HUMAN RESOURCE DEVELOPMENT IN CHEMICALS AND CHEMICAL PRODUCTS RELATED INDUSTRIES FOR THE ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14000

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The purpose of this study was to investigate methods of human resource development in chemicals and chemical products related industries for the environmental management system (ISO 14000). The sample were persons who were responsible for the human resource development of ten companies which have been certified with the environmental management system ISO 14000 and which are located in Rayong province. The research instrument was a structured interview. Data for the study were analyzed by frequency distribution and content analysis.

Results.

The training development aspect consisted of one core course and two compulsory courses. The core course were consist of basic environmental knowledge which all employees had to take this course. The two compulsory courses were the internal audit course and the work instruction course. The internal audit course participated for supervisors or managers who were appointed as attended auditors. The course presented methods of identifying non-conformance as well as steps and techniques of conducting an audit. The work instruction course, which was for employees of each department was consisted of the regulations for the environmental management system (ISO 14000).

Supporting factors for human resource development for the environmental management system ISO 14000 were: activities which had previously been implemented by the companies, supporting by the executives, the employees's cooperation and appointment for the environmental working group. The conclusions of this study were: policy and supporting from administrators, cooperating, and awareness of environmental management of all employees. Recommendations for human development for the environmental management system ISO 14000 were: training environmental knowledge to the employees, the cooperation of employees, motivation, encouragement from administrators, continual follow-up, and field trips.

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จุฑามาส มาฆะลักษณ์ : การพัฒนาบุคลากรของกลุ่มอุตสาหกรรมสารเคมีและผลิตภัณฑ์เคมี เพื่อเข้าสู่ระบบมาตรฐานการจัดการสิ่งแวดล้อม ISO 14000 (HUMAN RESOURCE DEVELOPMENT IN CHEMICALS AND CHEMICAL PRODUCTS RELATED INDUSTRIES FOR THE ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14000). คณะกรรมการควบคุมสารนิพนธ์ สมคิด อิสระวัฒน์, Ph.D., บุญลือ ทองอยู่, กศ.ด., ณรงค์ รัตนะ, MSCE. 126 หน้า. ISBN 974 – 04 – 0772 – 2.

การวิจัยเรื่อง การพัฒนาบุคลากรของกลุ่มอุตสาหกรรมสารเคมีและผลิตภัณฑ์เคมี เพื่อเข้าสู่ระบบมาตรฐานการจัดการสิ่งแวดล้อม ISO 14000 มีวัตถุประสงค์ที่จะศึกษาแนวทางการพัฒนาบุคลากรของบริษัทผู้ผลิตสารเคมีและผลิตภัณฑ์เคมีซึ่งได้รับการรับรองระบบมาตรฐานการจัดการสิ่งแวดล้อม ISO 14000 กลุ่มตัวอย่างเป็นบริษัทผู้ผลิตสารเคมีและผลิตภัณฑ์เคมีซึ่งได้รับการรับรองระบบมาตรฐานการจัดการสิ่งแวดล้อม ISO 14000 ในจังหวัดระยองจำนวน 10 บริษัท เครื่องมือที่ใช้ในการวิจัยคือแบบสัมภาษณ์แบบมีโครงสร้างซึ่งผู้วิจัยสร้างขึ้นจำนวน 1 ชุด การวิเคราะห์ข้อมูลใช้การแจกแจงความถี่ และการวิเคราะห์เนื้อหา

ผลการวิจัยพบว่า

การพัฒนาบุคลากรของบริษัทกลุ่มตัวอย่าง ใช้วิธีการฝึกอบรม ซึ่งประกอบด้วยหลักสูตรหลักจำนวน 1 หลักสูตรซึ่งพนักงานทุกคนต้องเรียนเนื้อหาสาระเรื่องเดียวกัน เป็นเรื่องความรู้พื้นฐานด้านสิ่งแวดล้อม หลักสูตรเฉพาะมีจำนวน 2 หลักสูตรคือ หลักสูตร Internal audit ซึ่งเป็นหลักสูตรสำหรับพนักงานที่ได้รับการแต่งตั้งเป็นผู้ตรวจสอบระบบ (Auditor) เป็นเรื่องการตรวจติดตามระบบมาตรฐานการจัดการสิ่งแวดล้อม ISO 14000 และหลักสูตร Work instruction เป็นหลักสูตรสำหรับพนักงานแต่ละแผนกเป็นเรื่องวิธีการปฏิบัติงานที่เกี่ยวข้องกับข้อกำหนด ISO14000 ปัจจัยส่งเสริมการพัฒนาบุคลากรให้ประสบความสำเร็จ ได้แก่ กิจกรรมที่บริษัทเคยทำมาก่อนระบบ ISO 14000 ผู้บริหารให้การสนับสนุน พนักงานให้ความร่วมมือและผู้รับผิดชอบมีการประสานงานที่ดี ข้อเสนอแนะในการพัฒนาบุคลากรเพื่อให้ได้มาซึ่งระบบมาตรฐานการจัดการสิ่งแวดล้อม ISO 14000 ได้แก่ การฝึกอบรมให้ความรู้ความเข้าใจกับพนักงานเรื่องสิ่งแวดล้อม ความร่วมมือของทุกคน แรงจูงใจ การกระตุ้นติดตาม และการดูงาน

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CHAPTER I

INTRODUCTION

1.1 The background and the importance of the problem

The environmental project of the United Nations assessed the world's environmental impact and estimated that in two to three years, the level of unleaded gasoline and CFCs* produced by industries would destroyed the atmosphere increasing size of the hole in the ozone layer. Loosing ozonic gases rate would be increased ten percent through this hole. This would result in dramatics changes to the world's climate and weather patterns with an over all increasing in temperatures. Ultraviolet B rays would be able to pass directly through this hole to the Earth and this would increase the incident rate of skin cancer more than 26%or 300,000 people per year. Currently, there were 1.6 million people who suffered from Cataracts causing by over exposure to these ultraviolet rays. Ultraviolet B rays also destroyed human immune system. Thus, the increasing in CFCs and unleaded gasoline produced by industries could be directly impact to the environment,health and quality of human's life(Jate Chareontho,1998: 2;Thawin Sirichokechaikul,1999: 1;Suthep Therasart, 1999:3).

Nowadays, human were exposed to many different kind of chemicals, which were used in agriculture industries, food, science and technology (Phimon Reanwatthana and Chaiwat Tanewanion, 1996: 134).

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* CFCs stsndard for clorofluorocarbon which was used for cooling marcher in the shape of the plate of foam, hair spray, chip card for computer.

People who exposed to these chemicals could be sick, disability and even death (Suphamas Panichsak, 1997: 5).

Applying new technology to increase products, develop quality of life and well being by ignore to natural damage led to environmental pollution (Ratree Phara ,1985: 164).

Chatchai On-Charoen (1990: 2)If people knew how to use science and technology correctly and completely to environment, they would behave to the environment by the way of protecting, correcting and promoting.

Endoo Chotikul (1999: 1) found that 60.5% of factories produced waste product or pollution from the process of production. Only 7.6% of the factories realized to recycle system.

The Thai government emphasized industry's strategy and policies in the National Economic and Social Development Plan No. 8 (1997-2001) by increasing the ability for international competition, conserving the environment and natural resources, supporting small industry and expanding industry to the regional areas. The conservation part of the plan encouraged the industry's policy makers to think about the social cost of environmental destruction. The report noted that the depletion of natural resources has been used to build the wealth for a small group of people. The report also questioned why those who destroyed the environment were not expected to pay anything (The office Industrial Economics Bangkok, 1996: 20-21).

This must be brought to the attention of people and restudied. New methods must be found for solving these problems such as the "polluter must pay" principle. Private companies should participate in pollution management or to adopt

the International Standard for Environmental Management System (ISO 14000) within their industries(The office Industrial Economics Bangkok, 2000: 20-21).

The important factors for economic development included the building of a completed production base for the changed-world market and maintaining the balance between production, natural resources and the environment. This could be achieved by supporting industries that had the least impact on the environment. Supporting for industries that brought the technology for waste reduction, reuse and recycle was vital, as well as supporting for the production and use of products which were non-polluting according to ISO 14000 (The National Economic and Social Development Board, 2000: 109-110).

The activities of people in the company, production, industry and service were the major causes of environmental problems and the depletion of natural resources. This was especially the case for production development, which involved expanding industries, supporting small and regional industries, and developing the quality of industries.

In 2000, the industry was increased. The types of goods that were highly expanded were asset goods, middle goods and raw materials such as electronics, parts of electric circuits, industrial machines, oils and chemicals. Each year chemical exports increased. In the first seven months of the year the 2000 expansion was 70% equal to the same period of the year before, 1999 (The office of Industrial Economics Bangkok, 1999: 2). The incredible increase in production quality also caused environmental problems. Unless managed correctly, economic development and environmental conservation were conflicting processes. What was needed was a way to develop which had minimum effect on the environment and maximum support for

development and could also satisfy today's consumers. This should not affect the life and the environment of the next generation.

Conservation of the environment played an increasingly important role for businesses and industries. Their goal should find a balance between industrial development and environmental conservation which allowed for company profits but did not take advantage of either the customer or the environment (Suthep Theerasart,1999: 1; Thawin Sirichokchaikul,1999: 1).

ISO 14000 had both indirect and direct benefit for business processes and industrial management. Industrial officers must progressively change the method of productivity as well as accept responsibility to expand Thai industry into the world market while also protecting the industrial environment. The exact policy was that development of industries must be in balance with conservation of the environment. Thai industries must be quickly developed to meet the universal standard especially with the use of ISO 14000. Preparation must be made to use this method (Kullawat Buasawas, 1997: 9).

For the reasons mentioned above, many organizations had taken up using of the ISO 14000. The development had to do together with both human resource development and organizational development. The human resource development emphasized the importance of the environment, which is very difficult. This is encouraged because it had to begin with the creation of the majority's thought who were really interested in protecting and conserving the environment. This could make the organization eager to be responsible to their society and realize the human resource development's necessity for an environmental managed system. This work would only be successful if the employees developed their knowledge, concept and good behavior,

which depended on the occupation and suitable organization. This development was good for both human resource personnel as well as employees in other areas of the organization such as education, training and other development sections (The National Economic and Social Development Board, 1999: 110).

