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Harmonisation of an environmental health and safety management system

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HARMONISATION OF AN ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT SYSTEM

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ABSTRACT

Management systems are a business powerful tool when efficiently monitored and continuously improved.

This project focused on the improvement of the existing Environment, Health and Safety Management System (EH&SMS) at Siemens Magnet Technology with the aim to improve the EH&SMS by reviewing and harmonising its documentation and procedures with the existing documentation and procedures from Siemens Healthcare in Germany. This project was developed taking in consideration the company's requirements and the relevance of the topic.

In order to have the implemented changes in place, the standards and schemes related to environment, health and safety management systems were consulted and the implementation of new changes followed the requirements set in the relevant standards and schemes. The international BS ISO 14001:2004 and BS OHSAS 18001:2007 set out the framework to properly build an effective revision and implementation of the improved EH&SMS.

An initial combined EH&S internal audit took place to identify the strengths and areas for improvement, the efficiency of the MS and how well the environment health and safety aspects were covered in the current MS. The audit allowed a deep analysis in each process part of the MS which determined the effectiveness of the implementation of SMT EH&S standards.

For the purpose of document control, SAP EDM system was used to store all the procedures and documentation. It was understood that, by inserting all the documentation under one common area, it allowed different business units to consult the EH&S documents and procedures regardless their location enabling a transparent and quicker approach whenever there is an environment, health and safety related topic in the company's agenda.

This project found that, by following the requirements set in the international standards mentioned and improving the communication while implementing a new change, employees will increasingly engage and feel motivated to participate. Employees were involved in different stages of the project, leading to an increase of the interest in the EH&S areas and a wider understanding of the benefits from an intuitive MS.

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ACRONYMS

BS – British Standard

BSI – British Standards Institution

BU – Business Units

CAPA – Corrective Actions and Preventive Actions

CSR – Corporate Social Responsibility

ECGI – European Corporate Governance Institute

EMAS – Eco Management and Audit Scheme

EH&S – Environment Health and Safety

EH&SMS – Environment Health and Safety Management System

EMS – Environmental Management System

EPE – Environmental Performance Evaluation

EU – European Union

HSE – Health and Safety Executive

IEMA – Institute of Environmental Management and Assessment

ISO – International Organisation for Standardisation

IOSH – Institute of Occupational Safety and Health

IT – Information Technology

KPI – Key Performance Indicators

MRI – Magnetic Resonance Imaging

MS – Management System

OHS – Occupational Health and Safety

OHSAS – Occupational Health and Safety Assessment Series

OMT – Oxford Magnet Technology

PREP – Product Related Environmental Protection

SAP – Systems Applications and Products

SAP EDM – Systems Applications and Products, Energy Data Management

SESIS – Siemens Environmental and Technical Safety Information System

SMT – Siemens Magnet Technology

SMEs – Small and Medium Enterprises

TRAC – Web based project management and bug tracking system

UKAS – United Kingdom Accreditation Service

CHAPTER 1 – INTRODUCTION

Each business has the aim to fulfil the requirements in the areas of environmental protection and occupational health and safety. However, to compete amongst the best, this approach encompasses more than meeting minimum legal requirements, and this is what distinguishes leading businesses from the rest.

1.1 – Siemens Magnet Technology – Company Profile

Siemens Magnet Technology (SMT), part of the Siemens Healthcare, is a world leader in the design and manufacture of superconducting magnets for Magnetic Resonance Imaging (MRI) body scanners and has achieved significant export growth and technological advancement.

Since its introduction in the early 1980's, MRI has quickly become accepted as the leading diagnostic imaging modality in healthcare. SMT has contributed to this through its position as a world-leading manufacturer with proven capability to incorporate high quality aspects of volume production into novel high-field superconducting magnet designs for MRI. More than a third of all MRI scanners installed in hospitals around the world have at their heart a superconducting magnet designed and manufactured by SMT.

Figure 1: Siemens Magnet Technology facilities, Eynsham Oxfordshire (retrieved from Environment Health and Safety figures Report 2009 – SMT)

1.1.1 – Heritage, Experience and Innovation

In 1959, Martin Wood, then a Senior Research Officer at the Physics Faculty of Oxford University, started a small business with his wife Audrey, initially working from their garden shed. Their objective, sanctioned and supported by the University, was to design, manufacture and supply equipment for generating high magnetic fields for a small number of researchers who were to make major contributions to the way we live today. The company they founded was Oxford Instruments, a global leader in advanced instrumentation for scientific research, industrial chemical analysis and quality control, semiconductor processing, and healthcare.

Oxford Instruments produced the world's first superconducting magnet in 1961 and, by the 1970s, the company was pioneering Magnetic Resonance Imaging. It created the first resistive full body magnet in 1979, and the following year it introduced the world's first superconducting full body MRI magnet.

Such was the pace of development required by the medical industry that in 1982 Oxford Instruments formed a subsidiary company, Oxford Magnet Technology Ltd (OMT), located on the Oxford Instruments site. At this time OMT were producing fewer than

50 magnets per year. Two years later, in 1984, a purpose built factory was established on the current site in Eynsham, designed with a production capacity of 300 magnet systems per year. In Sept. 1989 Siemens acquired 51% of Oxford Magnet Technology in a joint venture with Oxford Instruments. In November 2003 the business was fully acquired by Siemens and in June 2004 the company name changed to Siemens Magnet Technology Ltd. As the world-wide demand for MRI systems has grown rapidly since the early 1980's so has the company and today, following two further factory expansions, the manufacturing capacity is now around 1200 units per year.

SMT works in partnership with the world's leading MRI system manufacturers and supplies 40% of the magnets for this purpose. There are currently over 12,000 SMT MRI magnets in use in over 100 countries. The company now produces over one thousand magnets year, worth over £150 million per year.

SMT employs almost 500 people at its 200,000 square feet production facility in Oxfordshire, United Kingdom, 50 of whom are dedicated to research and development. Thorough partnerships with Siemens Regional Units and Oxford Instruments, SMT maintain Max Service support offices in Europe, USA, Japan and China.

Throughout its history the company has focused on technological excellence. The business has won six Queen's Awards in recognition of its high-tech achievements and export success - 95% of the magnets produced at SMT go overseas - and contribution to the development of MRI technology.

[Retrieved from Environment Health and Safety figures Report 2009 – SMT]

SMT is a leader regarding its designs and manufactured magnets and wants to be among the best in this industry when it comes to environmental protection and the health and safety of its employees. The company believes that one of the core keys to this approach is a strong and well implemented Environment Health and Safety Management System (EH&SMS).

The benefits of having an effective EH&SMS are:

- cost reduction, accident/injury reduction, prevention and waste/pollution reduction opportunities;
- response to customer or shareholder demands;

- reduced consumption of natural resources and energy;
- systemised approach to compliance with environmental health and safety regulations;
- regulatory incentives for demonstrated environmental health and safety leadership;
- ease of managing legal and compliance requirements; and
- commitment to social responsibility.

Implementing an effective EH&SMS involves the optimisation of processes and components, focusing the attention to a single set of procedures that associate the three areas of interest: environment, health and safety.
An EH&SMS is an important instrument that can be used to achieve market goals and to reduce the negative impacts that a business can produce from not conforming to a good EH&S policy.
An uniform EH&SMS reduces double work and overtime, since shared business tools, templates and training documents can be used at every business unit location. Energy will no longer be wasted by trying to solve problems from a fragile system, but instead this energy will be entirely focused on the continual improvement of this important tool.

The objectives of this study are to:

- understand the influence of an improved and harmonised management system in a business;
- improve employees communication and interaction regarding EH&S areas;
- improve the way the documents/procedures are controlled; and
- implement this tool whilst providing manoeuvrability to employees for a continuous improvement of this work.

The goal of this study is to deliver a wider concept on EH&SMS to SMT employees by introducing a revised and improved management system documentation, its effective control and an easy approach towards this tool.

CHAPTER 2 – ENVIRONMENT HEALTH AND SAFETY MANAGEMENT SYSTEMS STANDARDS AND SCHEMES

This chapter provides a brief description of the standards and schemes consulted for this study on the implementation of an EH&S MS.

2.1 – Management Systems

Among many definitions, a "management system is best viewed as a framework that should be continually monitored and reviewed. It provides effective direction for an organisation's process management activities in response to changing internal and external factors" [Noble, 2000].

There are several approaches for management systems (environment, quality, health and safety, etc.), but companies should consider the fact that there is a management system for the organisation as a whole and that all new areas to be considered should be incorporated into that management system. The goals of several management systems within a company, particularly those related to the occupational health and safety, environmental, and quality issues, are the same, since, they are "trying to establish a system of performance standards, and first-time/every- time conformance to those standards, thus ensuring customer and stakeholder satisfaction, maximization of profits, and minimal process risk" [Noble, 2000].

2.2 – Integrated Management Systems

A difficulty that may be experienced by organisations is ensuring that the separate systems they operate are fully embedded into the business operations. Every one of these systems should operate as an integral part of the overall organisation management and not appear as a peripheral attachment to the business [Smith et al., 2004].

Management systems should integrate all of an organisation's system processes, enabling the organisation to work as a single unit with fortified objectives. Integrated management systems work as a complete framework.

Although the needs of each organisation differ, adopting an integrated approach should satisfy any organisation. To integrate a management system it should be considered the guidelines from the most established and understood management system and perhaps one that has been subjected to certification as a starting point.

Siemens Magnet Technology has an EH&SMS implemented. Managers at SMT have many issues to manage and these are seen as an integral part of the overall management system, recognising that there are no real incompatibilities between environmental management systems and occupational health and safety management systems.

Although SMT has an integrated EH&S management system, the environmental element of this system required more awareness and focus as when compared with the health and safety element of the management system, it was not at the same level of commitment and interest. Employees should build the environment concept of the management system in their minds and equally consider the environment and health and safety aspects of the company through the management system.

2.3 – Environmental Management System

An Environmental Management System (EMS) is a set of processes that aim to help an organisation manage its environmental issues effectively.

Recognition of an EMS can be achieved through accredited certification to one (or more) of the main standards and schemes available. The three most recognised standards are the Eco-Management and Audit Scheme (EMAS), ISO 14001 and the

British Standard – Guide to the phased implementation of an environmental management system including the use of environmental performance evaluation (BS8555) which will be covered in this section. These standards are complementary and well established and certification can offer significant benefits, such as:

- confidence that the implemented EMS meets requirements;
- third party/independent view - increased assurance on approach;
- help to demonstrate responsibility to shareholders, public, regulators, customers and clients;
- potential specific benefits with the Environment Agency (under Integrated Pollution Prevention and Control); and
- compliance with local legislation [Hyde & Reeve, 2004].

The United Kingdom government supported the use of accredited EMS Certification referring that organisations should use and implement a credible EMS that is appropriate to the improvement of their environmental and financial performance and this implementation should follow the guidelines of a national or international standard or scheme. An EMS that demonstrates good management of legislative compliance should be used to help achieve regulatory benefits such as reduced fees and charges. [Hyde & Reeve, 2004].

When exploring options and considering the development of an EMS there are a number of steps that should be considered:

- review of existing EMS 'type' structures and commitments within the organisation (such as any existing environmental policy commitment for the organisation, documented procedures and responsibilities etc);
- investigate potential trends that support an EMS. These may include:
    - trends and developments in legislation (increasing pressure for environmental legislation at European Union (EU), national and regional level);

- fiscal trends on businesses such as the increasing financial implications of climate change and landfill tax legislation;
- trends in commerce and trade such as increasing requirements to demonstrate positive environmental management in commercial contracts with clients (supply chain pressures);
- increasing public concern with the environment (customer level); and
- consider the main interests and stakeholders in the process (e.g. shareholders, customers, clients, regulators, and the public).

♦ Review the main options available for EMS certification and consider their suitability for the organisation. Factors may include:

- the benefits of branding and public profile offered by EMAS (e.g. through its logo and its public 'reporting requirement');
- sector specific or supply chain factors that may encourage consideration of ISO 14001;
- the benefits of a phased approach from BS 8555/Acorn - especially suitable for some smaller and medium sized businesses (SME's); and
- secure appropriate commitment at senior management level for EMS development (often this is an element within Phase 1 of the EMS but in practice there is usually an earlier commitment or agreement in principle made)

[Retrieved from IEMA website - http://ems.iema.net/planning]

The systematic approach to environmental management should follow the basic 'Plan, do, check, act' cycle, also known as PDCA cycle (Figure 2).

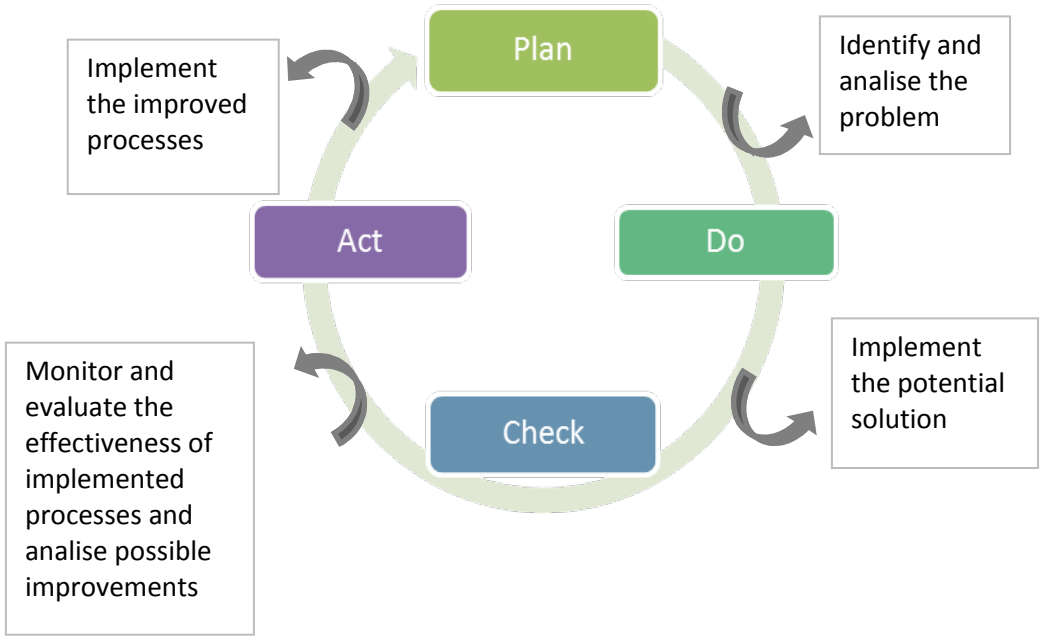


Figure 2: The systematic 'Plan, Do, Check, Act' cycle

This is the basis of ISO 14001 standard. As a circle that has no beginning or end, the PDCA cycle should be repeated again and again for a continuous and successful improvement. To understand the systematic approach amongst an EMS, the PDCA cycle can be broke down further, according to its stages, management activities and environmental management tools, as shown in Table 1.

