on the processes involved in the identification of environmental aspects, legal and other requirements for setting objectives and targets, ensuring compliance and enhancing environmental performance. Basically, ISO 14001 was set forth as an effective tool to guide managers in their efforts to capitalize on the cost reduction potential of waste reduction (UNEP *et al.*, 2001a:4 and Mohamed, 2001:582).

CHAPTER 3: KEY CONCEPTS AND DEFINITIONS RELATED TO SASOL SOLVENTS, SECUNDA SHEQ MANAGEMENT SYSTEM

3.1 FOCUS OF THE SHEQ MANAGEMENT SYSTEM

The main focus of ISO 9001 is customer satisfaction, whereas ISO 14001 focuses on the management of environmental protection and pollution prevention, while promoting a social and economic harmony (the so-called triple bottom line). OHSAS 18001 aims for the pro-active control of occupational risk, which in turn enables an organization to improve its safety and health related performance (Matias and Coelho, 2002:3860).

A brief description of a typical management system is described in Aucamp (2005). This generic management system consists of:

- A policy. This policy can be a single-function policy, or even a fully integrated SHEQ (safety, health, environment and quality) policy;
- Objectives and Targets based on the policy;
- A program to achieve these objectives;
- Monitoring and Measurement of the effectiveness of the program; and
- Management Review to improve insufficient progress and performance.

There is a common thread connecting most management systems developed over the last 20 years or so. It is a very simple principle, called the Deming cycle of plan-do-check-act Figure 2. This principle forms the basis for standards such as ISO 9001, ISO 14001 and OHSAS 18001, which are three of the better known ones. This principle can also be applied to almost any activity requiring management:

1. Plan. Analyse which aspects of an activity require improvement, then identify the most significant aspects and prioritise the actions to create improvement.

2. Do. Develop programs and procedures to implement the above-mentioned actions. This should include the establishment of responsibilities, resources, training and documentation.
3. Check. Establish procedures that will enable you to measure the progress toward the agreed-upon goals.
4. Act. In the case of insufficient progress being made, structured and directed action needs to be taken to determine the causes and to make the necessary changes that will drive improvement (Downs, 2003:32).

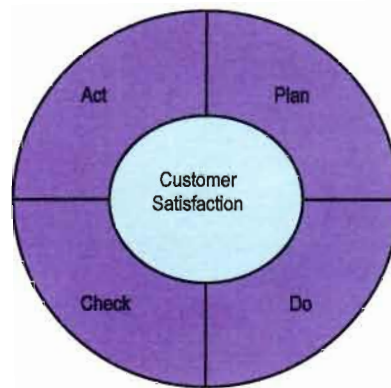


Figure 2.2 Deming cycle of plan-do-check-act

The above description is derived from the “*Generic Total Quality Management Model*” of “*Plan-Do-Check-Act*” which every EMS is comprised of (UNEP *et al*, 2001a:13)

3.2 BENEFITS OF REGISTRATION

There are also quite a number of benefits of registration to the various management system standards. These include amongst others:

- An organization’s demonstration of legal and regulatory compliance. This is the minimum requirement of a responsible organization;
- A demonstration to stakeholders of your commitment to either quality, or safety, or health or the environment, or any combination thereof. This is especially valuable when doing business in highly developed countries with a well-developed SH&E awareness;

- Better management of the organization's quality, safety, health and environmental risks, both now and in the future, which can reduce potential liabilities; and
- Cost savings resulting from more efficient business processes. This one still makes the most sense to management the world over (BSI Management Systems, date unknown).
- Mohamed (2001:582) states that investors, environmental groups, and citizens that demand sound corporate environmental management systems can accept ISO 14000 registration as a demonstration of a company's commitment to, and credibility for environmental issues.
- The statements made by Mohamed (2001) that there will be a long-term capital saving is supported. Bansal and Bogner (2002:269) states that in 1998, the Jutras division of Meridian Magnesium Inc., which manufactures magnesium automotive parts, reported that it saved almost \$2 million soon after its \$45,000 investment on an ISO 14001 certified environmental management system (EMS).

Some of the driving forces behind SHEQ management include the profitability of the organization, requirements from stakeholders, complying with legislation, reducing the organization's potential liabilities and increased competition among competitors (Aucamp, 2005).

3.3 THE DRIVE BEHIND INTEGRATION

As a consequence of the increased number of function-specific management system standards and the related costs of implementation and assessment, many organizations have begun questioning the introduction of management system standards as completely separate entities. This includes many organizations which already have or are about to have such systems in place. There is consequently, a growing need to integrate both the standards and the internal management systems they describe to reduce wasteful

redundancies, to facilitate implementation and even to generate synergetic effects (Jonker & Karapetrovic, 2004:608).

However, dealing with separate management systems covering quality, environment and safety and other issues, as well as ensuring that they fit strategically into the organization's plans, is a cumbersome task. Both in literature and in practice, the case for integrated management systems is starting to be made and an integrated management system is increasingly seen as part of the organization's management portfolio (Wilkinson & Dale, 1999:95). There is also one very important consideration that is usually true for all types of organizations: One management system is easier to manage (Winder, 2000:110).

Occupational health and safety, environmental protection and energy conservation are mentioned in both the ISO 9000 and ISO 14000 sets of standards, although more thoroughly in the 14000 series. From ISO 9000 we can therefore infer a concern with environmental preservation, both externally to the organization (the natural environment) and internally to the organization (the work environment) (Matias & Coelho, 2002:3859).

Matias & Coelho (2002:3860) points out that there are several requirements and points common to the ISO 9001, ISO 14001 and OHSAS 18001 Management Systems. There are also remarkable similarities between the main general requirements of the three, such as system requirements, management responsibility, resource management, management of processes, system implementation and monitoring and measuring. ISO 9001, ISO 14001 and OHSAS 18001 Management Systems standards have a common underlying principle of continuous improvement based on Deming's cycle of plan-do-check-act. As a result, they share a similar structure. System documentation, records, policies, planning, responsibility, implementation, operational control, communication, verification, audits, conformity, continuous improvements and prevention are specific requirements that are common to all three standards.