According to the mentioned problems and concept, the researcher intended to study how employees were developed in order to get the certificate of ISO 14000.

1.2 Purpose of the study

To study how the human resource development in chemicals and chemical products related industries those already certified to the environmental management system ISO 14000.

1.3 Research question

1.3.1 **Core Courses** : What kind of details in core courses were provided for training all workers in chemicals and chemical products related industries in order to be accepted for the certification of the environmental management system ISO 14000.

1.3.2 **Composary courses** : What kind of details in composary courses were provided for training workers in each department that involved in the environmental management system ISO 14000.

1) The title of the course
2) Duration of training
3) Content
4) Resource persons

5) Training methods

6) Training evaluation

1.4 Scope of the study

Scopes of the study were:

1.4.1 The sample were chemicals and chemical products related industries which already certified to the environmental management system ISO 14000.

1.4.2 The chemicals and chemical products related industries which are located in Rayong Province.

1.5 Definitions

International Organization for Standardization 14000 (ISO 14000 series) was the set of standards concerning the environmental management system (EMS Standards) including the activities of designing, marketing, producing, delivering and servicing. The concept of the standard was to enable the organization to continually develop and improve its EMS based on the British standard for environmental management (BS 7950).

Human resource development was the provision of activities to increase workers' experiences, support and improve their working behaviors to fulfil the organizations' objectives and to get the greatest advantage of themselves, their organizations as well as their country.

On the job training was the training that participants could gain knowledge of working techniques and skill from their trial practice. Moreover, they might be informed of concepts, philosophy, objectives and targets of working by means of actual practice.

Coaching was the provision of situations or activities intended to encourage and support learners to gain knowledge and understanding of their work. Learners would be applying their skill and experiences to fulfil their duty to meet the organizations' goal.

Education was the process that emphasized to create experiences for learners in order to apply for working in the future. It was the process that took a long time. There was clearly learning schedule and certification.

Field trip was a program provided for the workers to visit and study the working methods of other organizations. It enabled the workers to gain knowledge of working techniques and methods from the organizations they visited and to exchange knowledge, experience and ideas applicable to improve their working.

Core Courses were ones which all workers of the organizations were required to take in order that their organizations could be certified to the environmental management system ISO 14000.

Composary courses were the ones which all workers of each department involved in the environmental management system ISO 14000 are required to take so that their organizations could be certified to the environmental management system ISO 14000.

1.6 Expected outcome and benefits

1.6.1 Investigating the method of human resource development in order to get into the environmental management system ISO 14000.

1.6.2 Could provide information about human resource development to other organizations in order to get into the environmental management system ISO 14000.

CHAPTER II

LITERATURE REVIEW

The study on "Human resource development in chemicals and chemical products related industries for the environmental management system ISO 14000". The study had been reviewed the concept, theory and literature which related to this as follows:

2.1 The international standard for Environmental management system ISO 14000.

2.1.1 Background

2.1.2 Definitions

2.1.3 Benefits

2.1.4 Structure

2.1.5 The biefly concepts

2.1.6 Auditing

2.1.7 Preparation

2.2 Human resource development.

2.2.1 Definition of human resource development.

2.2.2 Methods and process of human resource development.

2.2.3 Activities of human resource development.

2.2.4 Human resource development of the organizations implementing the environmental issues.

2.2.5 Essential components for the training.

2.3 The human resources development in chemicals and chemical products related industries.

2.1 The international standard for environmental management system ISO 14000.

2.1.1 Background of the international standard for environmental management system ISO 14000.

The International Organization for Standardization was situated in Geneva, Switzerland. Its original short form was IOS but it was later changed to ISO. Its members were institutions of product standard from each country. Originally, ISO emphasized the product standard which could be applied worldwide. At present, the international standards were grouped such as the Standard for Quality Management (ISO 9000), the Standard for Environmental Management System (ISO 14000), and the Standard for Health and Safety System (ISO 18000) and so on. The United Nations had been interested in environmental issues since 1970. In 1992, the global meeting about the environment was held in Brazil, generating the world environmental protection project. Later, the establishment of the World Trade Organization (WTO) in 1995 resulted in the worldwide economic growth until it became the trade or economy beyond border. Moreover, it encouraged the competition in cost, quality, environment and safety. In 1996, the international standard for environmental management system was promulgated (Somlak Santirotchanakul, 1999: 7).

Background of the international standard for environmental management system ISO 14000 was shown in the diagram I.

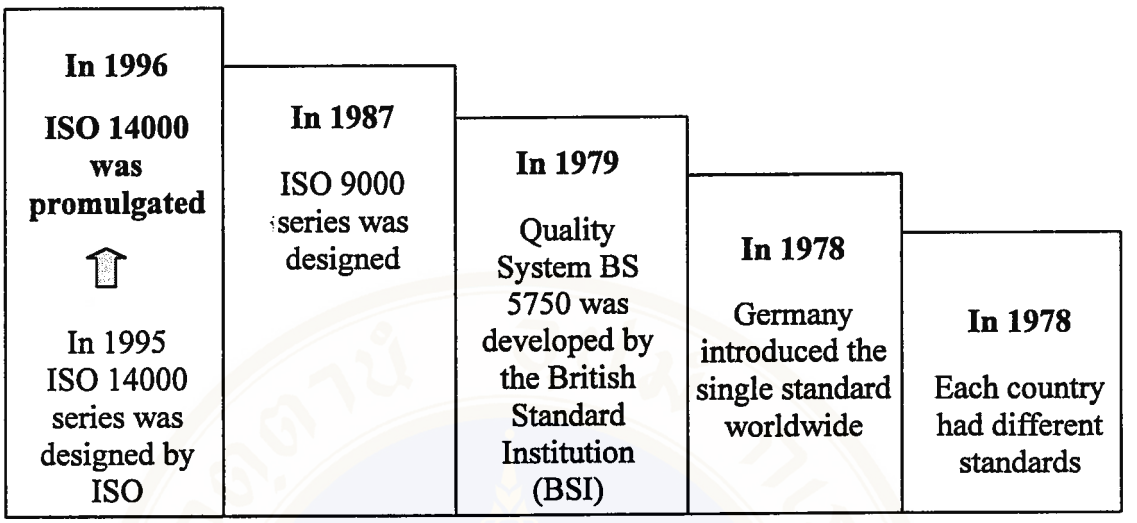


Diagram I: Background of the international standard for environmental management system ISO 14000 (Somlak Santirotchanakul, 1999).

2.1.2 Definitions of the international standard for environmental management system ISO 14000.

The experts had defined the international standard for environmental management system ISO 14000 in the follows:

Thawin Sirichokechaikul (1999: 1) explained that the ISO 14000 standard was the Standard for Environmental management system requiring that the organizations had system of maintaining, controlling and improving the environmental quality. The concept of this standard also covered the human hygiene protection by planing and defining directions for operations for the purpose of preventing and mitigating the pollution. Moreover, the organizations had been concerned with the environmental impacts caused by their activities, products and services from gaining raw materials, designing, research & development, manufacturing and delivering. The effective environmental management system also included utilizing the resources

efficiently and economically, avoiding the use of hazardous chemicals, recycling more of wastes and products.

Suthep Theerasart (1999: 6) defined the international standard for environmental management system ISO 14000 as a system with a clear structure of responsibilities, methods, process and sufficient resources for an operation. The primary components of the ISO 14000 standard involved stipulating environmental policy, analyzing environmental problems, considering environmental legislation, defining objectives and targets, conducting environmental programs, auditing, controlling, evaluating the operations and conducting corrective actions.

In Somlak Santirotchanakul's concept (1999: 6) the ISO 14000 standard was the international standard for environmental management system developed by and international organization. It emphasized the systematic environmental management, the effective development of manufacturing process, the mitigation in environmental impacts, the continual conservation of natural resources and energy. The ISO 14000 standard covered the activities of designing, manufacturing, servicing, packing, waste treatment, recycling, products and delivering.

Pranee Phanthumsinchai (1999: 33) defined the international standard for environmental management system ISO 14000 as all parts of the management system involving organizational structure, planing, responsibility, operation, process, resource utilized for implementing the ISO 14000 standard. It also included process, resource reviewing and maintaining the environmental policy. The objectives of implementing the ISO 14000 standard were to improve the effectiveness of the environmental management system and to comply with the policy of environmental conservation.

Cascio (1998: 15) explained that the International Standard for Environmental management system ISO 14000 was the system and structure of the environmental management. It consisted of management basis, principles of auditing, evaluating and personnel's working.

To summarize, the international standard for environmental management system ISO 14000 was a standard which proposed to conserve, control, and improve the environmental quality. Its concept were: defining the policy, analyzing environmental problems, defining objectives and targets for implementation, establishing the environmental program, auditing, controlling, evaluating and conducting the corrective and preventive actions. The organization implementing the ISO 14000 standard should clearly declare its policy to the public to show its responsibilities to the society. Moreover, steps for certification were required to certify that the organization's management and operation result in the least impact on the environment and the contribute to the confidence to the concerned people. The ISO 14000 standard could be applied to all types and sizes of organizations without the purpose of trade barriers.

2.1.3 Benefits of the environmental management system ISO 14000

Suthep Theerasart, 1999: 8; Somlak Santirotchanakul, 1999: 12 and Pranee Panthumsinchai, 1999: 34-35 had mentioned the benefits of implementing the Environmental management system 14000 in an organization as follows:

1) It helped not only conservation of limiting and unrenewable natural resources but also the mitigation of pollution, which directly affected our lives and living conditions.

2) Long term cost saving: It was because the implementation of the ISO 14000 standard led to the efficient and economical utilization of the natural resources and energy, the decrease of risks to the community including the prevention and reduction of pollution. It also resulted in the reduction of waste, natural resources and energy consumption, as well as of cost in solving the problems and waste treatment.