Table 1: The four stages of PDCA cycle relating to management activities and relevant environmental management tool [Hyde & Reeve, 2004]

Cycle stage	Management activities/steps	Relevant environment management tool
plan	• identify priority issues (significant aspects • establish (or modify) policy to address issues • identify performance standards/improvement opportunities (legal requirements, best practice solutions) • agree key performance indicators • set objectives and targets to meet desired performance levels • prepare action plans, programmes and procedures for achieving performance/meeting objectives and targets	environmental review
do	• implement actions	environmental program
check	• monitor results • evaluate performance against policy aims, objectives, targets, plans, programmes and procedures • determine reasons for deviations (e.g. non-conformances)	environmental management audit
act	• take corrective actions for non-conformances • reflect on performance and adequacy of system elements in delivering desired levels of performance • ensure changing circumstances are identified • modify system elements: policy, objectives and targets, plans, programmes and procedures, as necessary	management review

The environmental policy is an important feature of an EMS; it is fundamental to the system as it sets the framework for environmental management. The policy purpose is provided by setting appropriate objectives, targets, action plans, programs and procedures and it should address significant environmental aspects and requirements of applicable environmental legislation.

Checking performance is an important feature of an EMS as non-conformances are identified through auditing and performance is rectified accordingly.
Another important feature is the management review. The feedback mechanisms allied to the review ensure that the system is kept relevant and adequate and can deliver continual improvement.

The environmental review is an important first stage for organisations without a formal EMS. Subsequent environmental reviews may be sensible if circumstances significantly change.

2.4 – Instruments for Change

Effective environmental management requires effective 'change management'. The pressures for change may come from a variety of organisations, groups or individuals that have an interest in the business in question [Lewin, 1947].

Kurt Lewin's continuing relevance today allows the ongoing referring to his visionary theories and models of change developed in the 1940's and its adequacy to be referred on this project.

Change is pervasive and only organisations willing to adapt and embrace change will thrive. Change comes from environment, more often external than internal environment. Understanding when environmental change implies a need for organisational change and when it does not defines a good strategic leadership. Making internal changes in the business to accommodate external changes is reactive and shows the organisation wide vision of progress and adaptability.

The views and requirements of stakeholders affect how the organisation can operate. While legal requirements imposed by the statutory environmental protection authorities are of paramount importance, businesses are increasingly coming into contact with other stakeholders on environmental issues [Hyde & Reeve, 2004].

Management schemes rely on market forces too. Under such schemes, organisations can demonstrate to their stakeholders that the requirements of a management system standard are being met (through certification or not).

Amongst these schemes, two most significant are:

- ISO 14001 Environmental Management System standard, which sets out specifications for an environmental management system; and
- EMAS (EU Eco Management and Audit Scheme), which sets out the requirements for an EMS equivalent to ISO 14001, but with the additional requirement of a public reporting statement on environmental performance.

These schemes require specific environmental issues – based on the organisation's obligations under applicable laws and an understanding of stakeholders concerns – to be identified and addressed as part of the on-going environmental management process.
For more detailed information regarding ISO 14001:2004 please consult Annex 1.

2.5 – BS 8555 – British Standard Guide to the Phased Implementation of an Environmental Management System Including the Use of Environmental Performance Evaluation

In the UK, the BS 8555 standard allows organisations to take a 'six-steps' approach to a certificated environmental management system and allows for phased acknowledgment of progress towards the full implementation of an accredited EMS such as ISO 14001. BS 8555 makes particular reference to small and medium enterprises (SMEs) but is applicable to companies of any size, regardless of the type of work or location of the business.
The advantage of adopting the BS 8555 methodology is that an ISO 14001 compliant system can be progressively developed and implemented within the workplace in a controlled and structured manner that is more likely to be suited to SMEs with limited resources.

BS 8555 describes how to implement a generic EMS and can be used as a route towards ISO 14001 and EMAS within the supply chain. The six phase approach is summarised by the diagram that follows (Figure 3):

Figure 3: The systematic 'Plan, Do, Check, Act' cycle (modified from IEMA website www.iema.net/acorn_scheme/bs8555)

As an organisation introduces each step (or 'phase') in BS 8555, it can either assess itself through an internal audit, allow customers to assess it against selected criteria, or be accessed by a third party (such as a certification body). The standard allows an organisation to demonstrate progress to stakeholders, without necessarily having to go through a certification.

The sixth phase of this approach prepares an organisation either for certification to ISO 14001 or registration to EMAS. Organisations looking to gain recognition for their EMS to either EMAS registration or ISO 14001 accreditation should look into Phase 6 of the BS 8555 – Environmental management system acknowledgement, which outlines the preparatory stages for such work in detail. As part of this final stage, the organisation will, where appropriate [IEMA, n.d.]:

- provide evidence that the EMS has been implemented and managed prior to a final certification audit against all the requirements of ISO 14001. An organisation will also have conducted a full internal environmental audit and at least one comprehensive management review;
- undertake review of baseline assessment, environmental aspects, legal compliance, employee involvement, environmental policy and audits to confirm they meet the requirements of EMAS;
- assess the environmental performance evaluation (EPE) system developed through Phase 1 to 5 to ensure that the data collected and information produced is sufficient for external use and verification as part of EMAS; and
- produce an 'environmental statement' in accordance with EMAS requirements.

Phase 6 achievement is partly optional depending upon whether the organisation is pursuing a third party certification against ISO14001, a registration under the European EMAS regulation or reassurance for customers and other stakeholders through external communication and reporting of performance information.

2.6 – BS EN ISO 14001:2004 Environmental Management Systems – Requirements with guidance for use

This standard was developed by the International Organisation for Standardisation (ISO), and issued in 1996. ISO 14001 is part of a comprehensive suite of environmental management standards that provide guidance on various topics including environmental auditing, environmental performance indicators and life cycle assessment.

ISO 14001 is a 'specification with guidance for environmental management systems'. It is a standard specification of the requirements for an EMS which needs to be in place

and functioning in order to obtain official certification. However, organisations that design their EMS to conform to the standard are not obliged to obtain certification.

2.6.1 Critical elements of ISO 14001:2004 Standard

Organisations of all kinds are increasingly concerned with achieving and demonstrating sound environmental performance by controlling the impacts of their activities, products and services on the environment, consistent with their environmental policy and objectives. They do so in the context of increasingly stringent legislation, the development of economic policies and other measures that foster environmental protection, and increased concern expressed by interested parties about environment matters and sustainable development.

Many organisations have undertaken environmental "reviews" or "audits" to assess their environmental performance. On their own, however, these "reviews" and "audits" may not be sufficient to provide an organisation with the assurance that its performance not only meets, but will continue to meet, its legal and policy requirements. To be effective, they need to be conducted within a structured management system that is integrated within the organisation.

This international standard specifies requirements for an environmental management system to enable an organisation to develop and implement a policy and objectives which take into account legal requirements and information about significant environmental aspects. It is intended to apply to all types and sizes of organisation and to accommodate diverse geographical, cultural and social conditions. The basis of approach is shown in Figure 4. As mentioned before, for more information on the ISO 14001 standard please refer to Annex 1 of this document.

[BS EN ISO 14001:2004 - Introduction]

Figure 4: Environmental Management System model for ISO 14001 (retrieved from: BS EN ISO 14001:2004)

2.7 – Eco Management and Audit Scheme

A Community Eco-Management and Audit Scheme (EMAS), allows voluntary participation by organisations located inside or outside the Community.

The objective of EMAS focuses on promotion of continuous improvements in the environmental performances of organisations by implementing and establishing environmental management systems. This scheme provides guidance on determining a periodic evaluation of such systems and provision of information on environmental performance and encourages an open dialogue with the public, the active involvement of employees in organisations and appropriate training. [Chapter 1, Article 1, REGULATION (EC) No 1221/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC].

EMAS is a voluntary environmental tool operative since 1995 with the aim of continual improvements in the environmental performance of companies and other organisations. It was initially established by European Regulation 1836/93, which has since been updated twice with REGULATION (EC) No 1221/2009 that came into force in January 2010.

Its aim is to recognise and reward organisations that go beyond minimum legal compliance and continuously improve their environmental performance. In addition, it is a requirement of the scheme that participating organisations regularly produce a public environmental statement that reports on their environmental performance. It is this voluntary publication of environmental information, whose accuracy and reliability has been independently checked by an environmental verifier that gives EMAS and those organisations that participate, an enhanced credibility and recognition. These are the core elements of EMAS.

EMAS extends to organisations operating in all economic sectors and the key elements to a successful EMAS registration are outlined below:

- production of an Environmental Policy which makes a commitment to continual improvement in environmental performance;
- implementation of an Environmental Review which describes the current baseline position, considers relevant regulations, and evaluates significant environmental effects and issues, and documents current practices, procedures and non-compliance;
- establishment of an Environmental Programme, reflecting the Environmental Policy, and which manages the environmental effects identified in the review objectives;
- development and application of an Environmental Management System, which includes procedures, controls, data collection, monitoring, manuals, other documentation and training;
- implementation of periodic Environmental Audits to systematically and objectively evaluate whether the system meets its requirements, the environmental policy and compliance with regulations; and

- preparation and publication of an Environmental Statement (EMAS and UK-EMAS).

Having the EMAS registration, organisations can benefit from:

- cost reductions: better management of resources (e.g. energy and resources efficiency);
- risk minimisation: possibilities to reduce associated risk levels by assessing operational procedures;
- regulatory compliance: greater awareness and knowledge of regulatory requirements;
- regulatory relief: regulators may choose to relax regulatory requirements;
- improved relations with internal stakeholders: employee involvement and training under EMAS can lead to improved employee morale;
- improved relations with external stakeholders: EMAS registration of a site in close proximity to residents can enhance credibility and transparency; and
- competitive advantage: EMAS registration can lead to improved market access and increase market share.

EMAS goes further than ISO 14001 as it requires a deeper involvement of all parts within the organisation in its implementation, as shown in both Figure 5 and Figure 6.
Siemens Magnet Technology does not take part in EMAS. Its EHS representatives issue reports every six months and forward these to the EHS offices – SESIS report. SESIS stands for Siemens Environmental and Technical Safety Information System and is used as an instrument to monitor EH&S performance and definition of new goals.

Figure 5 – EMAS goes further than ISO 14001 (retrieved from www.ec.europa.eu/environment/emas/documents)

Figure 6: EMAS and ISO 14001 complementarities and differences (retrieved from http://ec.europa.eu/environment/emas/pdf/factsheet/EMASiso14001_high.pdf)

2.8 – Occupational Health and Safety Management Systems

The London Stock Exchange published rules on corporate governance for listed companies called "The Combined Code: Principles of Good Governance and Code of Best Practice" where it is recognised that the share value of a company is not only based on asset value but also on the success of the directors in managing all the strategic risks that the business faces, including Organisational Health and Safety (OH&S). The UK Government has extended this practice to the public sector, including higher education establishments.

Major accidents and claims for ill health/injury, damage to plant, equipment and property are costly, both in the short term and also in the longer term, through the loss of reputation caused by adverse publicity and the impact of legal enforcement. The Combined Code affects other organisations besides listed companies because listed companies need to assure themselves that their suppliers, both in their trading practices and the supply of products and services, are not putting them at risk [Smith et al., 2004].

Governmental and stakeholder pressure has also led organisations in the private and public sector to focus on Corporate Social Responsibility (CSR). OH&S is not just one element, but also a major requirement that has to be addressed when delivering CSR. The pressure for CSR controls comes from the European Union and there are standards developed by the ISO and British Standards Institution (BSI). [Smith et al, 2004]

The compliance approach is often too burdensome for small businesses. It is however recognised that many small businesses have quality systems such as BS EN ISO 9001:2008 Quality Management Systems – Requirements, working effectively. Occupational Health and Safety (OH&S) systems are just as easy to implement. Effective implementation of a system based on OHSAS 18001 - Occupational Health and Safety Assessment series, BS 8800 – Occupational Health and Safety Management systems – Guide, should enable an organisation to meet (and exceed) 99% of the compliance issues.

A successful organisation will integrate OH&S into its day-to-day management arrangements, recognising that there should be only one management system and style

providing the procedures and instructions. It will continuously maintain its OH&S management programme, updating it and communicating it to those who are directly affected – employees, contractors, customers, clients, visitors and the public. Not only is communication with those closest to the organisation essential, but evidence of successful OH&S management is sought by other groups important to the well-being of the organisation, such as investors, insurance companies, financial institutions and potential customers. OH&S may be perceived as a serious drain on resources, offering little in financial return. In practice, however, it has been shown that reducing accidents, occupational illness, equipment and plant damage will outweigh the costs of implementation. Improvements in performance indicators will help to safeguard the welfare of employees and others and at the same time benefit the financial performance of the organisation. Improvement in performance indicators examples follow:

- reductions in absenteeism;
- reductions in claims;
- improved insurance rating;
- absence of adverse publicity; and
- improved production output.