As mentioned previously, there are common aspects between the latest available safety, health, environmental and quality management standard systems. The following points can help to clarify those aspects common to quality, environment and safety management:

- Environmental management within an organization mainly aims to reduce environmental impacts that are associated with the activities, products and services of that organization. The adoption of system management models for care of the environment, which are similar to those used in quality management, is borne out of the awareness that these impacts are closely related to an organization's internal processes. A current trend being observed in this industry might lead to future terminology that might refer to aspects of quality related to the product or service and aspects of quality related to care of the environment. Basically a quality approach to fields traditionally outside of the quality sphere.
- Work-related accidents and occupational illnesses can be seen as an unplanned consequence of the production cycle and that they are linked to the relationship of the worker to the plant, machinery, materials and substances present in the workplace. According to the so-called safety triangle, for every accident where there are consequences for the environment or workers, there is a far larger number of accidents that do not have such significant consequences. But they might also have consequences that will only manifest in the long term. The improvement of environmental and workplace safety involves technical interventions as well as the adoption of management, organizational and training measurements that can influence behavioural safety.
- There are so many links between environmental management and safety management and these links are often so important that in many cases it is hard to make a distinction between the two. A fairly common recent occurrence is where the term "internal safety" is

used for aspects of production processes which pose risks to employees and external safety is used for those aspects that pose a risk to the population and environment surrounding the organization's location. Following from this, the OHSAS 18001 safety management documents also have implementation procedures similar in nature with those of ISO 14001 to assist organizations with an existing ISO 14001 system to implement this standard.

- There is a system logic that defines an organizational structure in terms of resources, responsibilities and procedures in all three systems. This structure aims to reach precise improvement objectives. In all three cases there is no time limit. This is all done against a background of continuous improvement (Scipioni *et al*, 2001:135).

3.4 CURRENT STATUS OF SHEQ MANAGEMENT SYSTEM

3.4.1 SCOPE AS PER CERTIFICATE OF REGISTRATION

The scope of registration regarding the different standards are as follows:

ISO 9001:2000

The manufacture of solvents, acids, co-monomers and Safol, excluding 7.5.2 Validation of Processes and 7.5.4 Customer Property.

ISO 14001:2004

All activities, products and services that the organization control or influences, that have or can have a significant impact on the environment related to the manufacture of solvents, acids, co-monomers and Safol, including receiving and off-loading of raw materials.

OHSAS 18001:2007

All routine and non-routine and facilities that the organization control or influences that can result in a health and/or safety risk related to the

manufacture of solvents, acids, co–monomers and Safol, including off-loading of raw material.

3.4.2 EXCLUSIONS

The following processes are excluded from the scope, however the need should arises in future, the necessary documents shall be established, implemented and maintained:

- Customer Property (Element 7.5.4) due to the fact that Sasol Solvents, Secunda does not use any product supplied by or any property of any of its customers in any of its manufacturing processes.
- Validation of Processes (Element 7.5.2) as all stages of production is monitored

3.4.3 INTERACTION BETWEEN VARIOUS PROCESSES

In Figure 3.1, the relationship between different processes in Sasol Solvents, Secunda with the SHEQ management system is illustrated.