3) Enhancing market share: The ISO 14000 Standard was served as trade privileges by exporters of many countries to increase their competitive potential because environmental issues might be considered by customers in purchasing the products.

4) Showing the environmental leadership and the responsibility to society. This improved an organization's image.

5) Maintaining good public relations: The ISO 14000 standard helped reducing the environmental impact within an organization, resulting in advantages for its employees.

6) The ISO 14000 standard implementation gave an organization a chance of studying, reviewing and analyzing environmental problems. This led to create thinking and new products which helped reducing the environmental impact.

2.1.4 The structure of the international standard for environmental management system ISO 14000.

The structure of the international standard for environmental management system ISO 14000 could be divided into three groups as follows:

1) Organization standards
2) Evaluation audit standards
3) Product standards

1) Organization standards

Environmental Management System: EMS

- ISO 14001 Environmental management system requirements.
- ISO 14004 Environmental management system principle and element.

2) Evaluation Audit Standards

2.1 Evaluation Audit Standards Environmental Auditing: EA

- ISO 14010 Principle of audit.
- ISO 14011 Environmental management system audit objectives, roles and responsibilities.
- ISO 14012 Personal attribute and skill.

2.2 Environmental Performance Evaluation: EPE

- ISO 14031 Environmental performance evaluation guidelines.

3) Product Standards

3.1 Environmental Labeling: EL

- ISO 14020 Objective of Environmental labels and declaration

- ISO 14021 General requirement and selected terms
- ISO 14022 General guidelines and specific symbols
- ISO 14023 Testing and verification
- ISO 14024 Certification procedures

3.2 Life Cycle Assessment: LCA

- ISO 14040 Principle and framework.
- ISO 14041 Environmental management – life cycle assessment- Goal and scope definition and life cycle inventory analysis.
- ISO 14042 Environmental management – life cycle assessment- life cycle impact assessment.
- ISO 14043 Environmental management – life cycle assessment- life cycle interpretation.

The structure of the international standard for environmental management system ISO 14000 was shown in the diagram II.

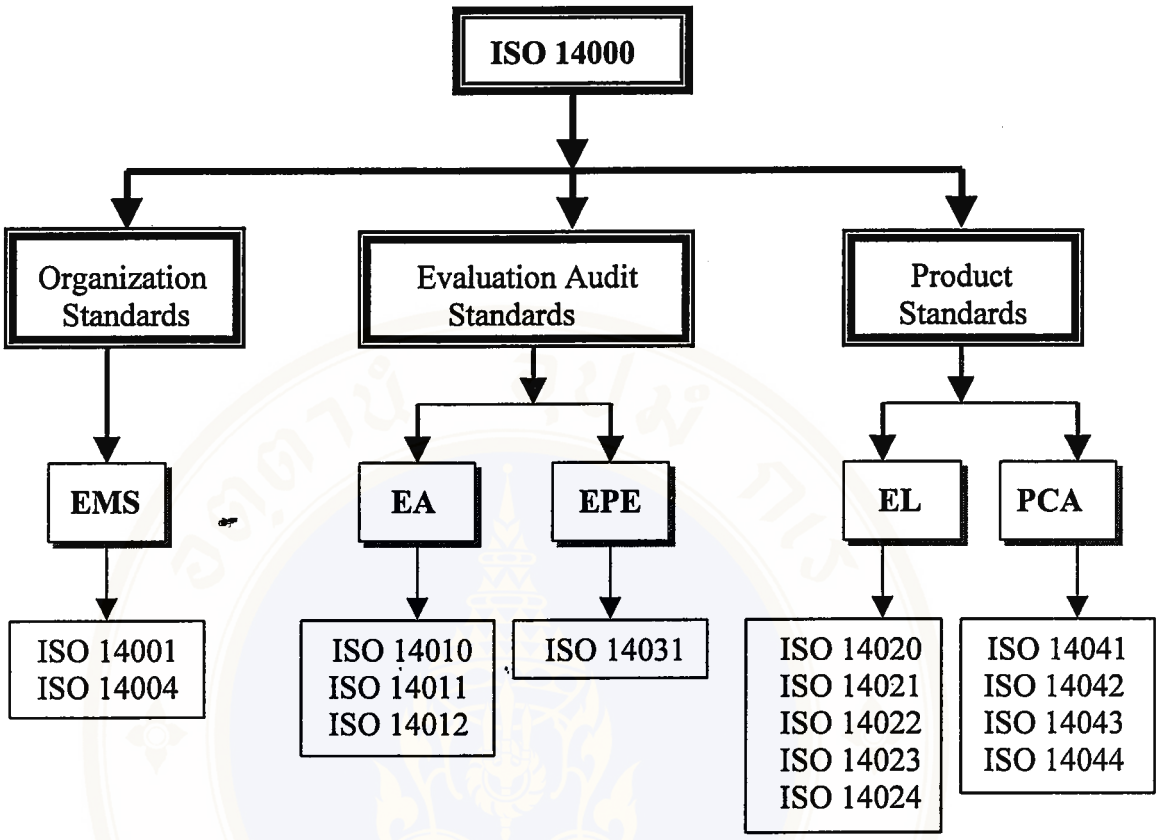


Diagram II: The structure of the international standard for environmental management system ISO 14000 (Thailand Productivity Institute, 1999).

2.1.5 The briefly concepts the of the environmental management system (EMS) were as follows:

1) Environmental policy

Initially, the organization's top management should have commitment and define the policy on EMS which was used for the direction of implementing and improving its EMS.

2) Planning

In order to achieve environmental policy, at least, the organization should:

- Identify the environmental aspects of its activities and specify those significant impacts on the environment.

- Identify legal and other requirements to which the organization was involved.

- Establish objectives and targets of its activities having impacts to environment.

- Establish environmental programmes for achieving its objectives and targets.

3) Implementation

In order to achieve environmental planning, at least, the organization should:

- Define roles, responsibilities and authorities for facilitating EMS effectively.

- Communicate to the staff at each level for the importance of conforming to the environmental policy; provide appropriate training to personnel performing the tasks to gain their knowledge and competence.

- Establish and control documentation relating to EMS.

- Control operations and activities to meet the specified objectives and targets.

- Identify potential accidents and emergency situations for preventing and mitigating the environmental impacts that may be associated with them and periodically test such procedures where practicable.

4) Checking and corrective action

To ensure that the organization was performing in accordance with the stated EMS programmers, at least, the organization should:

- Monitor and measure its performances comparing to the organization's plans.

- Identify any non-conformance and try to correct them.

- Record the on-going activities of the EMS.
- Conduct periodic EMS auditing.

5) Management review

The organization's top manager should review and continually improve its EMS, with the objective of improving its overall environmental performance.

The briefly concept of environmental management system was shown in diagram III.

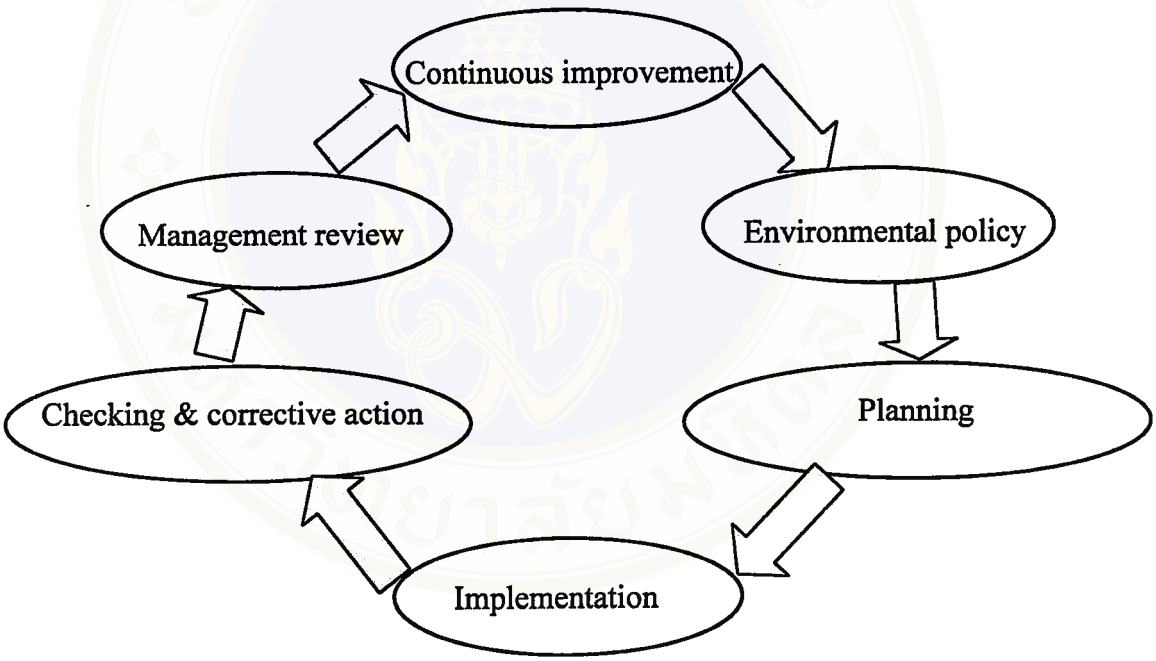


Diagram III: The Briefly concept of the environmental management system (Thailand Productivity Institute, 1998).

2.1.6 Auditing of environmental management system

Auditing of environmental management system, both internal and external auditing were regarded as one of the important factor in EMS. To harmonize the environmental auditing principle, the International Organization for Standardization

had developed ISO 14000 guidelines for environmental auditing-audit procedures auditing of EMS.

1) Initiating

- Assigned the auditing team members through the agreement of the auditee.

- Setting the auditing scope, including physical location and organization activities by lead auditor.

- Reviewed the organization's document such as environmental policy statement, manual for meeting its EMS requirements, records, etc. If the document was inadequate to conduct the audition, the auditee should be informed.

2) Preparing

- Determine auditing planed by lead auditor, then informed the auditing team members and auditee.

- Assigned specific tasks for each auditing team members.

- Prepared necessary working documents such as forms, checklists, etc.