OHSAS 18001 completes the trio of business management systems – quality, environmental and occupational health and safety.

Many organisations seek to integrate their formal management systems. OHSAS 18001 and BS 8800 embody the principles upon which BS EN ISO 14001 is based and many commonalities exist between them. An OH&S management system based on OHSAS 18001/BS 8800 allows alignment and integration with these other systems. This approach reduces the duplication of paperwork by approximately 50% when these systems are operating within a single management system. It also avoids unnecessary bureaucracy, improves business focus and avoids potential conflicts.

For an effective OH&S management system there needs to be a commitment at the highest level and a proactive approach from the organisation to address all OH&S issues. Management systems such as OHSAS 18001 and BS 8800 incentivise

organisations to provide the same level of importance to achieving high standards of OH&S as they do to other key business activities.

2.8.1 Critical elements of BS OHSAS 18001:2007

The OHSAS 18000 series have been developed to be compatible with ISO 9001:2000 and ISO 14001:2004 management systems standards, in order to facilitate the integration of quality, environmental and occupational health and safety management systems by organisations [BS OHSAS 18001:2007] (see Annex A (informative) – Correspondence between OHSAS 18001:2007, ISO 14001:2004 and ISO 9001:2000 - from OHSAS 18001:2007, that is set out in Annex II of this thesis). OHSAS Standard covers OH&S management providing organisations with elements of an effective OH&S management system that can be integrated with other management requirements and help organisations achieve OH&S and economic objectives. It also specifies requirements for an OH&S management system enabling organisations to develop and implement a policy and objectives that take into account legal requirements and information about OH&S risks. It applies to all types and sizes of organisations and accommodates diverse geographical, cultural and social conditions [BS OHSAS 18001:2007].

This OHSAS Standard aims at supporting and promoting good OH&S practices in balance with socio-economic needs [BS OHSAS 18001:2007].

It is possible for an organisation to adapt its existing management system(s) in order to establish an OH&S management system that conforms to the requirements of the OHSAS Standard. The level of detail and complexity of the OH&S management system depend on the scope of the system, the size of the organisation and the nature of its activities, products and services, and the organisation culture [BS OHSAS 18001:2007].

Figure 7 provides an overall view of the OH&S management system elements for a successful OH&S management.

Figure 7: Elements of successful OH&S management for OHSAS 18001:2007 Standard (retrieved from: BS OHSAS 18001:2007).

2.9 – Comparison between ISO 14001 and OHSAS 18001 Standards

The essential difference between ISO 14001 and OHSAS 18001 is that ISO 14001 focuses on managing an organisation's impact on the external environment, while OHSAS 18001 focuses on managing an organisation's internal environment to ensure a safe and healthy workplace. Structurally, the two standards and its requirements are essentially identical.

The following table provides a direct clause-by-cause comparison of ISO 14001 and OHSAS 18001:

Table 2: Clause-by-clause comparison of ISO 14001 and OHSAS 18001 (retrieved from: integrated-standards.com/compare-iso-14001-ohsas-18001.aspx)

Table 2 has the purpose of showing the structure similarities between the two standards reinforcing that when implementing and documenting a management system, the environment and health and safety areas of a business should be integrated into the same management system tool.

Although the similarities are many, there are some points where the standards are distinctly different: ISO 14001 focuses on managing the organisation's impact on the external environment to reduce pollution and comply with relevant regulations while OHSAS 18001 focuses on managing the organisation's internal environment to ensure a safe and healthy workplace environment. ISO 14001 requires aspects-impacts analysis

and OHSAS 18001 requires an organisation to conduct hazard identification and risk assessments.

Both requirements require an evaluation of the activities in the organisation and a listing of relevant risks, hazards, impacts, along with determining if appropriate controls are in place.

Consequently the processes and documentation needed to conform, implement and certify to ISO 14001 and OHSAS 18001 are essentially the same with the exception of the intent and focus that differ.

CHAPTER 3 – METHODOLOGY

This chapter presents the approach taken to achieve the implementation of the revised management system and the description of the new system adopted for the company's control of documents.

3.1 – Acquaintance

The need to improve the existing documents and management system arose from a good understanding of how these covered all the activities undertaken at Siemens Magnet Technology (SMT) and the positive impact that these changes would bring to the company. The current SMT Environmental Health and Safety Management System (EH&SMS) was first implemented as Health and Safety Management System, in line with relevant legislation and standards and covering the procedures from the company. Later, with the increase of environmental awareness, the company understood the importance of aligning its current management system and procedures with the environmental concept, hence the H&S MS introduced the Environment element and these were unified under the same management system.

The concept of harmonisation comes in context to bring closer and to the same level different business units that share business tools in the areas of environment health and safety. The harmonisation will add a structure review with the purpose of having all the procedures with same parameters. The driving force of this project is to have the space and tools ready to implement changes coming from Siemens Healthcare Germany.
The EH&SMS at SMT follows the requirements set in the international and British standards and is in line with Siemens Healthcare requirements. The harmonisation came to shape when presented with a gap in the communication from business units regarding common areas: environment health and safety procedures. The lack of transparency in these same procedures was identified with potential room for improvement, covering the communication gap mentioned previously.

3.2 – Practical Application

The strategic approach was based on experience and the decisions were made by observing and allocating the tools needed for the project.

To address all gaps of the system in place an internal combined audit – Environment and Health and Safety - was conducted by the director of Environmental Protection for Siemens Healthcare.

The audit was conducted by reviewing the company's environment, health and safety documentation and systems to determine the effectiveness of the environment, health and safety standards.

This audit covered all the EH&S requirements specified in both ISO 14001:2004 and OHSAS 18001:2007 standards (consult Chapter 2, Annex 1 and Annex 2 for an extended analysis on these standards)

The key areas may be summarised as follows:

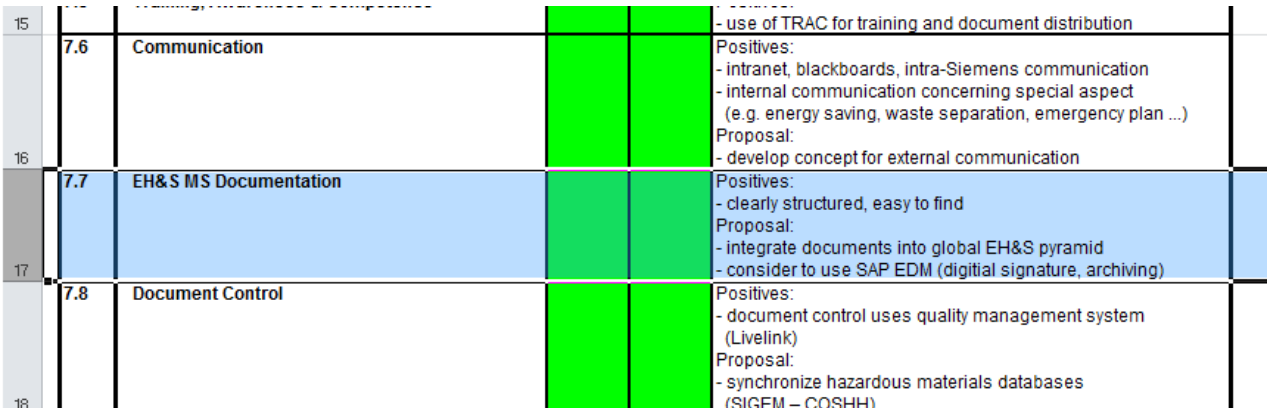
Strenghts

- High level of EH&S management and good employee consultation and involvement;
- Good commitment from the management team and director support for EH&S issues;
- High level of awareness by display of improvement proposals on notice boards;
- H&S Aspects very well covered;

Areas for improvement

- EH&S Policy commitments not well known by employees and ISO 14001 requirement 'Continual Improvement' not explicitly stated;
- EH&S MS Documentation should be included in the Global Siemens EH&S Pyramid and the SAP EDM system should be used to archive and control the documents.

An excerpt from this report is shown in Figure 8, with the suggestions made to the area of improvement.



15				- use of TRAC for training and document distribution
16	7.6	Communication		Positives: - intranet, blackboards, intra-Siemens communication - internal communication concerning special aspect (e.g. energy saving, waste separation, emergency plan ...) Proposal: - develop concept for external communication
17	7.7	EH&S MS Documentation		Positives: - clearly structured, easy to find Proposal: - integrate documents into global EH&S pyramid - consider to use SAP EDM (digitial signature, archiving)
18	7.8	Document Control		Positives: - document control uses quality management system (Livelink) Proposal: - synchronize hazardous materials databases (SIGEM – COSHH)

Figure 8 – Excerpt from Internal Audit Key Comments

Following the results from the internal audit, focus was given on the implementation and improvement of the suggestions that arose from the audit. Each requirement part of the management system was reviewed and revised, but more emphasis was given to the EH&S Policy, and EH&SMS Documentation.

The audit was followed by frequent meetings with the Director of Environmental Protection for Siemens Healthcare Sector and the Head of Health, Safety and Environment for Siemens Healthcare and Siemens IT Solutions (Healthcare UK). The main outcome from these meetings was to generate and implement the EH&SMS implementation plan. The aim of the implementation plan is that each business unit implements and updates Healthcare EH&SMS and that the responsible person for each business unit ensures it has been successfully completed.

The guidelines and suggestions from the audit and meetings generated the following set of objectives:

- Establish a project plan with required tasks, tasks owners and completion dates.
- Report status of implementation plan monthly to EH&S Manager and to the Director of Environmental protection (open, in process or complete)

- Based on the gap analysis, update and issue procedures and processes as needed;
- Communicate changes to EH&SMS to employees as needed;
- Training on the procedure changes to relevant employees;
- Implement updated processes and procedures;
- Improve the way the documents and procedures are controlled by integrating documentation in the Siemens Global EH&S Pyramid and the use of SAP EDM system.
- Conduction of internal EH&SMS audit after completion of tasks to verify conformance to new system.
- Understand the influence of the improved management system at the company;
- Increase the level of acquaintance from each employee with this tool;

The action log for SMT EH&S Department was created, together with the manager of EH&S Department, and presented to the SMT Management Team. The activities part of the action log included:

- Evaluate relevant legislative or standards and ensure management system accounts for these requirements;
- Update of documents and procedures to unify the EH&SMS;
- Restructure the EH&SMS and control the MS Documentation through SAP; and
- Communicate changes to the organisation and review ease of use and understanding of the revised MS.

The action log establishes required tasks, task owners and completion dates. EH&S MS action log was reported monthly to EH&S Manager and to Director of Environmental Protection. The action log can be consulted in the Annexes of this dissertation (Annex 3).

The management system documentation sits in the intranet and livelink of SMT where employees can access and make changes to the existing documents. This has the

advantage of enabling the easy and comfortable access to the MS documents by employees. However, these documents should be gathered in a commonplace (to other business units and site units) where there is a good organisation and control and a good visibility and tracking of all updates, versions and changes. For this to happen, an ID was created in SAP for each document part of the management system. This ID is unique and is the SAP 'name' for each document. All documents are uniquely identified with a document identifier (doc ID) consisting of:

Figure 9 – Document identifier for SAP documentation (Retrieved from SMT SAP Document Update Work-Instruction)

The review and revised documents are currently available in SAP and in intranet and livelink at the same time.

Table 3 includes the description of elements part of SAP Document Identifier for the process of SAP release documentation.

Table 3: Document identification, part of the SAP EDM process of release documentation (Retrieved from SMT SAP Document Update Work-Instruction)

SAP EDM provides an effective management by providing a central data storage for discreet documents. After revision, each document and its attachments follow a series of procedures that include:

- notification to EH&S Manager of a change in a document;

- the author of the revised document has an SAP digital signature which will be encrypted in the document. After being sign by the author for the revision, the document is then sent for the EH&S Manager for approval; and
- once the EH&S Manager accepts and reviews the change, it is then sent for revision from the Department Manager and from here it goes to the company Director for approval, training and final digital signature.

The electronic signature in the SAP-EDM system locks a document so that its content cannot be changed after a signature has been entered, and the identity of the signatory can be verified at any time.

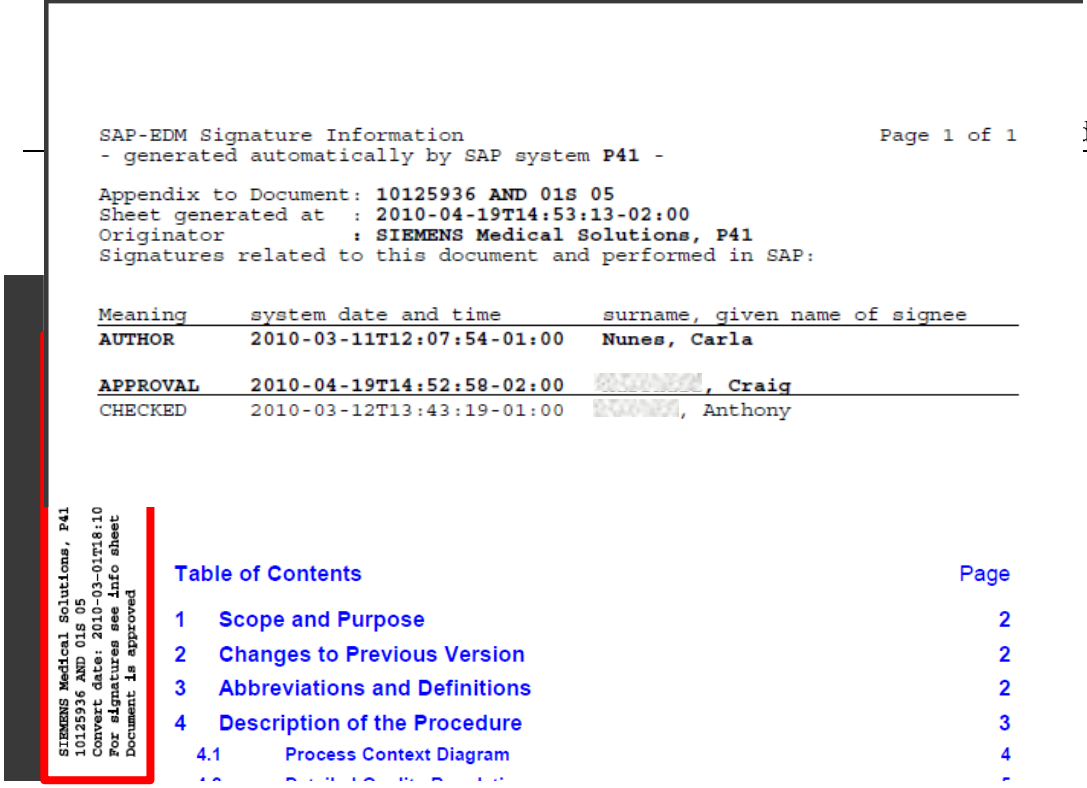
The signatory must be logged into SAP-EDM with his user name and password to insert an electronic signature in SAP-EDM. The signatory sets a so-called "status" in SAP-EDM, which defines the significance of the electronic signature (author, technical reviewer, approved by). Once the status is set, a popup window appears and prompts the signatory for his or her signature.

