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Intranet-Based Safety Documentation in Management of Major Hazards and Occupational Health and Safety

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In the European Union, Council Directive 96/82/EC requires operators producing, using, or handling significant amounts of dangerous substances to improve their safety management systems in order to better manage the major accident potentials deriving from human error.

A new safety management system for the Viikinmäki wastewater treatment plant in Helsinki, Finland, was implemented in this study. The system was designed to comply with both the new safety liabilities and the requirements of OHSAS 18001 (British Standards Institute, 1999). During the implementation phase experiences were gathered from the development processes in this small organisation.

The complete documentation was placed in the intranet of the plant. Hyperlinks between documents were created to ensure convenience of use. Documentation was made accessible for all workers from every workstation.

major accident safety management system intranet documentation

1. INTRODUCTION

There have been several major accidents during the last 30 years, among others in Seveso, Italy, in 1976 and in Bhopal, India, in 1984. These major accidents, which involved dangerous substances, have demonstrated the need for control of hazard, which arises when dangerous sites and dwellings are close together (Kletz, 1994).

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The European Union (EU) has set an environment policy, which aims at preserving and protecting the quality of the environment and at protecting human health through preventive action. As part of that objective, Council Directive 96/82/EC on the control of major accident hazards involving dangerous substances came into force in 1996. According to this so-called Seveso II Directive, a major accident is defined as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation of an establishment, and leading to serious danger to human health and the environment, and involving one or more dangerous substances.

Seveso II Directive aims at the prevention of major accidents and the limitation of their consequences for human and the environment. The directive requires the operators producing, using, or handling significant amounts of dangerous substances to improve their safety management systems in order to better manage the major accident potentials deriving from human error.

Finland as a member of the EU implemented the directive in its legislation in 1999. The main national law is the *Decree on the industrial handling and storage of dangerous chemicals* (No. 59, 1999). The new legislation is applied approximately to 100 operators in Finland. The Safety Technology Authority (TUKES) is the national authority supervising compliance with the regulations.

The Viikinmäki wastewater treatment plant is the biggest wastewater treatment plant in Finland. It faces major accident hazard potentials from production of biogas and storage of methanol. A new safety management system for the operator of the plant, Helsinki Water, was developed in this study.

The study aimed to develop operator's management processes to ensure compliance with the new safety liabilities and to comply with the specifications of an occupational health and safety management system OHSAS 18001:1999 (British Standards Institute [BSI], 1999). OHSAS 18001:1999 is a specification compiled by BSI. An additional objective of the study was to gather experiences from the implementation process. The study was part of a research programme, which aimed to develop a comprehensive model for implementation of safety, health, and environmental management system (Leino, 2001).

2. METHODS

Action research approach was chosen as a research setting. Researchers participated in the introduction of changes to the company's safety management. Action research was applicable because some of the basic precondi-

tions of the approach were fulfilled; the study concerned an independent establishment, the operator and researchers had common goals, a specific problem could be defined, both practical and scientific objectives could be set, and the final results could be evaluated.

Much action research in the field of safety has resulted in positive changes in organisations. Kjellén (2000) mentions reductions in accident rates following the introduction of improved accident investigation and near-accident reporting. Although the validity of results of action research is usually weak and general conclusions cannot be drawn, the method gives an opportunity to effectively evaluate the impact of different development measures. Considering the nature of different management system standards, which could be seen as models or paradigms to be given content by organisations themselves (Hale, Heming, Carthey, & Kirwan, 1997), it is essential to try to evaluate the qualitative dimensions of the management systems. Qualitative dimensions would be, for example, applicability, availability, and effectiveness of the safety management system. Action research, as a research setting, has inherent capability of this kind of evaluations. The results of action research should provide experiences of difficulties met and recommendations for best practices.

The project started with an evaluation of the current situation. Researchers and the operator went through the new liabilities and the specifications of OHSAS 18001:1999 in comparison to existing safety management procedures. On a basis of this evaluation the objectives and a schedule were set for the study. The study group consisted of professor Jouni Kivistö-Rahnasto and researchers Antti Leino and Pia Välimaa. A specific project group was established for development work and co-operation. The group consisted of the researchers and personnel from the plant, including plant manager. The work was carried out between October 2000 and April 2001. Phases of the development project are described in Figure 1.

Tampere University of Technology had consulted the operator on hazard identification and risk assessment in 1998. Results of this co-operation were checked carefully and handled as essential material to this study.