3) Conducting

- Opened meeting: introduced auditing team members to auditee's administrator, reviewed scope, objectives and auditing plan. confirmed resources, facilities, time and other relevant items needed to perform auditing.

- Collected evidence: through interviewing auditee, examine documents and observe pattern of working. If it was not followed the criteria. Recorded should be done.

- Reviewed and concluded the audit findings for each activities with responsible personnels.

- Closed meeting: presented audit findings to the auditee's adminitator. Disagreement should be discussed but final decision on the significance and description of the audit findings ultimately rest with lead auditor.

4) Reporting

- lead auditor was responsible for the accuracy and completeness of the report.

- The contents of the report should be consistent with auditing plan. Then, the report was submitted to certification parties.

The principle of environmental auditing was shown in the diagram IV.

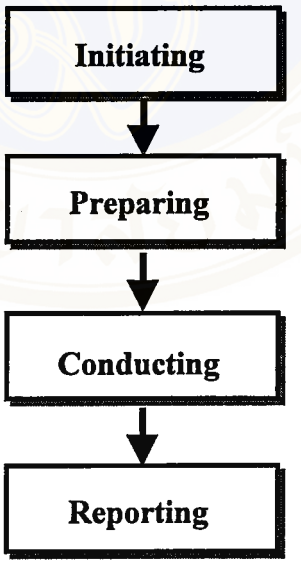


Diagram IV: Environmental auditing diagram(Thailand Productivity Institute,1998).

2.1.7 Preparation for the application for the EMS certification.

Main steps of application for the EMS certification were as follows:

Step 1. Study the standard ISO 14000 series.

Step 2. Assemble among the adminitators to sustain the establishment of EMS.

Step 3. Appoint a steering committee to set up and monitor the system.

Step 4. Stipulate environmental policy, plan for the management system and establish the necessary operational manuals and instructions.

Step 5. Implement the specified EMS.

Step 6. Conduct the internal audit to ensure that the system is complied with the standard requirements, implemented and maintained effectively.

Step 7. Correct non-conformity found during internal audit and improves the efficiency of EMS.

Step 8. Contact the certification body.

2.2 Human Resource Development.

2.2.1 Definitions of human resource development.

The human resource development was one of the steps for the personnel administration due to obstacles and problems found during the operation, the human resource development of the organization was required. The objective was to increase the employees' knowledge, ability and experience, necessary for organizational efficiency and effectiveness.

The experts had defined the meaning of "Human Resource Development" as follows:

Bangon Soroad (1995: 23) defined "Human Resource Development" as to improve the human resource's working efficiency to meet the organization's goals human resource development not only encourages the workers to be willing to do their work but also prevents mistakes, accidents, conflicts or other problems such as strike, absence and turnover.

Beach (1970: 7) explained that "Human Resource Development" was a process of learning provided for workers to gain knowledge and skill required for their work to meet the specific objective as well as to improve their behaviors as required.

Nadler (1989: 45) mentioned that "Human Resource Development" was the provision of activities in order to increase the worker' experience and learning at a specified period of time. Their activities aimed to improve the workers' working potential and of enhancing the workers' advancement.

Killan (1989: 126) defined "Human Resource Development" as advanced planning for personnel to make them ready to work, to fulfil their duty for the greatest advantage of the organization. Moreover, the organization must fill them with energy, willpower, intelligence, knowledge and ability to work and should encourage the personnel to use all of their ability to fulfil their duty for the highest success of the organization.

The definition of the term "Human Resource Development" as explained by the experts' concepts mentioned above could be summarized as a process of improving the worker's knowledge, ability, skill and attitude towards their work. The objective of these activities was also to give employees self-confidence, good values and personality consistent with their organizations. The human resource development

must be conducted continually to enable workers to effectively fulfil their duty and improve their working behavior for the greatest advantage of the workers themselves, their organizations, society and the country as well.

2.2.2 Methods and Process of Human Resource Development.

Goldstein (1993: 145) mentioned that the process of human resource development consisted of many steps, which correlate with one another as follows:

1) Step of specifying the requirement of human resource development.

2) Step of making a plan for human resource development that covers the arrangement of the requirements of human resource development according to priority, the establishment of the objective and the protection. Each plan should clearly specify target group, project, duration, persons who were responsible for the plan, and resources.

3) Step of evaluation human resource development plan. This step emphasized the follow-up and the evaluation of effectiveness and productivity of human resource development plan.

The process of human resource development was shown in the diagram V.

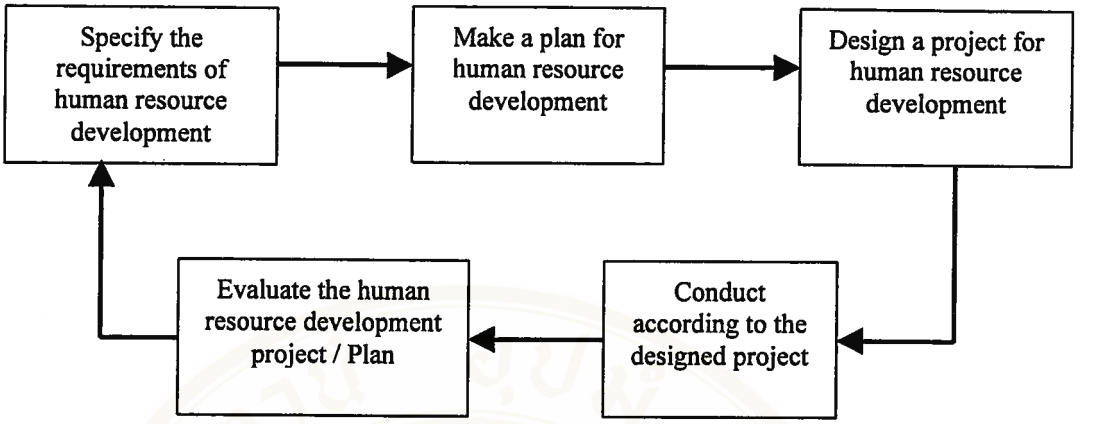


Diagram V: The process of human resource development (Goldstein, 1986).

Nadler, L., & Nadler, Z. (1993) divided human resource development methods into three types. They were:

1. Training
2. Education
3. Development

1. Training

Training refers to the organized learning activities provided in order to improve the participants' behavior to comply with training objectives. It also enables the participants to increase their ability, knowledge, and skill and to have good attitudes and a great sense of responsibility towards their organizations and other things involved with them. This directly affected the productivity of their organization, their society and their country as well (Harbisin & Myers, 1964: 2; Flippo, 1966: 243; Beach, 1980: 193 Wijitr Awakul, 1997: 15; Jongkolnee Chutimathawin, 1999: 1; Suwit Mulkam, 1999: 31).

Training could be divided into three types (Theerayuth Lorlerdrattana, 1987: 20)

1.1 On–the job training

On–the job training was the training, which purposed to enhance the participants' performance through the acquisition of increasing knowledge, skill, competencies and improving behavior. Moreover, the participants might be informed of concepts, philosophy, working objectives and targets from their actual practice. The following were four methods of on the job training which were commonly used:

1.1.1 **Coaching** was the training mainly provided for new employees or newly – promoted employees. Their direct boss coached them by assigning a job, giving advice and teaching them the effective working method; coaching emphasizes the actual practice.

1.1.2 **Job enlargement** was a method of giving an employee more tasks. It was horizontal job loading meaning that the job was redesigned to include additional tasks or operations requiring similar skill to an existing job.

1.1.3 **Job enrichment** was a method of giving an employee more responsibility that included some of the planing and control necessary for job accomplishment.

1.1.4 **Rotation** was a system in which an employee was moved from one specialized job to another. This method enabled the employees to develop and improve their skill, experience and knowledge required for the organization's success. Moreover, job rotation made the employee more eager to gain knowledge from their new position and also reduced working conflicts.

1.2 Off–the job training

Off–the job training was the training provided outside of working sides. The training course could be provided in or outside the organization.

1.3 Pre–Promotional training

Pre–Promotional training was the training provided before the participants were promoted. It was the training for those who were promoted or transferred to the new positions. The objective of this training was to provide the participants to understand of their new works before they were assigned to do those works. This could ensure the organization that the newly promoted workers could fulfil their duty effectively to the greatest advantage of the organization.

2. Education

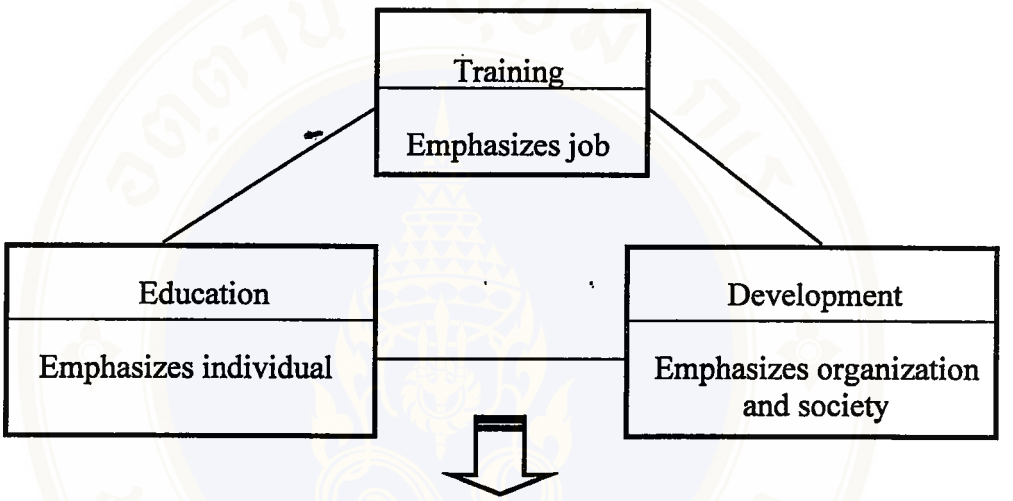
Education was a process of learning which purposes to improve the learner's bodies, thoughts, emotions, minds and social attitudes. It was a process which takes a long time and regulated the standard of curriculums and also certified the learner's knowledge need for their future career. The objective of the education was to enable learners to gain experiences to be successful in their future careers. The management of education for human resource in the organization had a medium risk of the investment(Kruawan Limaphichat, 1988: 15; Danai Theanphut, 1997: 31).