The Siemens ID chip card is inserted into a reader. The signature is then provided after entering an additional password (ID card PIN). Once the data has been checked, the electronic signature is digitally appended to the document (Figure 12).

Electronically signed documents are stored in PDF-format. Anyone who calls up such a document can see the status of the electronic signature in SAP-EDM, together with an electronic stamp generated by the system, which can also be printed out. The stamp contains the following information: (Retrieved from SMT SAP Document Update Work-Instruction)

- identification of the document with the document ID;
- who signed it, and when; and
- the significance of the signature (author, technical reviewer, approved by).

The following figures illustrate the final document stored in SAP after being electronically signed.



SAP-EDM Signature Information — Page 1 of 1
- generated automatically by SAP system **P41** -

Appendix to Document: **10125936 AND 01S 05**
Sheet generated at : **2010-04-19T14:53:13-02:00**
Originator : **SIEMENS Medical Solutions, P41**
Signatures related to this document and performed in SAP:

Meaning	system date and time	surname, given name of signee
AUTHOR	**2010-03-11T12:07:54-01:00**	**Nunes, Carla**
APPROVAL	**2010-04-19T14:52:58-02:00**	**[redacted], Craig**
CHECKED	2010-03-12T13:43:19-01:00	[redacted], Anthony

SIEMENS Medical Solutions, P41
10125936 AND 01S 05
Convert date: 2010-03-01T18:10
For signatures see info sheet
Document is approved

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Figure 10 – Heading of Quality Regulation at SMT containing SAP Document ID and electronic stamp

Team: S Cowton, C Nunes

Author:	Reviewed:	Approved:
S Cowton	Head of quality	Head of business unit

Copies are uncontrolled documents

Figure 11 – Footer of Quality Regulation at SMT

Figure 12 – Electronic signature digitally appended to the document

After having the documents updated and stored in SAP, the training on the new version of the document takes place. Employees assigned for training on the document will have a notification each time there will be an update on a document version so that they have their training on the new version. The new version is also updated to the Siemens Intranet Documentation Manual Page, where all documents from all departments within Siemens Magnet Technology are stored.

As suggested by the internal audit these reviewed documents can now be linked straight from SAP to the Siemens Global EH&S pyramid (Figure 13). Figure 13 shows the global Siemens Healthcare pyramid that informs the user where the relevant documentation from each unit should be located, so that it can be seen and made available to employees from other sites.

In the bottom of the pyramid, the section 'Regulations of the Healthcare Sites' stores the documentation from each site, and SMT documentation will be under the 'Europe' link. The fact that the management system documentation sits at the bottom of the pyramid shows the significance of having a well-documented management system. The superior levels need to sit on a strong foundation in order to successfully grow and evolve and a coherent management system is a good base for this to happen.

Figure 13 – EH&S Global Pyramid (retrieved from Siemens Healthcare intranet page)

CHAPTER 4 – SIEMENS MAGNET TECHNOLOGY ENVIRONMENT HEALTH AND SAFETY MANAGEMENT SYSTEM

In this chapter the requirements for the EH&SMS at SMT are specified and organised by procedure and performance requirements. This gives emphasis on performance requirements rather than on solely procedure and documentation requirements, as is critical that performance is achieved so that good effectiveness is maintained. Procedures are the vehicle tool to specify processes in order to achieve that performance: harmonisation of the EH&SMS. These requirements were reviewed and procedures included in SMT EH&SMS processes.

No matter where each business aims to fulfil the same prerequisites to meet requirements in the areas of environmental protection and occupational health and safety. Siemens Healthcare EH&S standards are based on the ISO 14001 international environmental standard, and are consistent with OHSAS 18001 and conform to the established EMAS of the European Union. All German factories have already been validated in accordance with this European Union directive since 1996. Since then, an integrated EH&S management system that meets the requirements of ISO 14001 and OHSAS 18001 is set up. Today, every Siemens Healthcare site worldwide is subject to the stringent requirements of this management system. If new businesses are acquired, these have a period of two years to implement the integrated EH&S management system. The EH&S MS of Siemens Healthcare covers a lot of topics which can be processed systematically and uniformly within the company. These include:

- environmental protection;
- occupational health and safety;
- fire protection and emergency services;
- radiological protection;
- handling dangerous substances; and

- transportation of dangerous goods and materials.

Efforts in the area of environmental protection and occupational health and safety are backed up by a clear EH&S policy. This policy focuses on five obligations, to which every employee of Siemens Healthcare is committed:

1. Continual improvement of the company's EH&S performance to protect the environment and provide a safe working environment;
2. Control and reduce EH&S hazards and business risks;
3. Create products and solutions that have as little impact as possible on health and the environment;
4. Conserve natural resources and prevent pollution; and
5. Compliance to applicable EH&S regulations and maintain market access.

(Retrieved from Siemens EH&S Report 2008)

4.1 – Introduction to EH&S Management System concept by Siemens Healthcare

The benefits of a uniform EH&S management system are obvious: double work and overtime are a thing of the past when shared business tools, templates and training documents can be used at every location. Good communication ideas have led to cost reductions and process improvements, worldwide. The EH&S management system is an important instrument that the company can use to better achieve market goals and to ensure access of products into international markets. For example, customers are increasingly asking specifically about the number of work accidents at the business locations, the energy consumption levels, whether the products are free from hazardous materials and whether they can be recycled. An important part of the company management system is the evaluation of processes and products with respect to their EH&S aspects. Siemens Healthcare businesses and sites, records products all of the relevant EH&S aspects, such as risks, energy and water consumption, emissions, waste water, radiation exposure and waste, to evaluate them in terms of how significant they

are and to what extent they can be influenced. Where risks for employees and customers or serious impacts to the environment can arise or statutory requirements must be fulfilled, the company rates the relevant aspects as significant and implement controls. The controls can range from pure monitoring, to internal rules (for example waste collection instruction, handling of dangerous substances), to engineering controls, through to implementation of improvement targets to improve aspects and performance. A multitude of relevant standards and legal directives apply to Siemens Healthcare sites and products. These are subject to constant change. Information about new laws and changed directives are provided by legal newsletters, websites as well as information services. However, Siemens Healthcare also obtains extensive knowledge from its own company offices for environmental protection and occupational health and safety as well as from its collaboration in associations and standardisation bodies.

To drive continual improvement in the area of environmental protection and occupational health and safety, Siemens Healthcare has a systematic target setting process. When defining goals, the company is supported by the instruments offered by the EH&S management system. Many improvement ideas are created while evaluating EH&S aspects, within the scope of EH&S reporting or during internal audits. Improvement measures are manifold; they range from energy saving measures at a site and environmentally sustainable plant operation through to product innovations and the optimisation of workplaces. The company suggestion system is another core element: The employees' ideas are collected and evaluated within the scope of idea management, 3i (ideas, initiatives and innovations). It was also confirmed in previous years that the management system can only function and develop its full performance with the employees' ideas, knowledge and initiative. Only if responsibilities and tasks are clearly delegated, can a globally-applicable management system be introduced and further developed in a structured fashion. In organisational terms, the EH&S activities of Siemens Healthcare are incorporated within Siemens as a whole. The organisational and supervisory duties, as well as guideline competence and control authority with respect to all EH&S requirements of the company are assumed by a member of the managing board of Siemens AG. Due to the company's size as well as to the decentralised responsibility structure, where Divisions are to a great extent managing themselves, two responsible management levels were established: the division heads

and the level of the heads of the operations. The corporate offices for environmental protection and occupational health and safety provide advice to the responsible managing board member of Siemens AG, and coordinate and supervise any resolved measures. At Siemens Healthcare, EH&S support for the Divisions is provided by the Sector EH&S office and the company medical office. The operational control for EH&S at the level of the operating companies is provided by EH&S representatives. The EH&S representatives of the operations and the supervisors within the various Business Units take care that the occupational health and safety tasks are performed. Tasks, competencies and authorities of the employees with managing, executive and supervisory functions are specified in organisational charts, job descriptions and instructions.

To ensure that the company's EH&S policy is implemented and goals are achieved, every organisational unit is required to establish appropriate operational controls (as applicable, equipment as well as procedures) as well as emergency and control measures. Due to its special importance for the health of employees, customers and patients, the management of hazardous substances is globally controlled within Siemens Healthcare. Hazardous substances used in each factories or products must pass through a release procedure in which measures to minimise risks for both employees and the environment during handling of these dangerous substances are defined and registered in a global database. A check is also carried out as to whether the number and quantity of used hazardous materials can be reduced.

Training ensures that employees know the instructions and are sufficiently qualified for the requirements of the EH&S system. Special tasks, for example the development of environmentally sustainable products, waste management or handling dangerous substances, require further qualification. Supervisors plan further training for their employees and determine specific training, should new requirements arise from work. Intranet pages and employee newsletters provide further information to the company's employees. Special attention is placed on providing information about the company commitment to the environment to the customers. In this way there is, for example, prepared what is referred to as EH&S sales cards, for sales staff. These cards contain information as bullet points about the company environmental performance.

Audits and inspections are important instruments to continually review and further develop the EH&S system. German sites take part in EMAS and in occupational health and safety certifications in accordance with OHSAS 18001, and are evaluated by external auditors. Operations outside Germany are checked by the Siemens Healthcare Sector EH&S office. In internal audits, qualified auditor teams regularly review the implementation of policy and target specifications as well as the functional ability of organisation, instruments and processes. Where non-conformances are identified during the audits, the operations define the appropriate corrective actions which are monitored by the EH&S representatives. Beyond the continual control of the EH&S system, there is the support by both internal and external audits, in particular in developing ideas, increasing the safety at workplaces, protecting the health of both employees and patients and preserving and improving the environment. Along with the regular audits, relevant EH&S metrics are obtained, trended and passed on to responsible management reports. Reliable statistics are a central instrument for monitoring the EH&S performance and the definition of new goals. With the Siemens Environmental and Technical Safety Information System (SESIS) the basic data is determined worldwide from all countries and areas. This includes, for example, energy consumption, emissions, waste volume, accident statistics, risks and measures, hazardous substances data, and also operating indicators such as staff numbers, absenteeism, sales, floor spaces etc. For sites not taking part in EMAS, the EH&S representatives issue reports every six months and forward these to the Sector EH&S office. Furthermore, reports on product-related environmental protection are issued every six months. All of this data provides the organisation with a reliable overview of the status of EH&S activities and helps us to identify weaknesses. (Retrieved from Siemens Healthcare EH&S Report 2008)

4.2 – Siemens Magnet Technology Environmental Health and Safety Management System

The basic elements of SMT EH&S-MS are designed to lead to continual EH&S performance improvement.

Figure 14: The EHS-MS processes are integrated into the management and business core processes of Process House (retrieved from Siemens EHS MS Report 2008)

The EH&S Management System is divided in main subjects as suggested on both OHSAS 18001 and ISO 14001 and these procedures exist as standalone documents available in the EH&S area of intranet and livelink.

These are organised as it follows:

1. Environment Health and Safety Policy
2. Planning
    a. EH&S Aspects and Impacts
    b. Legal and other requirements
    c. Objectives and targets: Milestone tracking
3. Implementation and Operation
    a. Procurement

b. Training and Development of staff
c. Communication
d. Control of documents
e. Operational control
f. Emergency evacuation

4. Checking
   a. Monitoring and measurement
   b. Nonconformity, corrective action and preventive action
   c. Control of records
   d. Internal audit: Assure process compliance
5. EH&S Management Review

4.3 – The EH&S MS Manual

At SMT the management system manual is in place with the purpose of providing a list of existing procedures that support and present guidelines for EH&S MS.

The SMT EHS MS takes into account the entire product life cycle, including:

- marketing, product and system planning, research and development, material selection, construction;
- procurement and logistics;
- production;
- sales and service;
- use;
- refurbish and reuse; and
- return, recycling and disposal of products.

The company objective is to continually improve the EH&S performance, reduce hazards and environmental aspects, maintain market access, reduce business risks and costs, and improve processes.

The EH&S MS manual serves the following purpose:

- to describe the core elements of the EH&S MS;
- to inform employees and business partners about elements of the Healthcare EH&S MS;
- to specify minimum Healthcare EH&S requirements and guidelines; and
- for use as the basis of Healthcare EH&S MS external and internal audits.

The manual should not be a replacement for EH&S compliance programs required for given countries, states or local jurisdictions and this is acknowledge at the company.