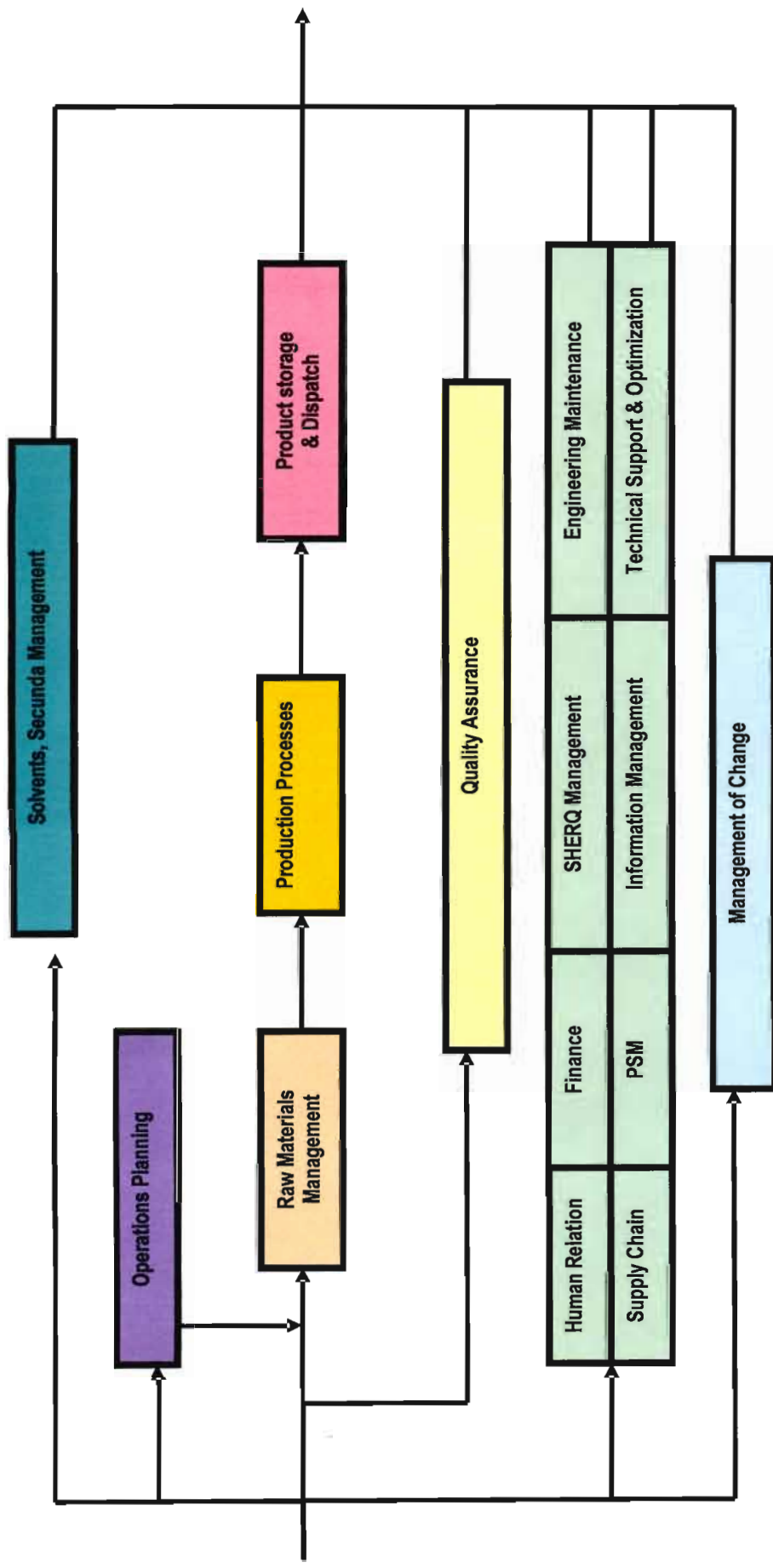


Figure 3.1: Value chain: Interaction between different processes

3.4.4 CURRENT STATUS OF PROCESS SAFETY INCIDENTS

In Figure 3.2, incidents (Fires / Explosions / Gas Releases / Spillages for 2007/2008) are illustrated, and in Figure 3.3, the results of root cause investigations are shown (Sasol Solvents Secunda Process Safety Incidents Index, 2008).