3. Development

Danai Theanphut (1997: 26) explained that development was a way to provide the human resource with useful knowledge and experience required for enhancement of the organization, the job and the individual. It also refered to provide the employees with the increased responsibilities to be equal to their competencies.

The methods of human resource development through training, education and development differed from one another in the application, process, success including assessment and risk rate. However, these three methods were set up for the success of the organization.

The activities of human resource development was shown in diagram VI.



Activities	Focus	Economics consideration	Assessment	Risk Rate
Training	- Current job	-Regarded as expenditure	-From the performance	- Low
Education	- Future job	- Short-term investment	-From the performance	- Medium
Development	- Human resource's creative thinking potential and cooperation for the organizational development	- Long – term investment	-From the organization's competitiveness or efficiency	- High

Diagram VI: The activities of human resource development (Theerayuth Lorlerdrattana, 1987).

2.2.3 Activities for human resource development could be specified as follows:

2.2.3.1 Concept of "Kaizen" management

Concept of "Kaizen" management were classified as follows:

1. Quality Control: a system of an economical production or service but satisfying customers.

2. Quality Control Circles: a system of monitor and improvement in the working area for development.

3. Total Quality Control: some compulsory activities in which all personnel involved from workers and managers.

4. Total Productive Maintenance: a commitment of all employees to maintain the effective tools or equipment.

5. Suggestive system: an ethics attention and developing for a punishment and a reward system.

6. Just in time: a production and controlling technique in order to reduce productive loss and a feedback to customers' requirement safely with a quality product.

In 1996, Kornkanok Maneeporn studied about Japanese human resources development with Kaizen: an adoption in Thai society. This research's objective was to adopt Kaizen theory in Thai Society. The group of this study was three-Japanese and seven Thai companies. It was found that Kaizen activities adopted in management for Thai society as total quality control, total productive maintenance, quality control, a suggestion of 5S, and a safety system in a working condition, "Kaizen" idea

enhanced a potential, creative thinking, a problem solving, a good attitude and a perception toward works among many employees. The enhancement resulted in a better production and less loss of work.

2.2.3.2 Quality Management

Quality management was the system that emphasized the quality. The critical elements were personnel, a system and an evaluation. A continuous management with quality composed of plan, analyzing problems in order to set strategy process and implementation do a commitment among employees, check as an evaluation, and an action as an improvement of a process for an efficiency and a high standard quality.

An organization needed to focus on the quality of work, a lower cost, a safety, punctuality and an empowerment. Activities for this kind of management were identified as follows:

1) 5S Activities

Parithat Phanbanyong (1996) stated that without the background of management by 5S activities, any management system was hardly to be implemented successfully. Since 5S activities would be developed parallel with developing of personnel, machine, an environment and trusting system.

5S activities were a background for enhancing productivity (Harn Aempreecha, 1999).

Seiri was a separation of used and useless equipment or goods to reduce stock wasting time and repetitive documents.

Seiton was a regulation for equipment to be picked up easily, reducing time to search and decreasing accident during the work.

Seiso was a cleaning of places, tools and an environment to reduce the number of damaged machines and increase an efficiency.

Seiketsu was a maintain of clean places.

Shitsuke was an encouragement for a discipline in work for quality products and a good image of a company.

In 1996 Krongkaew Thipmanee did a case study in PTT about human resources development to increase efficiency by 5S activities. The study aimed to find obstacles during the 5S activities and an improvement for the highest efficiency. The sample were one hundred and eighty employees of PTT. It was realized that employees intended to participate in the 5S activities highly with moderate obstacles. It concluded that 5S activities technique was a background for an improvement of every aspect of efficiency such as a production, cost, transportation, safety and environment.

In 1997, Taree Pornsinchai studied about management factors of 5S technique as a protection for any dangers in work: a case study of Cement Kao-wong factory, Saraburi Province. The samples were one hundred and one male employees in all levels with an interview method. It was found that most employees were trained for 5S activities and its committee commented that everyone must have a commitment. a promotion, a procedure, a news publication and a campaign had a major role in a success. It resulted in a safety and efficiency.

2) Quality Control: QC

The theme was a commitment of employees in problem analysis and finding of solution for improvement. It directed to a creative thinking among employees. All employees should be encouraged for a brainstorming by wisdom and an experience.

The Praboromrajchanok Institute of Health proposed the advantage of a quality system in work for three ways:-

1. The person who knew problems and solved them best was the one who closed to work.

2. The personnel learned how to work as a team and took part in a management.

3. The personnel perceived their value and pride that encouraged them to work hard.

In 1995, Suphratra Junnapiya presented an article regarding human resource development by a quality process, a potential in human resource development in an organization. The writer proposed that the group of voluntary employees who caused a quality of work, played a role in public, private and public enterprise sectors with the mentioned activities. They intended to improve continuously in accordance with policies to give a benefit both in themselves and society. The mentioned voluntary group had two important roles, one as an attitude adaptation as well as a behavior in all levels and the other as a way to save cost. Fostering a quality was the relationship with human resources development. The activities developed wisdom or ability, built a perception of improvement, practiced, acreative thinking and leadership,

responsibility for themselves and colleague including their coordination. They were all techniques for persons development.

3) Quality Management : ISO 9000

A system or a method for an entrepreneur to manage the organization in accordance with the policy of quality products or services. First, the company established a quality policy. Then it reorganized management and operation employees and provided a quality manual or procedure covering a systematic work instruction, which went along with its policy, personnel manual and machinery of the production system. The management of the mentioned components for the most benefit was called "quality management system" All personnel studied the management policy, drafted and acted the specified work procedure strictly and finally cooperated for an investigation and followed up the continuous change.

In 1996, Kitti Ngamsakulrungroj studied relating the management of ISO 9000 system in I.C. industry: a case study in NS. Electronic Bangkok (1993). It was to find the procedure of ISO 9000, its problems and solution, and impact after the utilization of the system.

Interviewing two hundred and fifty employees made this study. Several problems were found. One was the scarce of expert in each section, which was solved by training and transfers the knowledge to others in the company. The others were an incomplete analysis of ISO 9000 regulation that was solved by a consultancy, and staff's adherence to the old system, which was figured out by training with work procedure. From the research of impact, the company's image was preferable due

to a standard quality of products and resulted in greater number of customers, more productivity and a manufacturing efficiency.

In 1996 Pitthaya Waradee did a research regarding to personnel adaptation after using of ISO 9000 in the company: a case study in Micropolis Corporation (Thailand) Co., Ltd. This research intended to search for an influenced factor towards employees' adaptation after fulfillment of ISO 9000 with the example of one hundred and twenty-eight people. It was found that the factor was an acceptance of ISO 9000. It was established by training to change the old culture, focusing on the quantity and the reduced cost, to the new culture, focusing on the value and advantage of adaptation. Adaptation in personnel and organization would succeed if the commitment of management occurred constantly. Management needed to empower employees in tracking processes, evaluate the result and give some advises. The critical problem for adaptation was the knowledge and understanding in ISO 9000 regulation and a preparation of ISO 9000 manual with procedure for personnel.

4. Quality management: QS 9000

Quality management: QS 9000 was a standard system for a quality control invented by the car company. The objective was to control quality and satisfy customers.

In 1998, Chalawalai Wutthikornkriangkrai had a study about human resources development in Thai Arrow Co., Ltd. How the company managed to obtain QS-9000. The samples were thirteen administrators in charge of QS-9000 project of three branches: Bangplee, Chachengsao and Pitsanulok. They were interviewed. The study found that receiving QS-9000, the companies should emphasize in three sections

developing personnel: (1) orientation and regulation section. (2) adminitration section and (3) quality activities section. Quality activity section was the most important part that had the greatest numbers of training courses, which were taught continuously. It was recommended that training was a necessary factor.

2.2.4 Human resource development of the organizations those implementing the environmental issues.

To have good awareness to work and the organization, it was necessary that the human resource would be developed, especially if the organization had defined the policy and objective to implement the environmental management system ISO 14000. All human resources were required to have basic abilities in the environmental problem management as follows (Casio, 1998: 44):

1. Ability to manage problems impacts and projects on the environment.

2. Ability to perform in accordance with the laws and other regulations and the ability level of the personnel in some positions having to be as determined by the laws such as the ones related to the chemicals, etc.

3. Ability to mitigate and control the environmental risks as well as to be ready for the emergency situation.

4. Ability to build up the motivation or to encourage the employees to participate in the implementation of the environmental management system.

5. Ability to continuously develop the working performance on the environment.

The regulations of the training for the environmental management system ISO 14000 could be divided into three main parts as follows (Cascio, 1998: 48):

1. Knowledge training: to enable the employees to know and understand what they must do, should do and why they have to do.

2. Awareness training: to encourage the employees to do the things beneficial to the environment.

3. Competency-based training: to enable the employees to work efficiently and still maintaiff the system.

The arrangement of the training for the environmental management system ISO 14000 could be divided into four main steps as follows (Thawin Sirichokechaikul, 1999: 374):

Step I: Training needs

Step II: Providing the training

Step III: Training implementation

Step IV: Training system effectiveness evaluation

Step I: Training needs

According to the regulations of the ISO 14000, it was required that the training needs for all employees who worked may cause the environmental impacts be denitrified. The personnel responsible for the training system should consider the training needs as follows:

1) Regulations of the personnel recruitment, employment, experiences, training & skill development plans according to the company's policy.

2) Responsibilities and authority which were identified in the job description for the employees of each position.

3) Work complexity and risks of causing the environmental impacts.

4) Readiness of resources especially in the small and medium enterprises.

Step II: Providing the training

It was not necessary for the identified training to be provided simultaneously but they could be provided in stages depending on the follow cases:

1) The training for new employees: There should be a method in specifying the course required for training the new employees as well as the length of time to be taken from the employment date.