The EH&S MS covers the following topics:

- environmental protection;
- occupational health and safety;
- fire protection and emergency preparedness;
- radiation protection (ionizing and non-ionizing radiation);
- hazardous substances management; and
- dangerous goods or hazardous material transportation.

The EH&S MS process is described by the following process map (Figure 15):

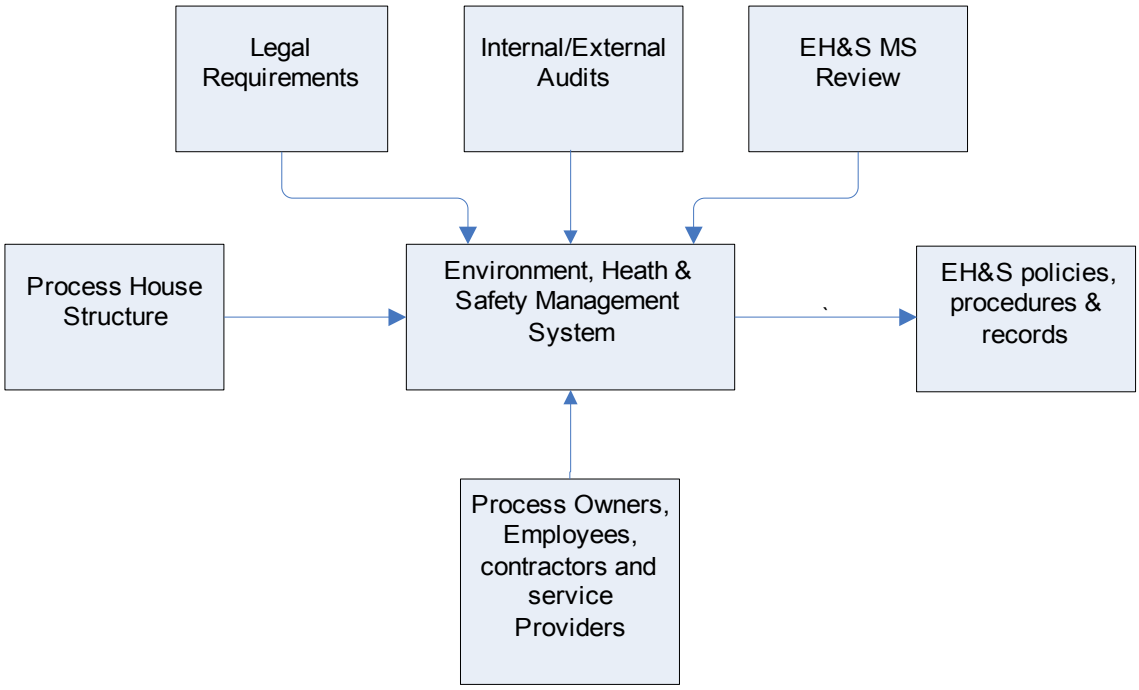

Figure 15: EH&S Management System process map

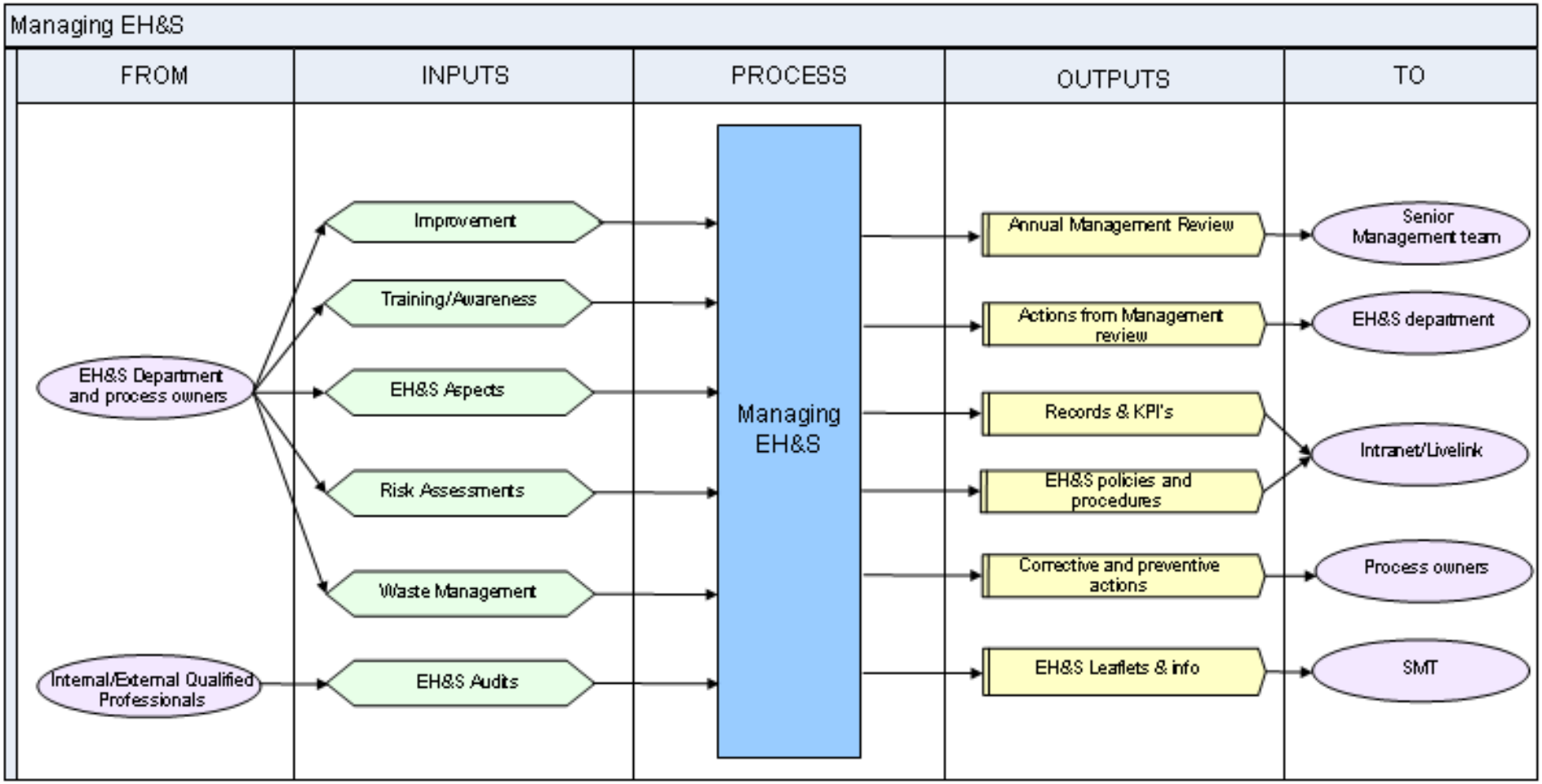

Figure 16: Managing EH&S Process Context diagram

The diagram shown above (Figure 16), part of the EH&S manual, presents a list of input-output procedures involved in the management of EH&S process.

This diagram puts into context the EH&S department and process owners along with internal and external qualified professionals (From) and their contribution to the management of the EH&S process (inputs). Generated outputs are then allocated to each appropriate area or responsible process owner (To).

4.4 – Environment Health and Safety Policy

The foundation of an integrated management is the EH&S policy, whether the goal is the certification or not. It outlines the organisation's aims and commitments and sets the framework for more detailed objectives and targets to be developed and achieved. It also shows the level of commitment to environment health and safety management to the workforce and to contractors, suppliers, visitors [Hyde & Reeve, 2004].

A comprehensive policy statement is essential to effective EH&S management, stating clearly the overall EH&S objectives and a commitment at all levels to improve environment and health and safety performance. The policy should contribute to all aspects of business performance as part of a proven commitment to continuous improvement.
As both OHSAS 18001 and ISO 14001 mention, top management shall formulate, document and implement an environmental policy appropriate to the environmental impacts of an organisation's activities, products and services. It shall be included in the policy a:

- framework for setting EH&S objectives and targets;
- commitment to continual improvement;
- commitment to prevention of pollution; and,
- commitment to comply with EH&S laws and regulations.

The policy shall be communicated to all employees and shall be available to the public. The policy at SMT, as required by both ISO 14001:2004 and OHSAS 18001:2007 (4.2 requirements) includes a clear statement of continual improvement to EH&S areas. The companies' five EH&S commitments related to the business and stated in the policy are:

- continual improvement of EH&S performance to protect the environment and provide a safe working environment;
- control and reduce hazards and business risks;
- create products and solutions to improve EHS aspects;
- conserve natural resources and prevent pollution; and
- compliance to applicable EHS regulations across all product lifecycles.

To achieve these business commitments:

- executive management is responsible;
- EH&S is personal and employee participation is mandatory;
- EH&S regulatory compliance is mandatory;
- EH&S management system is used as a living system;
- EH&S is part of all business functions;
- EH&S objectives and targets are implemented to improve businesses processes and EH&S performance, and are reviewed by executive management; and
- business partners are expected to participate along with the company to improve EH&S performance.

The policy is available and has a good visibility to all employees, visitors, suppliers and contractors. Its availability include: front reception area, offices and department areas, notice boards and SMT intranet, providing a good awareness of EH&S topics stated in the policy. It includes an EH&S organisational chart and allocated responsibilities for: managing director, divisional HR business partner, director responsible for EH&S,

senior management team, EH&S Department, managers of people, managers of process and employees.

The policy is signed by the Managing Director and the senior management team. The statement of intent also includes the five commitments that all within the site are expected to aspire to.
The document is communicated to all employees to ensure that they are aware of their individual responsibilities and is a topic discussion in the quarterly EH&S Committee Meetings.
All roles and responsibilities are detailed within the arrangements and continue to list the main procedures in brief, with more detailed work instructions held on the intranet.
Every employee and staff has access to the intranet which is broken down into quality, environment, health and safety. If there are any amendments to the environment health and safety management system, the TRAC system, which manages all training data, automatically alerts all by e-mail and once they have read the new document(s), which they then need to digitally sign, it is recorded as training via e-learning. For further information please consult the Environment Health and Safety Policy on Annex VI.

To ensure that all employees and staff have comprehensive understanding on these points further training was assigned to allow a greater ability to get the information required without assistance. The policy was made part of the weekly internal audits by introducing environmental questions to the already existing health and safety questions (including the policy and its commitments).

As an outcome from the internal audit conducted by the Siemens Director of Environmental Protection, the ISO 14001 ‘continual improvement’ statement (see Annex I) was not clearly stated therefore the policy was reviewed and changed to include this requirement.

The picture bellow can be found in the SMT EH&S policy and illustrates the commitment of the company on having one management system for the areas of environment, health and safety. This is the Plan-Do-Check-Act (PDCA) cycle and it can

be found in the ISO 14001:2004 standard or OHSAS 18001 adjusted accordingly to each standard.

Figure 17: Environmental management system model for SMT MS modified from the ISO 14001 and OHSAS 18001 models (retrieved from EH&S policy at SMT)

4.5 – Planning

Before planning phase can be started it was important to acknowledge that an effective, intuitive successful EH&S management highly depends on:

- strong commitment from the top management to be reinforced throughout the overall organisation;
- a proactive approach. Avoiding and preventing is far better and cheaper than reacting to the aftermath of problems as when they arise;
- continual improvement of EH&S performance commitment throughout the business;
- facing changes on a flexible and open approach (for example, introduction of a new legislation); and,

- clear and transparent plans to be documented and management system outputs recorded as evidence for audit purposes.

Figure 18 bellow illustrates the described.

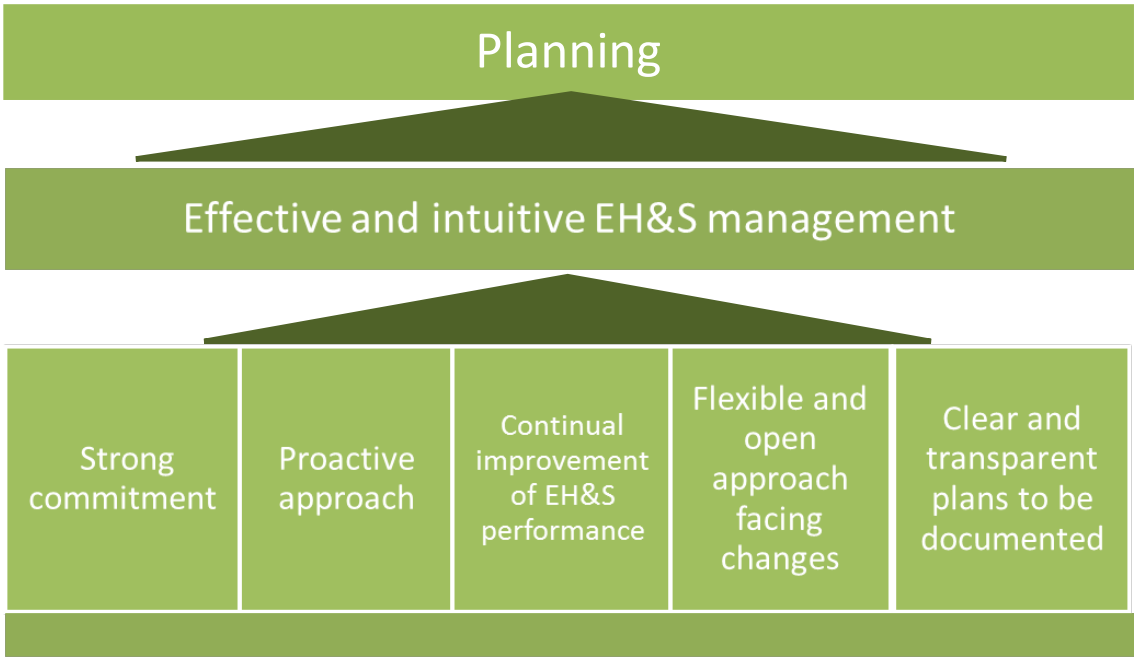

Figure 18: Steps that lead to a successful planning

4.5.1 Environmental Health and Safety Aspects

EH&S management has as fundamental principle the maintenance of interactions (either actual or potential) considered to be significant. These interactions are termed aspects and the changes they cause are termed impacts [Hyde & Reeve, 2004].