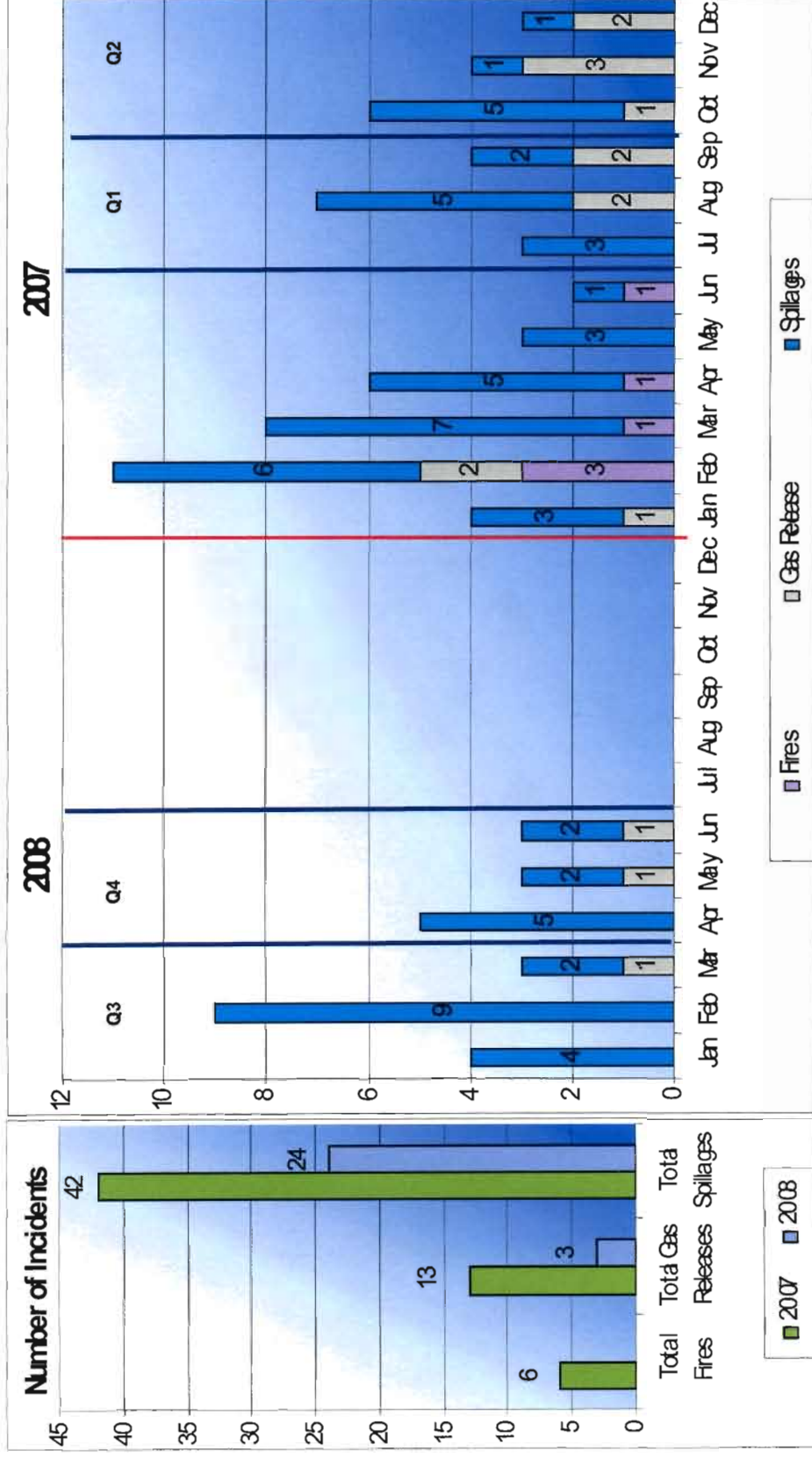


Figure 3.2: Number and nature of incidents: 2007/8

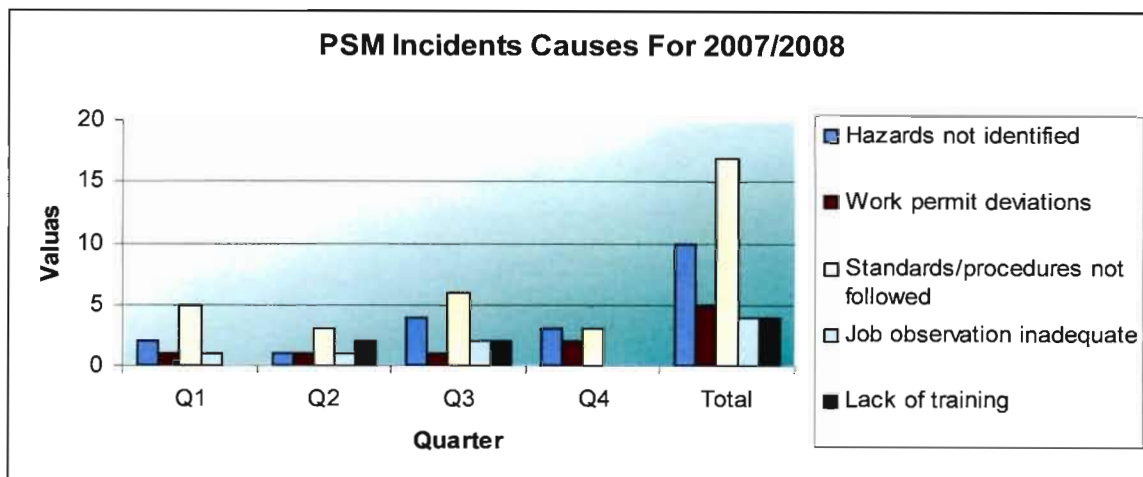


Figure 3.3: Process Safety Management causes of incidents: 2007/8

The following can be concluded from Figures 3.2 and 3.3:

- Despite the fact that PSM has been implemented at Sasol since the end 2007, there is no real downwards trend on process safety incidents. This could possibly be attributed to the fact that PSM hasn't yet been integrated with the SHEQ management system with the resultant confusion of trying to adhere to two different management systems.
- One major spillage out of 27 process incidents was reported for 2007/2008. On the 26th of April 22 tones of Hexene were spilled at Rail Loading due three Temperature Safety Valve's (TSV) opening and releasing product to the oily water sewer. This release was just one spark away from potentially very serious fires. There was a reduction in major process incidents however there were an increase in smaller spillages.
- Many of the incidents were the result of procedures either not followed or being inadequate.
- A review of PSM incident investigations at Solvents Secunda revealed shortcomings in the incident management process:
 - The ability to distinguish between root causes and contributory causes / proximal cause.
 - PSM incident investigation teams do not consist of specialists in the different fields, it is important to have the right specialists around the table to ask the necessary questions.

- Managers and specialists are not trained in incident investigations / root cause analysis.
- For effective management and operational control, it is essential to integrate the Sasol Solvents, Secunda SHEQ Management System and PSM elements.

CHAPTER 4: KEY CONCEPTS AND DEFINITIONS RELATED TO PROCESS SAFETY MANAGEMENT

4.1 PROCESS SAFETY MANAGEMENT PHILOSOPHY

The Process Safety Management (PSM) standards should provide assurance that operational hazards are identified, that potential incidents are avoided, that operational safety requirements are considered in business decisions and that unacceptable risks to persons, property, products, and the environment are avoided.

Efforts at continuous improvement in order to drive incidents to a minimum shall include regular audits to ensure the implementation of the PSM standard, corrective actions and follow-up on the effectiveness of the system. These requirements can be directly linked to the ISO 14001 4.5.5 Internal Audits and 4.5.3 Nonconformity, Corrective Action and Preventive Action leading up to continual improvement.

The PSM program shall be applied to all stages in the life of a plant, including concept development, basic and detail design, construction, operation, maintenance, closure, decommissioning and demolition (Sasol Corporate S1 standard, 2007).

4.2 PROCESS SAFETY MANAGEMENT ELEMENT STANDARDS

(S1.1) Employee Participation

This Element Standard documents the requirements for consulting employees and service providers in the development of the PSM program. It covers the minimum requirements for employee participation in the PSM program and access to relevant PSM information. It requires the development of a written plan of action regarding employee participation, consultation with employees and their representatives on the conduct and development of process hazard analyses, and on the development of other elements of PSM

(S1.2) Process Safety Information (PSI)

This Element Standard requires compilation of written Process Safety Information, including hazard information on process chemicals, process technology information (design, technical specifications and operations) and equipment information on facilities. Process Safety Information shall be maintained for the lifetime of the facility.

(S1.3) Process Hazard Analysis (PHA)

This Element Standard requires that Process Hazard Analyses shall be conducted at various stages in the life cycle of plants. Process Hazard Analysis shall be updated and revalidated regularly and must be retained for the life of the plant, or as per legal requirements. The Process Hazard Analyses Standard also includes requirements for a reactive chemicals program and the consideration of Human Factors (ergonomics, man-machine interfaces, etc.) and inherently safe design.

(S1.4) Standard Operating Procedures (SOP's)

This Element Standard requires clear Standard Operating Procedures for activities involving process plants, including the Process Safety Information relevant to the activity. Such procedures shall include steps for each operating phase, set operating limits for safe operation, safety and health considerations and safety systems and their functions. These procedures should be readily accessible to employees and service providers who work on or maintain a facility, and should be reviewed as often as necessary to ensure they reflect current operating practices and requirements. They must include safe work practices to provide for special circumstances, for example lockout / tag-out, confined space entry, etc.

(S1.5) Training

This Element Standard requires Sasol employees operating and maintaining a facility to be trained in the overview of the process and in the relevant operating procedures. This training must emphasize specific safety and health hazards, emergency operations and safe work practices. Initial training shall occur before assignment.

(S1.6) Service Provider Management

This Element Standard sets the requirements for Sasol and service provider employers with respect to service provider employees involved in maintenance, repair, turnaround, major renovation or specialty work, on or near chemical process plants. Service providers are required to train their employees to perform their jobs safely, document that employees have received and understood the training and are declared competent. They must also ensure that their employees know about potential process hazards, site emergency plans and that they follow the safety rules of the facility. They must advise Sasol of the hazards that the contract work itself poses and hazards identified by their employees.

(S1.7) Pre Start-up Safety Review (PSSR)

This Element Standard describes the requirements for a pre start-up safety review for new and modified plants and equipment. This is to confirm that the construction and equipment of a process are in accordance with design specifications, to ensure that adequate safety, operating, maintenance and emergency procedures are in place and to ensure that process operator training has been completed. For new facilities, a Process Hazard Analysis shall be performed and recommendations resolved and implemented before start-up.