Planning is the first part of the plan-do-check-act (PDCA) circle. This circle has been made widely known as a quality control circle by Deming (1982). Besides quality management it has been used in several other management concepts, such as OHSAS 18001:1999, BS 8800:1996 (BSI, 1996), and ISO 14001:1999 (International Organization for Standardization [ISO], 1996). Now the EU has also adopted it to its Seveso II Directive. Experiences from the implementations of ISO 14001:1999 environmental management systems could be used in the project.

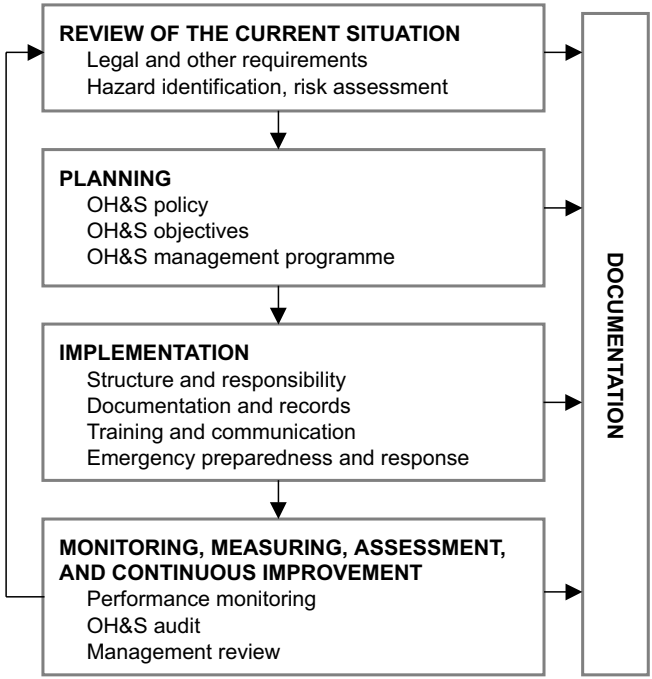

Figure 1. Phases of an Occupational Health and Safety (OH&S) management system development project.

Planning was carried out in order to give future direction to safe work in the Viikinmäki plant. The occupational health and safety (OH&S) policy and objectives were set, and an OH&S management programme was created to ensure the implementation of the new policy.

Implementation of the OH&S management programme included the following phases: defining the structure, safety responsibilities, and documentation procedures; checking the competences and communication; and providing training. Finally the emergency preparedness and response were revised.

The last parts of Deming's circle, that is, check and act, were covered by establishing OH&S performance monitoring, audit, and management review procedures.

3. RESULTS

Special attention was given to the documentation of the safety management system. Firstly the existing documentation, which dealt mostly with quality, was reviewed. As a result of this review a need for a holistic plant-operating manual was discovered. The new manual was to cover both quality and OH&S

issues. The operator also wanted to prepare its documentation procedures to meet the future needs of an environmental management system.

Availability and usability should be central factors in planning the plant-operating manual. King (1990) gives recommendations on the availability of the manual. He states that personnel of shift leader status and higher should be given their personal copies of the complete manual, and it should be available for all operating personnel for reference. Zwetsloot (1994) and Pascal (1997) have argued for the integration of management systems and their documentation in order to improve their usability. Integration reduces the amount of documents and provides the reader a more comprehensive view at the same time.

A holistic plant-operating manual was developed from the revised quality control documentation and the new safety management documentation. The intranet solution of the plant offered an opportunity to place the complete documentation in the intranet of the plant. Hyperlinks between documents were created to ensure convenience of use. Every worker has access to workstations at the plant and at least basic skills for working with computers. No physical copies of the operating manual were needed. Intranet-based documentation gave special advantages for document control; it is more straightforward thus reducing the time spent for locating and revising documents and removing obsolete documents.

The content of the intranet-based plant-operating manual on quality, occupational safety, and health (QOS&H) documentation is partly presented in Table 1. The new OH&S management system of the Viikinmäki wastewater treatment plant addresses, for example, the following safety issues:

- The roles and responsibilities of personnel involved in the management of major hazards at all levels of the organization (C6.1);
- The identification of training needs of such personnel and the provision of the training so identified (C6.2);
- Adoption and implementation of procedures for systematic identifying and assessing of major hazards using the Hazard and Operability Study (HAZOP, B2.1);
- Adoption and implementation of procedures and instructions for safe operation and maintenance of plant, processes, and equipment (C1–C5);
- Adoption and implementation of procedures for planning modifications to installations, processes, or storage facilities (B7);
- Adoption and implementation of procedures for preparing, testing, and reviewing emergency plans (C7);

- Adoption and implementation of procedures for the ongoing assessment of compliance with the objectives set by the operator's major accident prevention policy and safety management system (D);
- Mechanisms for investigation and taking corrective action in the case of non-compliance, that is, near misses, and follow-up on the basis of lessons learnt (D);
- Adoption and implementation of procedures for systematic assessment of the major accident prevention policy and suitability of the safety management system and its updating by senior management (E).