ISO 14001 defines:

> Environmental aspect – An element of an organisation's activities, products and services which can interact with the environment.
>
> Environmental impact – Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

Therefore, when thinking in aspects and impacts is useful to think in terms of 'cause' and 'effect'. As defined above, activities have aspects (environmental health or safety interactions) that cause impacts (changes in the environment, health or safety). The figure bellow illustrates what has been described [Hyde & Reeve, 2004].

Figure 19: The activity-aspect-impact relationship [Hyde & Reeve, 2004]

ISO 14001 determines that the organisation shall document and implement a process to:

- identify and document environmental aspects of the organisation's activities, products and services;
- select and document significant environmental aspects using a defined and objective methodology for evaluating importance of environmental impacts; and
- update environmental aspects when changes are made to the organisation's activities, products, and services.

The organisation shall ensure that the significant environmental aspects are taken into account in establishing, implementing and maintaining its environmental management system.

The EH&S aspect/impact procedure at SMT:

- specifies all required elements (who compiles aspect list and how list is compiled; how aspect list is documented; who will periodically review aspect list; significance review frequency; how responsible departments and executive management will be informed of significant aspects and to whom and how will significant aspects be communicated);
- includes a systematic aspect significance scoring method;
- specifies a process for identifying aspects and keeping this list up to date, which includes specification that process owners/departments/engineers notify EHS team(s) of process changes that may cause a change in aspects or significance, and includes tools for notifications;
- specifies that aspect reviews occur at least annually;
- establishes a significance threshold that ensures that there are some significant aspects; and
- specifies inclusion of supplier and PREP aspects.

SMT documented list of total aspects by department and sub process:

- includes all required elements (activity, tasks, aspects, associated potential impacts and affected equipment); and
- includes aspects that are both controlled and influenced by the organisation, including aspects of the organisation's suppliers for goods and services.

The internal audit conducted by the Director of Environmental Protection shown as a positive outcome the use of risk assessments to evaluate EH&S aspects and that these were well covered.
The Risk Assessment procedure was updated to include more Environmental aspects. These documents are part of the EH&S MS manual and were revised and updated.

4.5.2 - Legal and Other Requirements

According to ISO 14001 the organisation shall document and implement a process to:

- Identify and have access to any applicable legislative, regulatory and other requirements; and
- Link these requirements to specific environmental aspects.

SMT is aware of all legal and other requirements in relation to EH&S. In particular:

- SMT is aware of, and complies with, all relevant EC (European Commission) Directives and United Kingdom law. SMT pays particular regard to any Statutory Instrument, Order or any other Regulation or Bylaw made under the Acts or other applicable Acts or Regulations.
- SMT complies with other mandatory requirements, local safety, environmental and security regulations, including any requirements specified by the Health and Safety Executive, Environment Agency, Local Authority, Regional Water Company, Regional Fire Brigade, Police or Civil Defence Authority.
- SMT ensures works are carried out in accordance with Approved Codes of Practice and Guidance Notes issued by the Health and Safety Commission/Executive, Environment Agency and other relevant bodies e.g. the Institute of Electrical Engineers.
- SMT ensures that their Contractors, agents / employees are aware of, and comply with, these requirements.

The EH&S manager reviews the following to determine legal and other requirements applicable to SMT:

- Risk Assessment
- SMT permits, licenses and registrations
- EH&S requirements (from Med EH&S website Germany Healthcare)

The EH&S manager provides all responsible process owners with the requirements, if necessary and document all requirements in a Database and keep this up to date.

The EH&S manager/department analyses EH&S regulatory changes to determine what impacts there are. If there are any impacts, the EH&S manager recommends changes needed to efficiently integrate the new requirements into SMT processes.

The EH&S regulations and requirements are reviewed for possible updates, twice a year or when regulations or Med EH&S requirements change.

The Siemens Shared Service Environmental Risk Manager also provides SMT EH&S with relevant information to keep the SMT EH&S register of legislation up to date.

Important regulations and requirements are communicated to all employees and contractors by intranet/live link and/or notice boards.

A copy/original of all current SMT EH&S permits, licenses and registrations are maintained by and available at the EH&S department.

Each process owner shall inform the EH&S department with a written document if there are new EH&S requirements in his/her area of responsibility.

If a regulation affects a new process/product it is necessary to inform the EH&S Manager immediately and find a solution.

The use of a governmental internet page and mailing list to be informed of changes in regulations (which occur nearly every day) is a positive outcome from this process.

4.5.3 – Objectives, Targets and Program(s)

Objectives and targets are the springboard for action to improve environmental health and safety performance.

EH&S management is, essentially, the management of an organisation's significant EH&S aspects, and this means that objectives and targets need to provide a clear and demonstrable link to the significant aspects. They should also reflect the EH&S policy since this sets the general aims and direction for EH&S management.

Objectives and targets set specific goals for action. They also provide standards against which the degree of business can be measured or progress monitored.

There is a hierarchical relationship between policy aims, objectives and targets, although the distinction between objectives and targets is not always 'hard and fast'. Policy aims set the overall corporate context and objectives flow from them. It is useful to think of targets as the means by which overall objectives will be attained and against which operational actions will be accessed. Objectives tend to be longer term, corporate and relatively broad. Targets should be short term (typically annual), operational and specific. Targets should be an integral part of action plans and programmes at the level of the business unit [Hyde & Reeve, 2004].

Figure 20: Relation between policy, objectives and targets [Hyde & Reeve, 2004]

Objectives and targets specify continual improvement goals. However, simultaneous continual improvement is rarely practical across an organisation's entire range of significant aspects.

Objectives and targets should help drive continual improvement in overall EH&S performance. However, not all of them define specific EH&S improvement goals. For example if an aspect is being effectively managed, an improvement goal may not be required but rather an objective or target should be applied to ensure that current controls continue to work well.

According to ISO 14001 the organisation shall:

- establish and maintain documented and measurable environmental objectives and targets at all relevant functions within the organisation; and
- establish and maintain documented and measurable environmental objectives and targets for all significant environmental aspects.

When setting environment objectives and targets, it must be ensured that:

- all applicable legislative, regulatory and other requirements are considered;
- views of persons, or groups concerned with or affected by the organisation's environmental performance are considered and;
- the environmental policy, prevention of pollution and continual improvement are considered;
- establish, document and maintain programs to achieve each environmental objective and target that include:
  - designation of responsibility for achieving objectives and targets at relevant functions and levels of the organisation; and
  - the means and time-frame by which they are to be achieved.

The above points are suggested by ISO 14001. Identical suggestions are delivered by OHSAS 18001. An example was given for the environmental standard, however, for the implementation both standards were considered.

When establishing and reviewing EH&S objectives and targets, the following are considered:

- Healthcare EH&S policy;
- relevant regulations and other subscribed requirements;
- significant EH&S aspects
- technological, financial, operational and business requirements; and
- views of interested parties.

SMT plan targets using target implementation plans. Target implementation plans include tasks, responsibilities, completion timeframe and metrics to measure performance. Target implementation plans are updated as needed and tracked to completion. These include:

- use of scorecards, target implementation plan and target metrics (part of business plan);
- commitment of the management team;
- multiple ways for employees to participate in the selection of objectives and targets:

    - EH&S committee;
    - proposals for improvement; and
    - weekly audits.

CHAPTER 5 – IMPLEMENTATION AND OPERATION

Implementation and operation includes programmes and action plans which are supported by procedures and relevant documentation that enables the organisation to work towards the achievement of objectives and targets.

For successful implementation and operation of environment health and safety management system, ISO 14001 and OHSAS 18001 identify the following key areas that need to be addressed:

- resources, roles, responsibility and authority;
- competence, training and awareness;
- communication;
- documentation;
- control of documents;
- operational control;
- emergency preparedness and response;
- checking;
- monitoring and measurement;
- non-conformance, corrective action and preventive action (CAPA);
- internal audit; and
- management review.

5.1 – Resources, Roles, Responsibility and Authority

Responsibilities are assigned so that it is clear who is responsible for each EH&S related task and to ensure all EH&S responsibilities are covered. The EH&S Manager is responsible for all EH&S support topics, including environmental protection (process and product related); occupational health and safety; fire protection; hazardous substances and dangerous goods. These responsibilities are specified in every EH&S procedure and applicable work instructions as well as generally in the EH&SMS manual.

Management ensure there are adequate EH&S labour resources to implement maintain and continually improve the MS.

The organisation's top management team appoints a management representative responsible for:

- ensuring conformance with both ISO 14001 and OHSAS 18001;
- reporting on the conformance of the environmental management system; and
- making recommendations for its improvement.

The organisation must have access to resources, skills in environmental science, health and safety management to perform its tasks and experience needed to maintain and implement an effective management system and ensure an active involvement in its execution.

5.2 – Competence, Training and Awareness

OHSAS 18001, 4.4.2 states that:

'Personnel shall be competent to perform tasks that may impact on OH&S in the workplace. Competence shall be defined in terms of appropriate education, training and/or experience'

Environment health and safety should include an equivalent part of all training and awareness requirements for the organisation and this should begin where employment

begins by ensuring that all have the literacy skills and other specific abilities required to carry a role.

SMT training procedure includes all required elements:

- who performs training needs assessments, frequency and how it is done;
- relevant functions and organisations included in the training program;
- how list of employees and other relevant persons (including EH&S Managers) who perform tasks involved with significant aspects is determined;
- topics covered for each job type;
- when training and retraining is done;
- if a training matrix/course is used;
- how training is coordinated/tracked; and
- strategy for successful course completion, experience and/or competence determination and how it is determined that external persons performing work on behalf of SMT are competent.

The training assessment is completed and revised at least every two years. The existing training plan specifies the job duties and tasks required for the training subjects, when the training is done and special competence methods. EH&SMS training includes all required EH&S elements:

- importance to conform with Healthcare and SMT EH&SMS procedures, work instructions and requirements;
- the significant EH&S impacts of their activities and the EH&S benefits of personal performance; and
- tasks and responsibilities under the company MS, including emergency preparedness requirements and possible consequences of deviations from proper work procedures.

All employees are competent to perform their tasks involving significant EH&S aspects. SMT acknowledges that training, education and experience are effective to achieve the described above.

5.3 – Communication

EH&S management is one discipline of interest to a wide range of stakeholders, therefore, effective communication is a crucial element in the EH&S management process [Hyde & Reeve, 2004].
Communication allow the organisation and individuals within it to understands what needs to be done, how to be done and to monitor and review progress of what is being done. Furthermore, it is the vehicle to progressing the PDCA cycle [Hyde & Reeve, 2004].

A key function is to acknowledge what external parties expect from the organisation as well have clear what is the organisation looking for in these external parties. Communication it is the means by which others are informed of the organisational values, policy, practices and performance. Effective communication is essential to [Hyde & Reeve, 2004]:

- initiate and sustain action;
- build awareness and motivation;
- demonstrate intentions and performance; and
- form opinions and establish reputation.

5.3.1 Internal Communication

Effective internal communication is effective to [Hyde & Reeve, 2004]:

- promote awareness of all relevant developments;

- encourage staff involvement and participation in EH&S matters; and
- monitor progress through reporting and feedback.

Each category of internal audience is expected to have different attitudes, cultures, background knowledge and competences; therefore communication needs to be adjusted for each individual needs [Hyde & Reeve, 2004]. The following table provides an overview of various important areas for internal communication on EH&S matters and different internal audiences.

Table 4: Examples of internal communication and categories of internal audiences [Hyde & Reeve, 2004]

5.3.2 External Communication

When communicating to potential external parties, it should be remembered that one might not have a comprehensive understanding of the organisation or sector, and there will be different levels of awareness when it comes to EH&S area. What is obvious to

those initiating the communication may not be obvious or even known to external stakeholders [Hyde & Reeve, 2004].

Effective external communication should seek to:

- understand expectations and capabilities on a mutual basis;
- keep up to date relevant developments;
- build good relations with key stakeholders; and
- demonstrate vision, plans and progress on EH&S issues.

A mixture of communication tools helps reinforcing a message, for instance, posting overheads and feedback points on the organisation intranet following a series of internal workshops, or producing a leaflet for distribution. Table 5 is an indicative list of communication tools.

Table 5: List of communication tools [Hyde & Reeve, 2004]

SMT communication procedure includes what information is distributed to employees and how it is done, as well who is responsible for preparing and distributing EH&S communication and frequency of each type of communication. This procedure covers internal communications and the external inquiries that are forwarded to EH&S Manager and Human Resources Representative to proper response. There isn't a procedure for external communication in place, but tools described in the table above are mainly followed when establishing an external contact with contractors or stakeholders. There is, although, a record of decision signed and dated by top management that SMT has considered processes to make external communication including the information that will be volunteered. SMT has identified each of its most important external stakeholders and its information is kept in the intranet system of the company.

5.4 – Documentation

Nowadays it is common to keep systems in electronic format. As with paper-based systems, however, the aim should be to ensure that the system supports the work and is not the driver [Smith et al., 2004].

SMT is responsible for specifying appropriate procedures and work instructions and maintain the required records to meet the requirements of the EH&SMS. Figure 21 illustrates the types of EH&SMS documents and the responsibilities for creation, distribution and updating EH&SMS documents.