(S1.8) Maintenance Integrity Safety Standard (MISS)

This Element Standard requires Sasol to establish and implement written maintenance procedures for the ongoing safety and integrity of process plants and equipment. Such procedures shall include requirements for testing, inspection, preventative maintenance, documentation and quality assurance.

(S1.9) Work Permits

This Element Standard sets the minimum requirements for the permit to work system. Work permits shall be issued for maintenance work conducted on or near a chemical process plant (including off-site

pipelines). The permit shall furthermore identify the actions required to mitigate all potential hazards prior to the commencement of work.

(S1.10) Management of Change (MOC)

This Element Standard requires Sasol to establish and implement written procedures to manage changes, except replacements in kind, to chemical process plants and equipment. The standard requires training of affected employees on the changes prior to start-up. Process Safety Information and operating procedures must be updated as necessary.

(S1.11) Incident Investigation

This Element Standard requires that incidents be promptly reported and investigated following an incident. The standard calls for an investigation team, including at least one person knowledgeable in the process involved, a service provider employee when the incident involved contract work, and others with knowledge and experience to investigate and analyze the incident and to prepare a report. It also sets timing for these activities.

(S1.12) Emergency Planning and Response

This Element Standard requires the development and implementation of emergency action plans and provision for appropriate training based on credible worst case scenarios. Emergency action plans must also include procedures for handling events such as fires, explosions and chemical releases.

(S1.13) Compliance Audits

This Element Standard requires internal and external compliance audits on process safety requirements at specified frequencies. Management shall respond to audit findings promptly.

S1.14) Trade Secrets

This Element Standard requires Sasol to implement minimum requirements for dealing with trade secrets, intellectual property and

licensed technology information in the communication of process safety information to affected employees and others. Sasol shall enter into confidentiality agreements with employees, service providers and technology licensors to protect trade secrets where applicable.

4.3 PROCESS SAFETY MANAGEMENT ACTION LIST FROM BASELINE AUDIT

A baseline PSM audit was conducted at Sasol Solvents, Secunda over the period of three months March 2008 to May 2008. From baseline audit and gap analysis, a list of major issues to be addressed was produced. The results of the baseline audit are shown in Figure 4.1 (Sasol Solvents Secunda PSM baseline audit report and gap analysis, 2008).

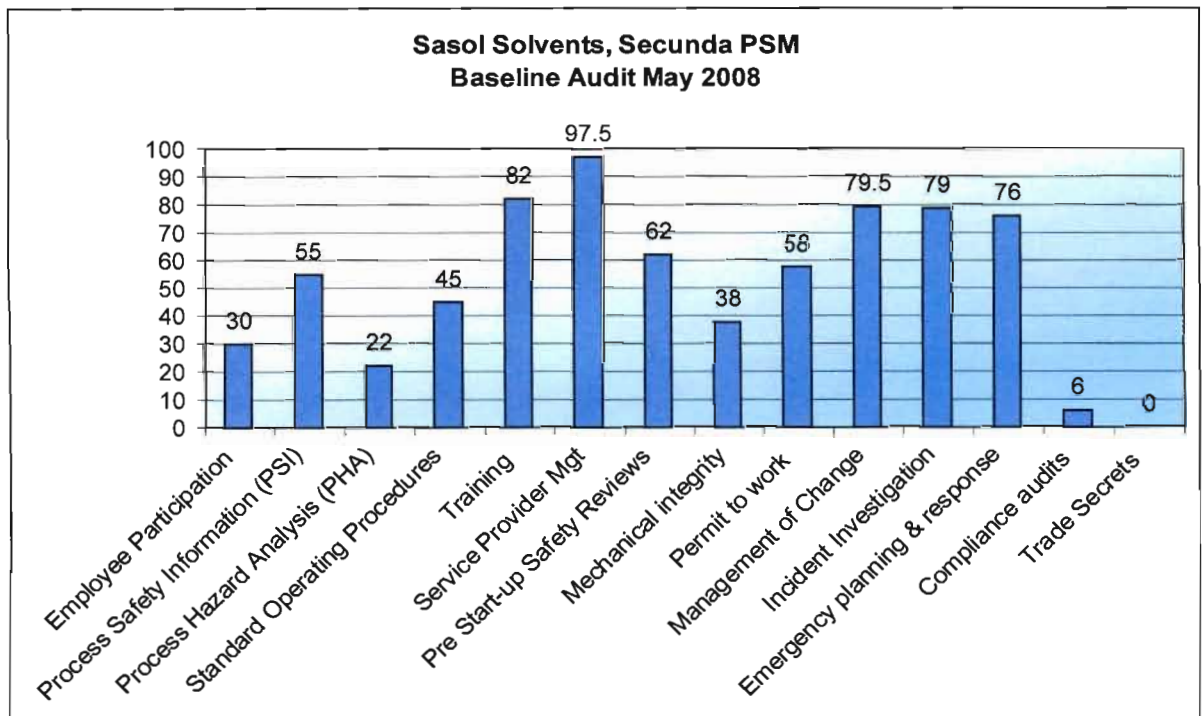


Figure 4.1: Results of baseline audit: Number of identified issues to be addressed.

Table 4.1 identifies the major challenges arising due to the fact that the current SHEQ Management System is not integrated with the PSM system. Actions have been identified to ensure the effective integration of the PSM system into the current SHEQ Management System.