2) The training for present employees: All identified training courses should be provided to all employees so that they all had the understanding in the same direction. Moreover, the re-training might be conducted once a year or more depending on the importance of activities and the severity of the impacts.

3) The training for commissioners and contractors: It should be implemented as soon as possible, such as after the signing of the mutual agreement or before the construction in the factory compound by the contractor.

Step III: Training implementation

The training implementation in accordance with the training plan should have the following documents as a record:

1) Training record

2) Training contents

3) Training evaluation for each course

4) Training follow-up report arrangement

Step IV: Training system effectiveness evaluation

The objectives of the training evaluation in the environmental management system ISO 14000 were as follows:

1) To knew whether all personnel who might cause the environmental impacts from their work were suitably provided with the training or not.

2) To knew whether the environment could gain more or less benefit from the activities provided by the organization.

3) To knew whether after being trained, the personnel were able to perform their work as expected and planned or not.

Details were shown in the diagram VII.

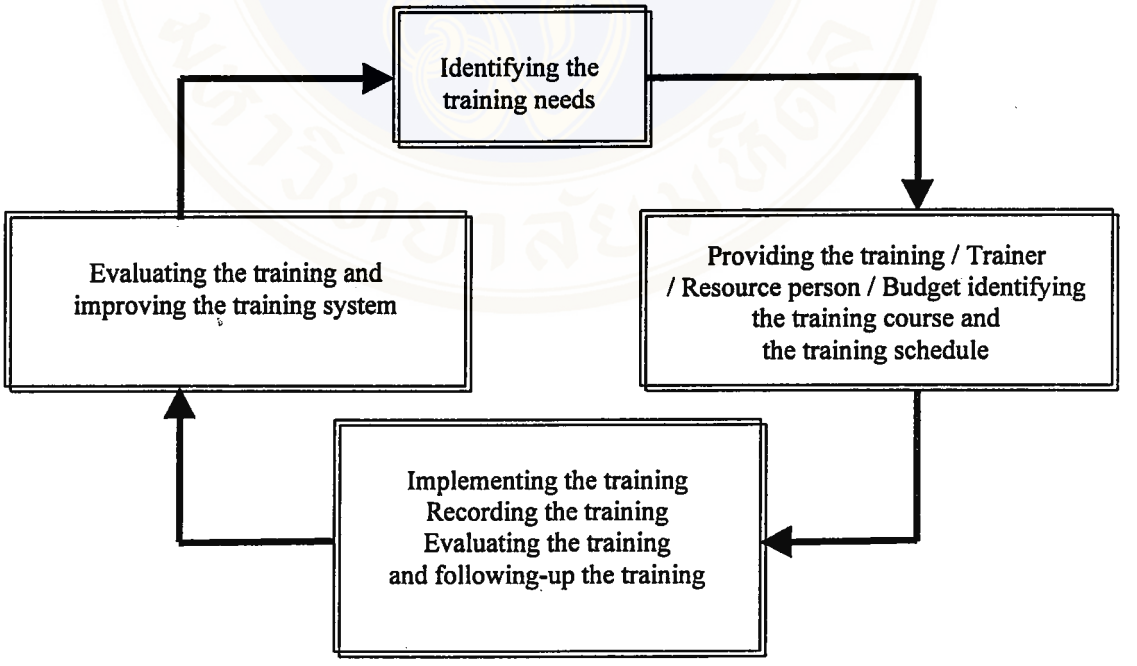


Diagram VII: The arrangement of the training for environmental management system ISO 14000 (Thawin Sirichokechaikul, 1999: 374).

The principles according to the regulations of the environment management system ISO 14000 specified that for the organization's continuous improvement and development, the human resource, the most important component, must be developed by means of the training. The training must be consistent with the needs, policy direction, objectives and goals, therefore, the training subjects had to comply with the actual situation at the suitable time (Suthep Theerasart, 1999: 72). The organization must also specify who should be trained and what training course should be taken. The personnel performing the tasks related to the environmental problems in the organization were required to be aware of the following (Cascio, 1998: 42):

1) The importance of working performance which conforms to the policy, procedures and regulations of the environmental management system.

2) The environmental impacts which actually happen or may be caused by activities or working performance and also the importance of improvements in job performance.

3) The employees' roles, duties and responsibilities which help contribution to the fulfillment of the objectives, the conformity to procedures and regulations of the environmental management system including the preparation for readiness for the emergency situation.

4) Consequences from the performance which did not conform to the procedures.

2.2.5 Essential components for the training

1) Resource persons

2) Training methods

3) Training evaluation

1) Resource persons

Resource persons were the ones who had a lot of knowledge and experiences. They were also the ones who seek the methods that help improving the people's behavior to meet the determined objectives at a specific time. The resource persons were not teachers but they might apply the teachers' good features for the training (Somkid Isarawatana, 2000: 6).

The resource persons could be categorized into two types as follows:

1.1) Internal resource persons referred to the personnel in the organization who were capable for training or transferring knowledge to other personnel in the same organization.

1.2) External resource persons or honored resource persons referred to those who had experiences, knowledge and skills in the contents of the course.

The resource persons were capable of transferring knowledge in the course contents in conjunction with their experiences. They were also the ones who provided the participants with technical data. Therefore, it was essential that the selected resource persons should be suitable for each course.

Either the internal resource persons or the external resource persons depending on the training plan of the organization, including laws might implement

the training & regulations, the risk and the importance of impacts to the environment related to the training course.

The selection of the resource persons could be performed as follows:

- Internal resource persons: the qualifications required for the internal resource persons as working experience, educational background or knowledge of the training course should be determined. The internal resource persons' names were recorded and the methods for the internal resource person development were also determined so that the organization had enough training resources for the continual environmental management.

- External resource persons: the methods for considering and certifying the ability of the external resource persons should be determined; for example, they must qualified for conducting the training or in some cases, laws & regulations about the resource persons must also be considered (Thawin Sirichokechaikul, 1999: 382).

1. Training methods

There were a number of different methods used by resource persons for training or transferring knowledge (Somkid Isarawatana, 2000: 134-158). They were as follows:

Lecture

Lecture was a training method which the resource person informs or explains the course contents to the participants. The resource person prepared, conducted a study for the training contents, gave knowledge, determined and conducted the training while the participants were passive recipients of information or knowledge. Most of the resource persons would rather use the lecture for the training.

The reasons for this might be that it was easily prepared and familiar to the resource persons more than other methods. Moreover, the resource persons could present information on a specific topic as required to a large number of participants.

Role-playing

Role-playing was the playing in the situation required to be studied and discussed without any preparation for the script. The participants or learners perform according to their own ideas through their roles. The role-playing was a good training method for the learners to gain experiences from the supposed situation. It was also a method from which other participants' concepts and opinions were surveyed.

The role-playing focuses on surveying the concepts more than presenting the contents and it also emphasizes the feeling more than other methods.

Simulation

Simulation was a training method that represents a real-life situation to enable the participants to learn and get the real feeling. The simulation was similar to the role-playing. For the role-playing, the situation and the roles are determined. The learners performed according to the determined situation without any script but they express their ideas through the determined roles. In contrast, for the simulation, there was script for the learners and they had to perform according to the determined condition.

Case study

Case study was a process, which enables the learners/participants to develop their ability in solving the problem by analyzing the facts or data. This method emphasized the analytical process rather than the contents. After being

presented the course contents, the learners would be given the questions on the problems to analyze and find out the solution.

Brain storming

Brain storming was a training method which each member or learner could freely express his/her idea to the determined problem. This method provided all learners a chance to think and express their ideas. Then, all of their ideas were analyzed, concluded and finally presented to the meeting.

Small Group

Small group consisted of at least two learners. It was a training method which the learners/participants helped one another to express their ideas, seek knowledge, and decide to do something according to the opinions of the group.

Group Discussion

Group discussion was a training method that about 3-7 the learners/ participants were grouped for each group to discuss the determined issue and then present the results of the discussion to the meeting. This method was suitable for training a large number of learners because their interests were different and the resource person would like them to participate in the training.

Field trip

Field trip was a training method, which the learners/participants were given training at the actual site. Apps (1999) had an idea that the field trip was a good method used to encourage the participants to learn by themselves.

In summary, the training on the environmental issues could take various forms such as lecture, role-playing, simulation, case study, brain storming, small

group, group discussion and field trip. The resource persons were the ones who selected the most appropriate method for the achievement of the objectives of the training.

3. Training evaluation

Evaluation was a method aimed to follow up, observe and improve the training to fulfill the objectives most efficiently and effectively. The training evaluation could be performed both formally and informally (Wichit Arwakul, 1997: 236). The type and method of the evaluation as the behavioral evaluation, the pre-test and post-test, etc. were mostly specified during the design of the course outline (Jongkolnee ChutimaThawin, 1999: 25). The trainer was responsible for the training evaluation, which could be categorized into two types as follows:

1. Formative evaluation: Its purpose was to check what the learners/ participants had been trained what should be additionally provided, and what should be improved. The participants' progress was also evaluated compared with the determined objective in order that the trainer might find out a way to improve his/her training techniques. Moreover, this evaluation must be performed all the time by the trainer.

2. Summative evaluation: Its purpose was to check in what level the learners/participants were successful. It was geared to an assessment of overall outcomes at the end of the training.

In conclusion, the key factor for the training was the resource persons, which could be either internal or external resource persons depending on the reason and the necessity of the organization. They were the ones who not only determine the training

method according to their skills and the objective of the course but also evaluate the participants' performance.

In 1999 Endoo Chot-tikul's resourched "The admittance in the international standard for environmental management system ISO 14000 of the executives of three hundred and twenty-two industrial factories in Pathum-thani". The purpose was to study the admittance in the international standard for environmental management system ISO 14000 of the executives of the industrial factories in Pathum-Thani. The results showed that 60.5 % of the industrial factories had policies for preventing and solving environmental problems. The medium and small sized factories gave little importance to the environmental management, while the large sized factories recognized the environmental problems. Most of the executives gained knowledge, understanding, and information on the ISO 14000 standard from Thai Industrial Standard Institute. It was also revealed that 2.6 % of the factories have already applied for the ISO 14000 certification. In addition, 61.9 % of the executives accepted the implementation of the ISO 14000 standard because it helped improve the organization's image, mitigate the environmental problems affected to workers and neighboring community and promote the participation in the environmental conservation.