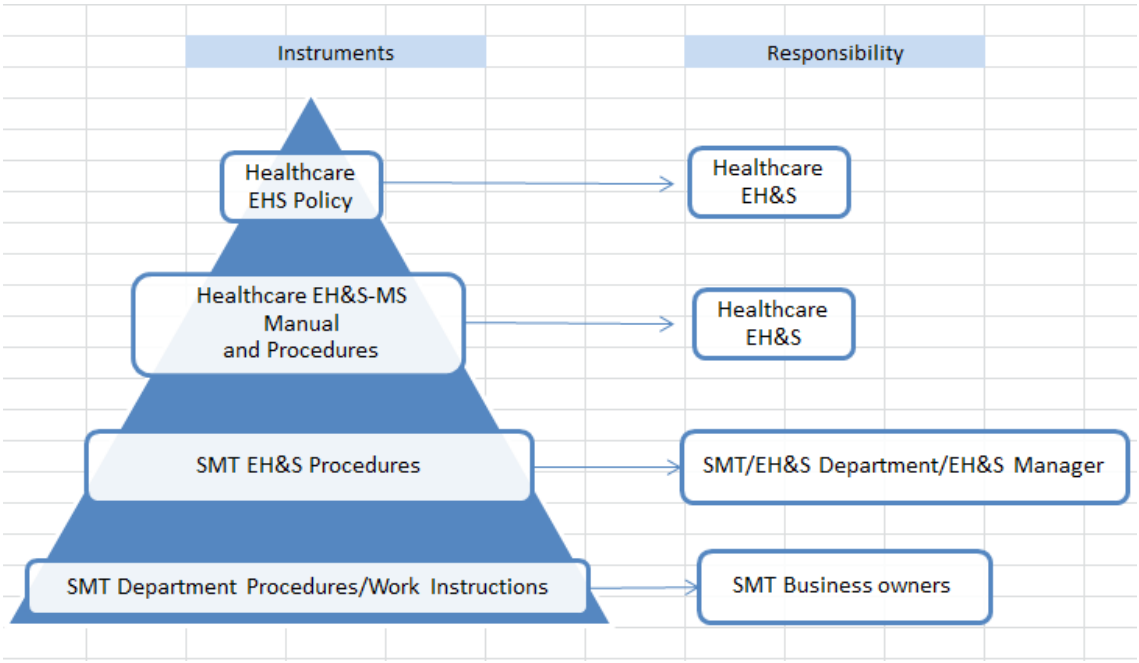

Figure 21: Instruments for documentation and responsibility for updates

SMT includes a list of site-specific regulations, permits, licenses and registrations that sit under the Healthcare EH&SMS Manual and Procedures and these are also kept in intranet area, notice boards and livelink EH&S area.

5.5 – Control of Documents

The responsibility to control documents and data comes from record development. Document and data control emphasis is to ensure that the end-user has a good access to documents and is able to understand its content [Smith et al., 2004].

The storage of information electronically is reviewed periodically and SMT adopted a new storage and sharing of information through SAP tool. This allowed a permanent storage and accessibility throughout all Siemens organisational business units. SAP control of documentation also keeps older versions available allows a clear track of changes in new versions of documentation. This tool controls the revision and reviewed documents meaning that there will always need to be an approval from the EH&S manager on the new versions, therefore, controlling and understanding the latest changes. The documents are legible, dated and identifiable and SAP provides an orderly maintenance.

EH&S policy and procedures are covered under SMT document control system and it includes all required elements (documents covered; document organisation and localization; how documents are made readily available to employees; document review, approval and decision process; who is responsible for document control and how obsolete documents are removed from circulation and controlled). Current EH&S documents are easily located and readily available by intranet or hardcopy to all applicable employees who need to use these documents.

5.6 – Operational Control

According to OHSAS 18001, operational control requires the organisation to:

'…identify those operations and activities that are associated with identified risks where control measures need to be applied. The organisation shall plan these activities, including maintenance, in order to ensure that they are carried out under specific conditions by:

a) establishing and maintaining documented procedures to cover situations where their absence could lead to deviations from the OH&S policy and objectives;
b) stipulating operating criteria in the procedures;
c) establishing and maintaining procedures related to the identified OH&S risks of goods, equipment and services purchased and/or used by the organisation and communicating relevant procedures and requirements to suppliers and contractors; and
d) establishing and maintaining procedures for the design of workplace, process, installations, machinery, operating procedures and work organisation, including their adaption to human capabilities, in order to eliminate or reduce OH&S risks at their source.'

SMT operational controls covers all required aspects and these include: waste management, air emissions management, waste water management, fire protection, electrical safety, hazardous energy control, noise control, personal protective equipment, industrial truck safety, industrial hygiene, chemical import/use control, dangerous goods, chemical handling/storage and any other significant aspect. This procedure specifies operational controls for:

- tasks with significant aspects that have a work instruction covering operation and preventive maintenance;
- operating instructions for covered equipment and tasks;
- how should operator proceed when operating controls are exceeded;
- how and when preventive maintenance should be performed; and
- control parameters to monitor.

Each significant aspect has an identified operational control and if not, it can be explained why a deviation from the EH&S policy won't occur without an operational control.

SMT conforms to regulatory Healthcare Sector requirements related to:

- electrical safety and hazardous energy equipment, processes, controls, personal protective equipment and/or training;
- hazardous and regulated waste;
- chemical import, use and control/hazardous substance management;
- waste water management, including permit/registration, process or control equipment;
- fire protection emergency services;
- cranes/slings and industrial truck safety;
- machine/equipment guarding, noise control and industrial hygiene; and
- dangerous goods/hazardous materials transportation.

5.7 – Emergency Preparedness and Response

SMT EH&SMS emergency preparedness and response plan was reviewed and updated to include all the required elements (how operations are identified for emergency hazard potential and who performs the identification; tasks to be performed in response to each foreseeable emergency event and who performs tasks; who periodically reviews the emergency work instructions or other related documents and when are they reviewed).

SMT emergency preparedness and response plan includes a description of owned emergency equipment and includes specific notification and response actions, up-to-date emergency call lists and post evacuation locations (inside and outside as appropriate).

SMT emergency preparedness and response plan specifies the use of actual drill simulations and the plan conforms to regulatory requirements. This procedure plan is evaluated at least once a year for possible improvements, and after each drill.

5.8 – Checking

Checking involves the monitoring and evaluation on the effectiveness of the implemented processes against the set objectives and specifications. The analysis for possible improvements is made and outcomes from this stage are reported. The diagram bellow illustrates the inputs and outputs mentioned:

Figure 22: Inputs and outputs of 'Checking'. Diagram adapted from OHSAS 18001 model

5.8.1 – Monitoring and Measurement

SMT monitoring and measurement is done through a balanced scorecard set in the beginning of each financial year including the key characteristics of its operations and activities that have a significant impact on the environment and occupational health & safety. SMT meets the established plan and monitors all required elements, including:

- EH&S targets;
- operational controls for tasks involving significant aspects;
- parameters required by EH&S regulation; and
- any monitoring to be performed is transparent for each significant aspect.

The purposes of monitoring and measuring are:

- meet the policy commitments, achieving objectives and targets and continual improvement;
- developing information to identify significant aspects/hazards;
- meet legal and other requirements;
- monitoring consumption of resources; and
- provide data to support or evaluate operational controls, EH&S performance and EH&S MS.

EH&S department is responsible for assisting process owners to define EH&S parameters to monitor and measure, therefore process owners are responsible to define EH&S parameters with assistance from EH&S team and trend data in order to look for control issues or opportunities for targets. Process owners are responsible for assigning personnel to perform monitoring. The EH&S department and process owners review significant aspects and hazards to select EH&S parameters to be monitored. The monitoring is performed as per the balanced scorecard (monitoring plan) and the monitoring records stored confirm the implemented actions. The data is reviewed and analysed for trends and used to identify possible EH&S targets or non-conformances.

5.8.2 – Non-Conformance, Corrective Action and Preventive Action (CAPA)

SMT uses the process of EH&SMS audits to investigate non-conformances. Corrective and preventive measures are taken for inadequate or incomplete planning and for deviations and deficiencies from the EH&SMS from the following sources:

- physical, process and operations observations;
- customer complaints;
- system and product audits;
- internal EH&S audits; and
- employees.

SMT CAPA procedure specifies a CAPA plan process that addresses every non-conformance or non-compliance, except those found during routine regulatory inspections. This procedure allows minor non-conformances and other non-conformances to be addressed through immediate actions.

5.8.3 – Internal Audit

The effectiveness of the EH&SMS is accessed by EH&SMS audits. These assessments check to verify at a specific point in time whether the EH&SMS and the organisations' processes and performance conform to the Healthcare EH&S Management System Standard, and whether it has been properly implemented and maintained the EH&SMS.

Compliance assessments of all relevant EH&S topics are done at least every two years, but often these are done more frequently based on the EH&S aspect significance or historical performance. The organisation shall:

- document and implement a process to internally audit the environmental management system at planned intervals.
    - ensure objectivity and impartiality of the internal auditors

- define responsibilities and requirements for:
  - planning and conducting the audits
  - reporting audit results and
  - retaining associated records
- consider environmental importance of the organisation's processes and activities and the results of previous audits when planning internal audits
- access compliance with ISO 14001:2004
- access effectiveness of the environmental management system implementation and maintenance
- report results of internal audits to management

5.9 – Management Review

Management review examines the overall performance of the on-going processes, in this case the EH&S processes, the need to change and strategies to achieve this change. The management review is a tool to ensure on-going effectiveness, suitability and adequacy of EH&S management within the organisation. It includes revision of external recommendations received by external audits but also considers changes as outcome of new projects and external communications [Hyde & Reeve, 2004].

Management review is a key element on any business to ensure that processes and procedures are being applied as intended and continue to meet the needs of the organisation.

Management review closes the PDCA cycle and, most importantly, provides the mechanism to continual improvement required for any management system. It is a live process within the business and is addressed in BS 8800, OHSAS 18001 and ISO 14001 [Smith et al., 2004].

In order to answer the main question: 'Is the EH&SMS in SMT effective and suitable for meeting the objectives?' the EH&S department summarises all internal and external EH&S audit result in a document and publishes it in the intranet and livelink, which contains the following inputs and outputs (Figure 23):

Input to EH&S management reviews include:

- Results of internal EH&S audits and evaluations of compliance with legal requirements and with other requirements to which SMT subscribes;
- Communication(s) from external interested parties, including complaints;
- The EH&S performance of the organisation;
- The extent to which objectives and targets have been met;
- Status of corrective and preventive actions;
- Follow-up actions from previous management reviews;
- Changing circumstances, including developments in legal and other requirements related to its EH&S aspects; and
- Recommendations for improvement.

Output to EH&S management reviews include:

- Any decisions and actions related to possible changes to EH&S policy, objectives, targets and other elements of the EH&SMS; and
- Commitment to continual improvement.

This process is shown in Figure 23 and the same is part of the Quality Regulation 'Environment Health and Safety Management System Review', document that is part of the EH&S Documentation.

The minutes of the management review shall include all decisions and actions with regards to the above.

The information for this review is taken from the following sources:

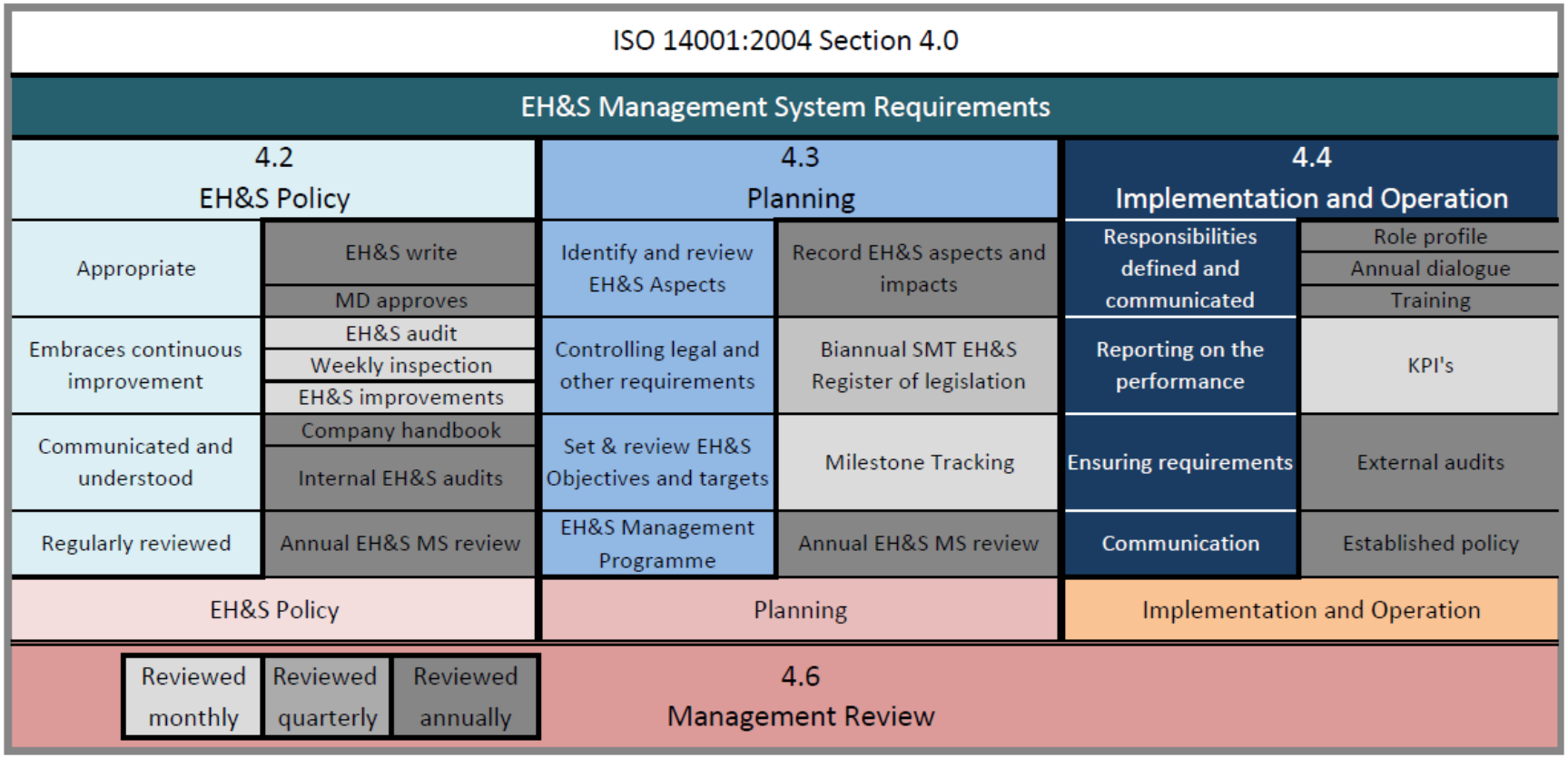

Figure 23: EH&S Management System Requirements

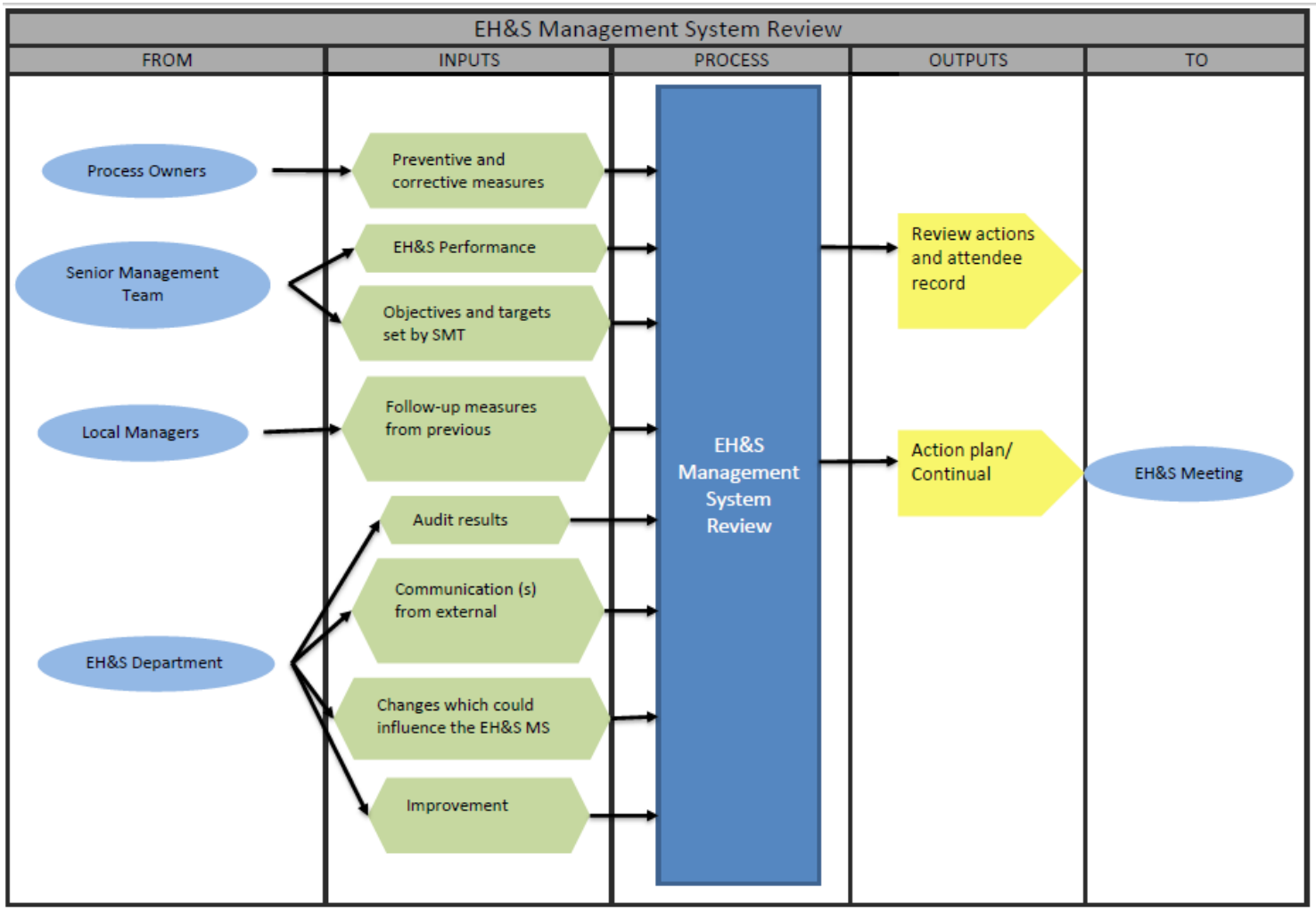

Figure 24: EH&S Management System Review

CHAPTER 6 – DISCUSSION, CONCLUSION AND FURTHER WORK

This chapter provides a comparison between the aim of this study and the actual implemented project at Siemens Magnet Technology. This aims to promote a better understanding of what has been achieved with this study and how it has changed the dynamics between the Environment Health and Safety area and SMT employees.

6.1 – Discussion

This project was conducted by approaching the management system tool and, together with SMT employees, staff, the Management Team and Environmental Director for Siemens Healthcare, analyse how this tool could be improved and better integrated in the company.

The implemented changes will be compared against how the presented harmonisation approach introduced new improvements in the EH&S area and how this approach was the vehicle to new certifications, achievements, and a stronger and clearer bonding between different businesses units.

The implemented changes on the MS documentation brought an immediate positive impact of different business units through the control of documents by SAP EDM system. By having the documentation and procedures sitting at SAP EDM, each employee part of Siemens can consult and access the document, regardless their location. Having the documents under SAP EDM system increased the traceability of updates on each document version as a digital signature will be part of each page of the document with information on the author(s) and the releaser.

The initial internal audit ensured all the EH&S aspects were covered by the management system and accessed the efficiency of the system. The audit originated suggestions to be made to the current system so that all addressed gaps could be covered and lead the company to certification in EH&S areas.

The instruments of change used in this project (as described in Chapter 2) provided the framework and guidelines for the strategic approach undertaken. BS ISO 14001:2004

and BS OHSAS 18001:2007 allowed a detailed revision on each document part of the MS. The review of each topic in the MS revealed that the requirements of the standards are integrated in each aspect of the EH&SMS as shown in chapter 4 and through a deep analysis of the current MS, updates made on each specification allowed the MS to be up to date and ready to face revisions and internal or external audits with minor non-conformances or no-conformances.

The international standards covered in this project are compatible with the Eco Management and Audit Scheme (EMAS), therefore, by having the MS certificated to these standards, SMT is also compatible with EMAS scheme. Furthermore, certification to the international standards has led to increased compliance with legal requirements and improved the management of legal compliance.

Throughout the study, the preference in using circle cycle diagrams was explored, following the basis of both ISO 14001 and OHSAS 18001 standards. A circle cycle diagram illustrates perfectly what should be the basis of a successful and efficient MS: continuous, constant review and incremental problem solving. A cycle with no beginning or end illustrates how it must be repeated again and again for successful improvements and results.

The policy is a core element to an effective EH&SMS. The policy is comprehensive and includes a statement that clearly states overall EH&S objectives and the commitments at all levels to improve EH&S performance. The policy was reviewed to ensure it contributes to all aspects of business performance as part of a commitment to continual improvement. Following the revision of the policy, its commitments were highlighted and used as bullet points.

The organisational updates and changes allowed the company to have the consistency and confidence to submit its MS to an Environmental ISO 14001 audit by the BSC body. The audit reported a successful outcome, with only some non-conformances, that included:

- improvement of the external communications procedure (there wasn't a written procedure for external communications) and consultation with contractors and suppliers; and
- staff and employees unsure where to find some specific EH&S documentation.

This was a successful outcome showing that the MS is not only in place but also has all the necessary requirements to fully cover the environmental needs of the business. This had a positive impact on the company's customers, employees and will decrease the environmental impact and save money by cutting unnecessary resources (use of energy, metals, plastics and paperwork).
The frequent communication on each steps taken throughout this project allowed employees to be involved and actively participate in the changes occurring at the EH&S Department. Employees felt motivated and engaged on the new improvements to the MS and the benefits one can have from continuously improving this tool.
The implementation of the revised MS has also shown that, by focusing on bringing the environment element closer to the health and safety areas, employees increased their interest and built their knowledge equally regarding all areas of the management, not dissociating one from the others so easily.

By implementing this project, SMT not only gained a new certification within the environmental area of the MS but also upgraded the existing certification within the health and safety area, as it went from having a British Safety Council (BSC) four star certification to BSC five star certification and with prospects of going to the maximum which is the Sword of Honour.

By the end of the implementation, business units had improved their communication as a new meeting on their agendas was now essential to address all EH&S issues together. Every two months the managers involved in the EH&S areas gather and discuss the upcoming ideas and relevant suggestions. A strategy plan is then documented with all the outcomes and what will be the actions to put in place.

The documented part of the MS harmonisation at SMT was one of the core keys in this project and special focus was given with regards to its location. SMT EH&SMS was located in the intranet area and only visible to employees of SMT. One of the purposes of implementing this project was to have these documents shared with every business units, therefore the documentation would then sit on a shared area in the German Website. For this to happen the documentation was controlled via SAP software, therefore each document, work instruction, action log or attachment, will have an identification under this software, that can be traceable and seen by every employee, no

matter where. This also allows the control of new versions, corrections, and author(s) from the new versions. Nevertheless it was found that SAP software is not that user friendly therefore, to add each document to SAP or update the version of a document it took longer than expected, and the chance of making a mistake while updating was high.

It was important to involve as much as possible all employees with the new changes through various workshops and meetings so that the whole phases of this process were transparent leading to a better understanding and involvement to all parts.
As a result of not being able to implement all phases of the project in the stipulated time, the employees were not as involved as much as it was expected.

6.2 – Conclusion and Further Work

The aim of this study was to introduce a review of the EH&S documentation structure with the purpose of having all the procedures following the same parameters set by Siemens Healthcare Germany. This project followed the different aspects of the environment, health and safety requirements set in the international standards to align the needs of the company with the increasingly demands of the society regarding environment and health and safety areas.

The international standards consulted included the BS EN ISO 14001:2004 – Environmental Management Systems – Requirements with guidance for use and BS OHSAS 18001:2007 – Occupational Health and Safety management systems – Requirements. The revision of the MS and this dissertation were organised following the structure set by both ISO 14001 and OHSAS 18001.
The documents that covered the processes at SMT were now part of one MS where all 3 elements were equally highlighted. This brought employees closer to the concept of integrated management system and the environment element of this specific management system.
The harmonisation of the management system delivered consistency to the procedures already in place and allowed employees to become more familiar with this tool by

including employees throughout the steps taken during the implementation of this project.

As a result of having the environment element of the MS highlighted, weekly internal audits now include more environmental topics and questions and employees have shown more effort and interest in this area.

It was noticed in the EH&S Committee meeting (monthly meeting) an increase of projects related to environment, including for instance: projects identified to reduce energy consumption, waste disposal minimisation, amongst others. The meeting includes also the topic 'EH&S Improvements' where each representative presents the improvement they were working during the last month. Here also an increase of environmental improvements, showing that this area is now more present in the daily activities of the company.

It was understood that, although the cost reduction or cost savings is a low response, certification is relevant to all companies, but is recognised that as larger organisations achieve the certification, there is a pressure exerted from the supply chain towards SME's. SME's react faster to downturns in economies and might place environmental management certification in lower priorities when survival of the business is at risk.

At the present case, being SMT a large organisation, it benefits from certification widely, without having its economy affected. Having an ISO 14001 certification encouraged employees to work towards an established goal and revealed higher motivation and team work in the environment area of the company.

The company went through a British Safety Council 5 star audit in the last year. The certification was achieved with minor non-conformances and SMT includes surveillance audits annually as part of the continual improvement commitment and to ensure the organisation is maintaining and following the standard requirements.

One of the motivations of this research was the relevancy of the chosen topic. The fact that it allowed the author to share knowledge and to connect the background theory to practical examples of implementation was an incentive throughout the completion of this project.

During the implementation of this study, the increased level of commitment of all employees proved that, when effectively communicating and having a clear approach throughout a process change, employees are more likely to engage as their understanding of the topic is wider.

SMT keeps a record of decision signed by top management team and has identified most important external stakeholders and contractors. Although, there isn't a written procedure for external communications in place, therefore the completion of a written procedure was suggested as part of further work to be developed. This procedure should be kept as part of the MS documentation.

Additional further work should be carried out towards the improvement in the contracting procedure on how contractors can access the facilities and the documentation and what level of access they need to carry out their duties so that these are in line with the company's requirements. By having this improvement in place, it would allow contractors to be in line with what is happening at the company and save time for both parts regarding the allocation of relevant information.

This project contributed for an increase on awareness regarding Environmental Management Systems and the improvement of MS document control and traceability. By having the procedures visible to all employees, this project brought also the improvement of the company's network regarding environmental issues, increasing the understanding and interest on the topic throughout all site units.

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ANNEX I

BS EN ISO 14001:2004 ENVIRONMENTAL MANAGEMENT SYSTEMS — REQUIREMENTS WITH GUIDANCE FOR USE

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ANNEX II

BS OHSAS 18001:2007 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS – REQUIREMENTS

Annex II - Occupational Health and Safety Management Systems – Requirements

Annex II - Occupational Health and Safety Management Systems – Requirements

Annex II - Occupational Health and Safety Management Systems – Requirements

Annex II - Occupational Health and Safety Management Systems – Requirements

ANNEX III

SMT MANAGEMENT SYSTEM HARMONISATION ACTION LOG

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ANNEX IV

DOCUMENT PLAN STRUCTURE

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ANNEX V

DOCUMENT PLAN

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ANNEX VI

ENVIRONMENT HEALTH AND SAFETY POLICY

ANNEX VII

EH&S MANAGEMENT SYSTEM STRUCTURE