Table 4.1: Deviations and actions required to comply with PSM requirements

PSM Requirements	Results	Deviations and Actions
S1 PSM Management Standard	47	Implementation plan must be drafted and the assignment of resources needed.
S1.1 Employee Participation	30	Employee participation plan in PSM and procedure to be rolled out with union & employee involvement. Define roles and responsibilities.
S1.2 Process Safety Information (PSI)	55	Process safety information not integrated with SHEQ Management System and difficult to track, partly outdated and incomplete information, document control, storage and retrieval not maintained and must be addressed.
S1.3 Process Hazard Analysis (PHA)	22	PHA not done on all units, PHA implementation must be planned with priorities across units.
S1.4 Standard Operating Procedures	45	Improvements to aspects of periodical reviews of SOPs, refresher training, linking of modules to the SOPs and inclusion of safe operating envelopes to be addressed.
S1.5 Training	82	Training documentation outdated, new documentation must be drafted.
S1.6 Service Provider Mgt	97.5	Alignment of interpretation especially auditing of service providers SH&E files.
S1.7 Pre Start-up Safety Reviews	62	Clearance of operation documentation does not address all the requirements of the PSM standard.
S1.8 Mechanical integrity	38	The list of process safety critical equipment (including relevant alarms, interlocks controls and instrumentation) must be drafted.
S1.9 Permit to work	58	Will be audited after the roll-out of the RSA Permit system.
S1.10 Management of Change	79.5	Show that changes to process technology/chemistry, operating limits, SOPs are treated as MOC's on all sites. Movement of people between units are not manage according to the MOC process.
S1.11 Incident Investigation	79	Most of the FER's are investigated by the SHEQ Department and others by the Reliability Department. Different reporting formats between departments. Address system fragmentation
S1.12 Emergency planning & response	76	Emergency exercises are carried out according to schedule. Deviations and concerns were not formally addressed by means of defined actions or next steps.

PSM Requirements	Results	Deviations and Actions
S1.13 Compliance audits	6	A PSM audit program, procedure and team must be set up and some audits carried out.
S1.14 Trade Secrets	0	No list of Trade Secrets available and must be compiled.

CHAPTER 5: CAN SHEQ MANAGEMENT SYSTEM AND PSM BE INTEGRATED?

5.1 INTEGRATION

ISO 9001, ISO 14001 and OHSAS 18001 are in general well-matched. The details of the systems are not identical. The general approach of integration is to adopt the strictest requirements of the specifications.

There are many common features of quality, environmental, and safety management systems and PSM as identified in 6.2. By joining these systems together, one can ideally produce a more consistent administrative arrangement, as well as more efficient systems of work and more focused outcomes (Winder, 2000:115).

A basic management responsibility is to provide employees with sufficient resources to do their work. In fact, the SHEQ Management System places accountability for ensuring adequate resources for implementation of safety, quality and environmental imperatives at the door of Management (Beechner & Koch, 1997:34).

The integration of the SHEQ and PSM systems requires the alignment of supporting system assessment methodologies. This is due to the fact that several of the practical benefits of integrated management systems involve the reduction of audit resources, including cost and time and increased audit effectiveness (Karapetrovic, 2002:63). In Table 5.1 similar elements of the different management systems have been aligned.

Table 5.1: Alignment of clauses of different management systems.

Solvents Management System Reference	ISO 9001:2000	ISO 14001:2004	OHSAS 18001:2007	Process Safety Management
Policy Declaration	5.1 Management Commitment 5.3 Quality Policy 8.5.1 Continual Improvement	4.2 Environmental Policy	4.2 OH&S Policy	S1 PSM Management Standard
PLANNING				
Risk Management	5.2 Customer Focus 7.2.1 Determination of Requirements Related to the Product 7.2.2 Review of Requirements related to the Products	4.3.1 Environmental Aspects	4.3.1 Hazard Identification, Risk Assessment and Determining Control	S1.3 Process Hazard Analysis (include capital design)
Identifying, Accessing Updating and Evaluating Compliance To Legal And Other Requirements	5.2 Customer Focus 7.2.1 (c) Statutory and Regulatory Requirements Related to the Product	4.3.2 Legal and Other Requirements 4.5.2 Evaluation of Compliance	4.3.2 Legal and Other Requirements 4.5.2 Evaluation of Compliance	S1.2 Process Safety Information (PSI) S1.14 Trade Secrets
Setting Safety, Health Environmental and Quality Objectives, Targets, Follow-up and Management Programmes	5.2 Customer Focus 7.2.1 Determination of Requirements Related to the Product 5.4.1 Quality Objectives 5.4.2 Quality Management System Planning 8.5.1 Continual Improvement	4.3.3 Objectives, Targets & Programmes Refer to 4.3.3	4.3.3 Objectives and programme(s) Refer to 4.3.3	*Corporate Indicator of Performance (IOP)

IMPLEMENTATION AND OPERATION				
Structure and Responsibility	5.1 Management Commitment 5.5.1 Responsibility and Authority 5.5.2 Management Representative 6.1 Provision of Resources 6.2 Human Resources 6.2.1 General 6.3 Infrastructure 6.4 Work Environment	4.4.1 Resources, Roles, Responsibility and Authority	4.4.1 Resources, roles, responsibility, accountability and authority.	S1.6 Service Provider Management
	6.2.1 (Human Resources) General 6.2.2 Competence, Awareness and Training	4.4.2 Competence, Training and Awareness	4.4.2 Competence, Training, and Awareness	S1.5 Training
Consultation and Communication	5.5.3 Internal Communication 7.2.3 Customer Communication	4.4.3 Communication	4.4.3 Communication, Participation and Consultation	S1.1 Employee Participation
Document and Data Control	4.2.1 Documentation Requirements – General 4.2.3 Control of Documents	4.4.4 Documentation 4.4.5 Control of Documents	4.4.4 Documentation 4.4.5 Control of Documents	S1.4 Standard Operating Procedures
Management System Procedures ➤ Design and Development ➤ Process Control (Production and Service Provision	7. Product Realization 7.1 Planning of Product Realization 7.2.1 Determination of Requirements Related to the Product 7.2.2 Review to	4.4.6 Operational Control	4.4.6 Operational Control	S1.7 Pre Start-up Safety Reviews S1.8 Mechanical integrity S1.9 Permit to work