In 1999, Somchai Nag-ON's researched "Trend of Promoting the international standard for environmental management system ISO 14000 for Industrial Sectors in Samut-Prakarn". The sample were three hundred and sixty-six industrial factories in Samut-Prakarn. The objectives were to study the basic data of industries to be used as guidelines for promoting the ISO 14000 standard and also investigate the industries' attitudes towards it. The results showed that most of the industries had

good attitudes towards the ISO 14000 standard. Moreover, considering the location, size, export rate of the industries, it was found that the changing of attitudes towards the ISO 14000 standard were not different in the statistical essence. In addition, since some industries had no knowledge or understanding on the standard, the development consistent with the environment should be promoted for the continual improvement of environmental quality and the upgrading of quality of life.

In 1998, The Praboromrajchanok Institute of Health conducted a study on the style of the development of human resource at service. This study aimed to collect data and conclude the concepts of the human resource development of the Ministry of Public Health. Twenty-nine well-known executives in governmental, private and state enterprise sectors were asked to express their ideas by means of interviewing.

The results of this study were as follows:

1. The effective methods for the human resource development were on the job experience, coaching, counseling, transition, anticipatory experience, transfer and rotation, self-improvement program, problem oriented learning, team learning, action learning, development off the job, pre-service training or pre-entry, orientation, in service training, specific training and special training.

2. The training contented necessaries for the human resource development were working skills, self-awareness and motivation.

The human resource development was a process of adjusting the personnel to be right for the job by means of education, training and development Kaizen, total quality management, or analytical study might be also adopted for improveming personnel ability and progress as well as for the effectiveness and the efficiency of the

organization. The environmental management system ISO 14000 was also one of the concepts that a lot of organizations were interested in implementing. However, human resource was an essential key for the organizational development. All organizations require the personnel who were qualified, have good awareness and were always prompt to work because this contributes to the good image, good quality of product and services, successful business, continual development and the most advantage of the policy of the organization.

2.3 The human resources development for chemicals and chemical products

For the human resources development for chemicals industry and chemical products (Thangchai Chevapeecha, 1987: 43-44) gave a guideline as follows:

1) Improvement in human resources for knowledge with recognition of improved technology, which did not have impact, an environment.

2) Group of researcher should have ethic to consider disadvantage in the future.

3) To reduce damaged environment and conserve resources for highest value, it was suggested to improve human resources provided with skill properly along with age and improved technology.

From the report in 1999 of Vinythai PCL Co; Ltd. as a chemical product and chemical manufacture, it was noted that the company broadened the scope of the human resources development. It was to aim at the benefit of the trained employees and a training became an education. While the employees have been trained

continuously for skill improvement, they also have been coached to have a knowledge of work, a capability in learning and a creative thinking. The company expected employees having widened prospects through and more understanding of work with various courses of training. The training was both domestic and foreign by outside insitute. The company would provide the employees only general knowledge training. Moreover, high-talented personnel with a high compensation would be hired to proper a potential of work. These personnel would be authorized to faster the effectiveness and cooperation by emphasizing a customer service to respond the demand in market.

Continuous development journal of Thai Polyacetal Co; Ltd. in 2000 stated about human resource development that except for a high technology, the company paid attention to a strict training by the use of a simulator model with a computer to make an experiment. The computer showed the manufacturing process and a result of solution, occurring really in the factory, with this model, the employees would be accustomed to the system and solved the problem with the existing standard.

Public relations document in 2000 of Bangkok Polyethylene Public Co; Ltd. stated about human resources development that its personnel were trained to give a consultant for some customers including proposing a solution for any problems occurring during manufacturing process. Moreover, the company offered knowledge activities for the customers such as a technical training and specialty training. These activities were various for each customer.

From the mentioned information, it could be concluded that the chemical manufacturing company provided various development for employees covering inside and outside training, a utilization of updated computer technology. All of the training

enhanced the capability of work among employees. It resulted in quality products and leaded to an international standard.

CHAPTER III

MATERIALS AND METHODS

The purpose of this study was to investigate how human resource development in chemicals and chemical products related industries for the environmental management system ISO 14000. The procedures of this study were as follows:

3.1 Population and sample

3.1.1 Population

The target population of this study were the executives or the persons who were responsible for human resource development of sixteen companies which were certified of the environmental management system ISO 14000 in chemicals and chemical products related industries (Data on September 23, 2000).

3.1.2 Sample

The purposive sampling of this study were ten companies in chemicals and chemical products related industries certified with the environmental management system ISO 14000, and located in Rayong Province. The sample were:

1) Thai Plastic and Chemical PCL Co; Ltd.

2) Tuntex Carbon Black (public) Co; Ltd.

3) Thai Polyacetal Co; Ltd.

4) Sak Chaisidhi Co; Ltd.

5) Vinythai PCL Co; Ltd.

6) Phattanaphan Chrmitech Co; Ltd.

7) Thai ABS Co; Ltd.

8) Dynamic Polytech Co; Ltd.

9) Bangkok Polyethylene Public Co; Ltd.

10) Thai Polypropylene Co; Ltd.

3.1.3 Selection of interviewees

The interviewees of this study were the executives who were responsible for human resource development of companies in chemicals and chemical products related industries certified to the environmental management system ISO 14000. There were ten persons from ten companies.

3.2 Instruments

3.2.1 Research instrument

The instrument used in this study were a structured interview guide, consisting of three important parts:

Part I: Demographic data.

Part II: Activities for human resource development.

Part III: Supporting factors and suggestions for human resource development for the environmental management system ISO 14000.

3.2.2 Identifying and Describing Procedures.

The procedures of the construction were as follows:

3.2.2.1 Defined what data were required for this research.

3.2.2.2 Reviewed retaled documents, research and textbooks.

3.2.2.3 Designed the structured interview guide.

3.2.2.4 Send the designed interview guide to four experts who were experts in the environmental management system ISO 14000 and human resource development to check the content validity, and give suggestions. The four experts were:

1) Assoc. Prof. Dr. Somkid Isarawatana, Ph.D Faculty of Social Sciences and Humanities, Mahidol University.

2) Asst. Prof. Siam Arunsrimoragot. Faculty of Environment and Resource Studies, Mahidol University.

3) Mr. Nipon Surapongrukchareon. Vice-President of Thai Tabuchi Electric. Co., Ltd.

4) Miss. Chalawalai Wuttikornkriengrai, Department Manager of Thai Arrow Products Co., Ltd.

3.2.2.5 Improved the research instrument.

3.2.2.6 Practiced to interview with experts by following each item in the structured interview guide until it was satisfied. Then, pre-test with three persons from three companies who were in the same industry as the sample but were not part of the sample in this study.

3.2.2.7 Checked the data collected from the pre-test.

3.2.2.8 Revised the structured interview guide.

3.3 Procedures

The procedures of this study were as follows:

3.3.1 Reviewed related literature from documents, textbooks and research papers.

3.3.2 Designed the structured interview.

3.3.3 Interviewed the sample.

3.3.4 Collected and analyzed data.

3.3.5 Wrote a report.

3.4 Data collection

The data were collected by the researcher. The procedures of collecting the data were:

3.4.1 The researcher made an appointment for an interview with the sample by mailing them letters from the Faculty of Social Sciences and Humanities, Mahidol University requesting for their cooperation in interviewing, then confirmed the date, time and venue for the interview by phone.

3.4.2 The equipments for the interview, such as, the interview guide, tape recorders was prepared.

3.4.3 The interviewees were interviewing at the offices of them.

3.4.4 The researcher conducted the interview. Data were also verified during the interview. In case of the data were not clear, the researcher re-asked.

3.4.5 The researcher requested the interviewees for permission to record during the interview. In case of the interviewees did not permit to have the data taped, the researcher would write down the data instead.

3.5 Data verification

The researcher made a literal transcript from the tape-recorded data. Data reliability were verified by using Triangulation(Denzin, 1970: 241).

3.5.1 Investigator triangulation

The researcher conducted the interview while three assistant researchers wrote the data down. The researcher and the assistants worked together to verify the data. If any disagreement on the data verification occurred among the researcher and the three assistants, three out of four points in voting would be accepted, otherwise, they would discuss, analyze and find out for the conclusion.

3.5.2 Data triangulation

In this study, the researcher verified the follow data:

1) Personnel source verification

The interviewees of this study were persons who were directly responsible for the environmental management system ISO 14000.

2) Time verification

Two weeks after the interview, the researcher contacted the interviewees for the second interview to confirm the data.

3) Place verification

The researcher conducted the interview as well as made a study tour of inspection at the interviewees' workplace.

3.5.3 Methodology triangulation

In this study, interviewees were asked the same questions according to the structured interview guide. The researcher conducted the interview together with tape recording and then made a transcript from the tape-recorded data. The information

from the documents concerning training procedures of the sample were also verified. Finally, the researcher analyzed all the given data.

3.6 Data analysis

The procedures of analyzing data were the follows:

3.6.1 The tape-recorded data were transcribed literally and then were categorized according to the questions required to cover the purposes of this study.

3.6.2 The data were analyzed by means of analytic induction. The researcher concluded the given data and then formulated a hypothesis, made a preliminary analysis and other conclusions periodically. In case the collected data were incomplete, the researcher collected additional data and revised the hypothesis. When the revised hypothesis was verified, it would be considered a final conclusion.

3.6.3 To confirm the final conclusion, the researcher discussed it with three advisors or experts in the environmental management system ISO 14000. The three experts were:

1) Assoc. Prof. Dr. Somkid Isarawatana, Ph.D., Faculty of Social Sciences and Humanities, Mahidol University.

2) Dr.Boonlue Tong-yoo, Ed.D., Deputy Permanent Secretary for Education, Ministry of Educution.

3) Mr. Narong Rattana, MSCD., Thai Director at Thai-German Institute.