TABLE 1. Content of Quality, Occupational Safety, and Health (QOS&H) Management System Documentation at the Viikinmäki Wastewater Treatment Plant

A. OPERATION POLICY
- A1. Introduction and description of system
- A2. QOS&H Policies

B. Planning
- B1. Product descriptions
- B2. QOS&H aspects
  - B2.1. Risk assessment
  - B2.2. Safety instructions for subcontractors
  - B2.3. Hot work supervising
- B3. Legal and other requirements
- B4. QOS&H objectives and targets
- B5. QOS&H management programme
- B6. Major accident prevention policy document
- B7. Management of change

C. IMPLEMENTATION AND OPERATION
- C1. Wastewater treatment
- C2. Sludge treatment
- C3. Use of biogas
- C4. Maintenance and support
- C5. Automated and other systems
  - C5.4. Smoke detector system
  - C5.5. Sprinkler system
  - C5.6. Smoke abatement system
  - C5.7. Access control
  - C5.8. Alarm system
  - C5.9. Announcement system
- C6. Operation procedures
  - C6.1. Organisation and responsibilities
  - C6.2. Training, awareness, and competence
  - C6.3. Work permits
  - C6.4. Consultation and communication
  - C6.5. Documentation
- C7. Emergency preparedness and response

D. CHECKING AND CORRECTIVE ACTION
- D1. Performance measurement and monitoring
- D2. Non-conformance, corrective, and preventive action
- D3. QOS&H system audit

E MANAGEMENT REVIEW
- E1. Management review and continuous improvement

F. RECORDS

G. FORMS

5. DISCUSSION AND CONCLUSIONS

Occupational health and safety management systems such as OHSAS 18001:1999 (BSI, 1999) and BS 8800:1996 (BSI, 1996) are tools for organisations to control their OH&S risks and improve their performance. They do

not state specific OH&S performance criteria; they should rather be seen as models or paradigms to be given content by organisations themselves. Conceptually this approach is also adopted in the EU's Seveso II Directive aiming at prevention of major accidents and their consequences by reducing human errors.

Human error as a term has been traditionally restricted to operators in immediate contact with the production system (Kjellén, 2000). The new directive aims to extend this term to include also the errors in the decision-making at all management levels. A safety management system can be seen as a safety measure or a defence, as Reason (1997) puts it, for preventing human errors both at workplace and on managerial level.

In this study the requirements of the OHSAS 18001:1999 were applied to the Viikinmäki wastewater treatment plant. The study shows that an organisation can comply with most of the new requirements deriving from the EU's Seveso II directive (Council Directive 96/82/EC) only by complying with the requirements of OHSAS 18001:1999.

The documentation system of the plant was reorganised in the study. Both the usability and the availability of the documentation were carefully taken into consideration. As a result an integrated plant-operating manual, covering quality, safety, and health aspects simultaneously, was created and placed in the intranet of the plant. The amount of documentation was reduced, thus resulting in more straightforward document control. Hyperlinks between documents were created to ensure convenience of use. The new plant-operating manual was made available for all workers from every workstation.

This study used action research as a research setting. Both the project group, including researchers, and the authorities evaluated the new safety management system. As a conclusion of the evaluation, preparedness for OH&S management system certification by an independent third party body was recognised. The national authority, Safety Technology Authority, supervising compliance with the legislation inspected the new management system and found eight cases of non-conformance. In general, the authority found the system complying with the requirements, and the cases of non-conformance fell under the topic of continuous improvement. Internal and external emergency plans were delivered to local fire service for comments.

It was not possible to evaluate the effectiveness of the management system with regard to human error reduction during this short-term project. It can however be stated that the presence of the system itself in the form of documentation does not prevent human errors either at the workplace or

on managerial level. The effectiveness of the system is dependant on how truly the daily work procedures follow the new, agreed policy.

As a result of this project the operator of the Viikinmäki wastewater treatment plant adopted the concept of continual improvement of its safety performance. To put it briefly, the first steps of improvement were primarily about reviewing the existing procedures, setting a new policy towards prevention, and establishing a systematic documentation system.

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