Control) Supporting Documentation as Control Measures ➤ Solvents Operating Documents ➤ Solvents Training Documents ➤ Interface Documents (Service Level Agreements) ➤ Synfuels Procedures / Work Instructions	Requirements Related to the Product 7.3.1 Design and Development Planning 7.3.2 Design and Development Inputs 7.3.3 Design and Development Outputs 7.3.4 Design and Development Review 7.3.5 Design and Development Verification 7.3.6 Design and Development Validation 7.3.7 Control to Design and Development Changes 7.4.1 Purchasing Process 7.4.2 Purchasing Information 7.4.3 Verification of Purchased Product 7.5.1 Control of Production and Service Provision 7.5.2 Validation of Processes for Production and Service Provision 7.5.5 Preservation of Product			
Emergency Preparedness and Response	8.3 Control of Nonconforming Product	4.4.7 Emergency Preparedness and Response	4.4.7 Emergency Preparedness and Response	S1.12 Emergency planning & response

CHECKING				
Monitoring and Measuring	7.6 Control of Monitoring and Measuring Devices 8.1 General 8.2.3 Monitoring and Measurement of Processes 8.2.4 Monitoring and Measurement of Product 8.4 Analysis of Data	4.5.1 Monitoring and Measurement	4.5.1 Performance Measurement and Monitoring	Process safety index
	8.2.3 Monitoring and Measurement of Processes 8.2.4 Monitoring and Measurement of Product	4.5.2 Evaluation of Compliance 4.5.5 Internal Audit	4.5.2 Evaluation of Compliance 4.5.4 Audits	S1.13 Compliance audits
	8.3 Control of Non-conforming Product 8.4 Analysis of Data 8.5.2 Corrective Action 8.5.3 Preventive Action	4.5.3 Nonconformity, Corrective Action and Preventive Action	4.5.3 Incident, investigation, Non-conformity, Corrective and Preventive Action	S1.11 Incident Investigation
	4.2.4 Control of Records 8.2.2 Internal Audits	4.5.4 Control of Records 4.5.5 Internal Audits	4.5.4 Control of Records 4.5.5 Internal Audits	S1.13 Compliance audits
MANAGEMENT REVIEW				
Management Review and Strategic Planning Meeting	5.1 Management Commitment 5.6 Management Review 5.6.1 General	4.6 Management Review	4.6 Management Review	Process Safety management (PSM): Meetings Structure

	5.6.2 Review Input 5.6.3 Review Output 8.5.1 Continual Improvement			
CONTINUAL IMPROVEMENT				
	Continual improvement	Continual improvement	Continual improvement	S1.10 Management of Change

(* Note: The Process Safety Management Standards does not set requirements for setting Safety, Health Environmental and Quality objectives and targets. The Corporate requirements for “*Reporting requirements According to Indicator of Performance*” (IOP) set the PSM requirement. The target is: Fire, Explosions and Releases below the set threshold values: A further 50% reduction in the SBU FER statistics as at June 2006 (61 FER’s for 2006) by 2010/11. Fires, Explosions and Releases above the set threshold values (2500 USD). A combined target for Sasol of 3 per quarter).

5.2 RELATIONSHIP BETWEEN SASOL SOLVENTS, SECUNDA SHEQ AND PSM

The relationship between the current Sasol Solvents, Secunda SHEQ management system and PSM of , is illustrated in Figure 5.1.

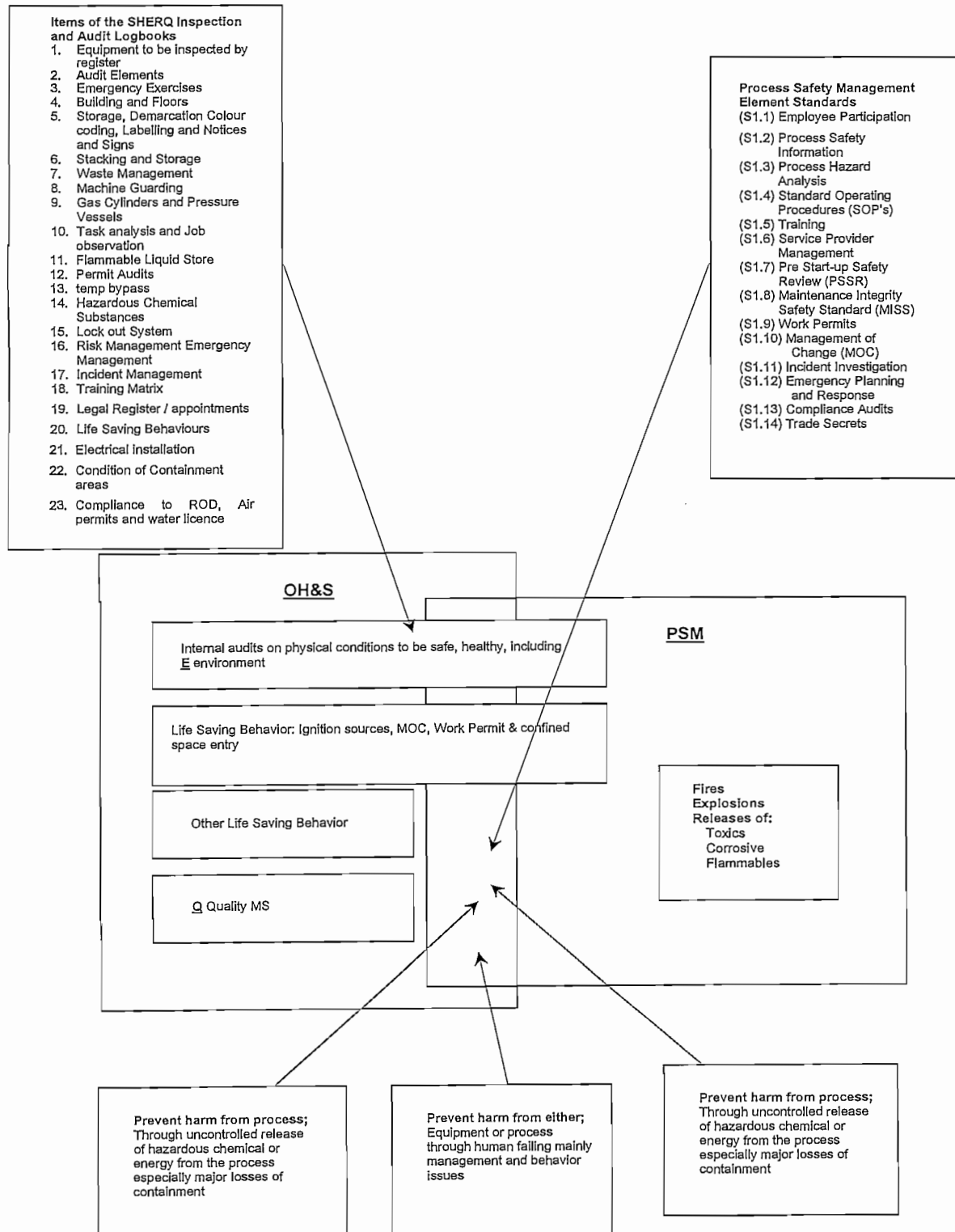


Figure 5.1: Relation between Sasol Solvents, Secunda SHEQ and PSM

CHAPTER 6 - SYNTHESIS

6.2 CONCLUSION

The aim of this study was to evaluate the possibility of integrating the current SHEQ systems of Sasol Solvents, Secunda with the newly developed compulsory PSM system. The current SHEQ systems consist of ISO9001, ISO14001 and OHSAS18001 and these systems have been integrated since 2001.

The objectives of the study as stated in Chapter 1 were as follows:

- What is a SHEQ Management System and Process Safety Management?
- Why is there a need for a SHEQ Management System and Process Safety Management?
- What is the relation between SHEQ element requirements and Process Safety Management?
- When evaluating Sasol Solvents, Secunda on process safety incidents for the previous year against PSM elements, is it possible to identify any shortfalls in the SHEQ Management System?
- Is it possible to identify SHEQ Management System elements that can successfully be integrated into the SHEQ Management System?
- Is it possible to group relevant elements and to create an unique element numbering system for Sasol Solvents, Secunda?

All of the above objectives were reached in this study and it can be concluded that the Sasol Solvents, Secunda SHEQ Management System and PSM elements can successfully be integrated due the nature of the system requirements. It is a very simple principle, since the Sasol Solvents, Secunda SHEQ Management System is based on the Deming cycle of plan-do-check-act. This principle forms the basis for ISO 9001, ISO 14001 and OHSAS 18001 and can also be applied to PSM.

As seen in chapter 3.3 the only PSM standard that is not addressed in the current Sasol Solvents, Secunda SHEQ Management system is Trade

secrets. Trade secrets may be very important when conducting Process Hazard Analysis. Trade secrets which have never been considered in the Sasol Solvents, Secunda SHEQ Management System can and must be seen as an "other requirement" under "Planning" (clause 2 as proposed below).

There are a number of requirements in the Sasol Solvents, Secunda SHEQ Management System that will have to be updated to incorporate the PSM requirement. The additional PSM requirements will enhance the current Sasol Solvents, Secunda SHEQ Management System in the following ways: involvement from employees and service providers, availability of process information and operating procedures at the operating areas, a clear understanding of all process hazards and auditing process safety requirement. An integrated system will enable management to have control of all critical equipment.

The Sasol Solvents, Secunda SHEQ Management System and PSM elements can be grouped to create an unique element numbering system for the Sasol Solvents, Secunda SHEQ Management System. This proposed numbering system is as follows:

1. POLICY
2. PLANNING
 - 2.1 Risk Management
 - 2.2 Legal and Other Requirements
 - 2.3 Objectives, Targets and Management Programmes
3. IMPLEMENTATION AND OPERATION
 - 3.1 Structure and Responsibility
 - 3.2 Competence, Training and Awareness
 - 3.3 Consultation and Communication
 - 3.4 Document and Data Control
 - 3.5 Operational Control
 - 3.6 Emergency Preparedness and Response

4. CHECKING

4.1 Monitoring and Measuring

4.2 Compliance (Audits)

4.3 Incident Management (Corrective and Preventive Action)

4.4 Records Management

5. MANAGEMENT REVIEW

The integrated SHEQ Management System and PSM must be incorporated into each unit's business process. This will ensure that all SHEQ Management System and PSM requirements will be adhered to and will enable Sasol Solvents, Secunda to effectively manage all the requirements in order to reduce the number and magnitude of all incidents.

6.2 RECOMMENDATIONS

6.2.1 Limitation

The proposed integrated system is unique to the Sasol Solvents Secunda SHEQ Management system (ISO 9001, ISO 14001 and OHSAS 18001). ISO 9001 certification is an optional requirement, depending on Business Unit's requirements and is exempted as a mandatory by the Sasol General Manager and Group Executive Committee member for SH&E.

6.2.2 Further Research

As seen in the Figure 4.1 Trade Secrets are not part of the Sasol Solvents Secunda SHEQ Management system. Sasol Solvents, Secunda will have to implement the requirements to ensure compliance to the PSM requirements. The element Trade Secrets is a key element in the corporate PSM System and research must be done to see how to successfully manage this requirement.

6.2.3 Way Forward

- The proposed integrated system as seen in Table 5.1 must be used to integrate the Sasol Solvents Secunda SHEQ Management

system (ISO 9001, ISO 14001 and OHSAS 18001) and PSM into an integrates system.

- Develop a change management charter, this includes the team responsible for integration of the Solvents, Secunda SHEQ Management System and PSM standards. The charter must also address cases where resources are not available and time lines.
- Plan, schedule and conduct leadership alignment interviews. To clarify leadership roles and develop leadership action plans with all stakeholder's involvement on the integrated system as seen in Table 5.1.
- Develop a reporting process where the management team of Solvents, Secunda takes accountability for the integration of the SHEQ Management System and PSM standards for each unit in the business.
- Carry out a high-level change impact assessment to identify the nature of anticipated change. This is used to verify that the change management approach is appropriate and enables more pro-active change enablement.
- Develop a training module according to the requirements of the integrated system as seen in Table 5.1 to train all employees and people working for or on behalf of Solvents, Secunda.

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