3.7 Statistical analysis

Data were analyzed by means of frequency distribution analysis.

CHAPTER IV

RESULTS

The purpose of this study investigated how the human resource development in chemicals and chemical products related industries for the environmental management system (ISO 14000).

Research results

Part I: Demographic data

4.1 Demographic data

The sample of this study were ten companies in the chemicals and chemical product related industries. All of these companies were certified with the environmental management system ISO 14000, and are located in Rayong Province.

It was found that more than half of them (six companies) have been carried out their enterprises for more than ten years. While the enterprises of three companies and the other one spent 5-10 years, and less than five years respectively.

The majority of them (seven companies) were certified with the environmental management system ISO 14000 in 1999, two of them were certified in 1998, and the other one was certified before 1998.

Five companies were issued with the Environmental Management System ISO 14000 certificates from TISI, while BVQS and AJA EQS (Thailand).

The duration that the sample spent for the achievement the Environmental Management System ISO 14000 certificate, four companies spent 6 – 12 months, three of them spent 13-18 months, and three spent 19-24 months.

The details of the sample were shown in table I

Table I: Demographic data of the sample

Demographic data	Number of companies (N=10)
1. The duration for carrying out the enterprise.	
- Less than 5 years	1
- 5-10 years	3
- More than 10 years	6
2. The year in which the company was certified with the environmental management system ISO 14000.	
- Before 1998	1
- 1998	2
- 1999	7
3. The certified of the company was issued with to the environmental management system ISO 14000 certificate.	
- TISI	5
- BVQS	2
- AJA EQS (Thailand)	2
- SGS	1
4. The duration spent for the achievement of the environmental management system ISO 14000 certification.	
- Less than 6 months	0
- 6-12 months	4
- 13 – 18 months	3
- 19-24 months	3

4.2 Demographic data of the interviewees

Data were collected by means of direct interviews from ten executives or persons who were responsible for the human resource development of the sample. Among the interviewees, nine were males and one was female. More than half of them (six interviewees) were between 36-45 years of age.

In terms of educational attainment, six of them were bachelor's degree graduates or equivalent while four of them were higher than bachelor's degree graduates.

It was found that the majority of them (seven interviewees) were graduated from fields which was not related to the international standard for the environmental management system ISO 14000, while only one graduated from the related field.

In terms of their present position, five of them were environmental management representatives (EMR), four were personnel department managers and the other was employee-relation manager.

Half of them (five interviewees) have been in their present position between 2-5 years.

It was also found that nine of ten interviewees had between 5-25 years work experience.

Among these interviewees, six of them have been working in their present companies for more than five years.

The details of the interviewees were shown in table II.

Table II: Demographic data of the interviewees

Demographic data	Number of companies (N=10)
1. Sex	
- Male	9
- Female	1
2. Age	
- Under 25 years	0
- 25-35 years	4
- 36-45 years	6
- Over 46	0
3. Education background	
- Over high school but under bachelor's degree.	0
- Bachelor' degree or equivalent.	6
- Higher than bachelor's degree.	4
4. How related is the field of their education to the International Standard for Environmental Management System ISO 14000.	
- irrelevant	7
- partly related	2
- directly related	1
5. Position	
- Environmental Management Representative(EMR).	5
- Personal department manager .	4
- The Employee-relation manager.	1
6. The duration for being in the present position.	
- Less than 2 years	2
- 2-5 years	5
- More than 6years	3
7. Work experience	
- Less than 5 years	1
- 5-10 years	2
- 11-15 years	3
- 16-20 years	2
- 21-25 years	2
- More than 25 years	0
8. Work experience in the present company.	
- Less than 5 years	4
- 5-10 years	3
- 11-15 years	3
- More than 16years	0

Part II: Activities of human resource development of companies in preparation for the environmental management system ISO 14000.

It was found that there were two courses provided for developing the human resource for the environmental management system ISO 14000.There were:

1. Core courses
2. Compulsory course

1. Core courses

Core courses were courses which all workers of the organization have to participated.

1.1 The title of the course name

This study was found that their organizations could be certified with the environmental management system ISO 14000, all workers in ten sample were required to take one core courses so that. However, names of core courses was different as follows:

- *ISO 14000 Awareness *(Stone, Sky, Sand, Soil).*
- *Introduction to ISO 14000 (Cloud, Fire, Wind).*
- *Environmental awareness 14000 (Rain).*
- *Fundamental knowledge of ISO 14000 (Fog).*
- *General knowledge of quality and environmental system (Water).*

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* The names following the speech of the sample are assumed by the researcher not the real names of the sample.

1.2 Duration of training

The majority of them (seven companies) spent six hours, two companies spent three hours and the other one spent two hours.

1.3 Participants

The numbers of the participants participated in taking the core courses of five companies were forty, three companies were fifty, and in each of other two companies were sixty and twenty.

1.4 Contents

The contents of the core courses of ten companies were the same.

1. Company's policy
2. Personnel's role and duties
3. Awareness
4. Fundamental knowledge of ISO 14000
5. Regulations of ISO 14000
6. Advantages

They were different in eight items as follow:

1. Company's environmental problems
2. General environmental problems
3. Usage of operational manuals and instruction
4. Waste management
5. Related laws
6. Energy conservation
7. Against chemicals, accidents and emergency events
8. Evaluation of environmental impacts

1.5 Resource persons

Half of them (five companies) invited in internals resource persons, Three companies invited in external resource persons and the other two companies invited in both internal and external resource persons.

1.6 Training methods

All of the sample invited in the lecture in training core courses, including other methods. the video (six companies), practicum (five companies),and role-playing and case study.

1.7 Training evaluation

Five companies evaluated the training by pre-test and the post-test, two companies evaluated it by only the post-test, Two companies invited in the training attendance and the other one invited in the question-answer method.

Details were shown in table III.

From the analysis of this study, the core courses could be divided in terms of the duration into three groups as follows:

Groups I: Core courses (six hours)

Groups II: Core courses (three hours)

Groups III: Core courses (two hours)

Groups I: Core courses (six hours)

The study was found that the majority of them (seven companies) (Stone, Water, Cloud, Rain, Sky, Sand, Fog) spent six hours in training their core courses. The numbers of the participants were 20-60. The positions of the participants were general manager employees. Their core courses contents were:

1. Company's policy
2. Personnel's roles and duties
3. Awareness
4. Fundamental knowledge of ISO 14000
5. Regulations of ISO 14000
6. Advantages
7. Company's environmental problems
8. General environmental problems
9. Usage of operational manuals and instructions

They were different in five items as follows:

1. Waste management (Stone, Rain, Sky, Sand, Fog)
2. Related laws (Stone, Rain, Fog)
3. Energy conservation (Stone, Cloud, Fog)
4. Against chemicals, accidents and emergency events (Stone, Cloud, Rain)
5. Evaluation of environmental impacts (Cloud, Rain)

In terms of the training resource persons of the six hours core courses training, it was found that four sample (Stone, Water, Sky, Sand), were invited in internal resource persons. Two companies (Cloud, Rain) were invited in external resource persons , and the other one (Fog), invited both internal and external resource persons. -

- *By internal resource persons from our own training development, because they have already been trained for this course (Stone).*
- *By our bosses and training team who are the company's environmental*

committee (EMR) because they have already been trained for this course (Water).

- *By internal resource persons as the company's engineers (Sky).*

- *By internal resource persons, most of them are our own personnel or from our Cement group (Sand).*

- *By internal resource persons from Safety office and NBC, BVQI which are our consultant firms (Cloud).*

- *By external resource persons from Thailand Environment Institute(TEI) (Rain).*

- *By external resource persons from the Federation of Thai Industries. And Thailand Environment Institute,the participants of the first session were executives and supervisors. However, the participants of the next session were trained by our internal resource persons who are ISO –coordinators (Fog).*

In terms of training methods, it was found that (seven companies) invited in the lecture, and such as five companies (Stone, Water, sky, Sand, fog) invited in the Video, three companies (Cloud, Rain, Sand)invited in the practicum , One company (Rain) invited in the role-playing and one company (Sand) invited in the case study.

- *By the video and the lecture with transparencies (Stone).*

- *By the lecture and the video on the environmental problem. The question-answer method was also invited in to help the participants raise up the existing environmental problems and find a solution (Sky).*

- *Mostly by the lecture with transparencies in conjunction with the video from Thailand Environment Institute (Sky).*

- *By the lecture with transparencies and illustration, The video, the*

workshop, the case study, and the practicum on fire escape (Sand).

- *By the lecture with transparencies, together with the video on the environmental problems. The video help the participants' attention, because it was realistic (Fog).*
- *Mainly by the lecture with transparencies in conjunction with the workshop (Cloud).*
- *By the lecture, the role-playing and also the workshop (Rain).*

For evaluation, three sample (Sand, Sky, Fog) were evaluated by pre-test and post-test, Two companies (Rain, Sand) by the training attendance and each of the other two companies (Cloud, Water) by post-test and question-answer method respectively.

- *The criteria of pre-test and post-test is 50 % (Stone).*
- *From pre-test and post-test, no body failed because the tests were about the training content, routine work, and what they have already known. This was just a warning of the bad effects if they did not follow the procedures (Sky).*
- *The criteria of pre-test and the post-test is 70% but were not difficult. Participants who did not pass will take another test. and all of them finally passed (Fog).*
- *From the training attendance (Rain).*
- *From only the full training attendance because it was a company course which would be recorded in the employees' profile according to ISO 14000 regulations. No evaluation in the participants' understanding (Sand).*
- *The criteria of post-test is 60% (Cloud).*
- *There was no test. Just like a talk. Anyone could ask what they wanted to*

know. The resource person asked and the participants answered. If they could not answer, the resource person suggested what they should answer because all the questions asks by the resource person were the ones the participants would be asked surely in the audit (Water).

Details were shown in table III.

Group II: Core courses (three hours)

The study was found that two companies (Soil, Fire) spent three hours in training their core courses. The numbers of the participants were 40-50 and the position of participants were employees. Their core courses contents were the same in seven items as follows:

1. Company's policy
2. Personnel's role and duties
3. Awareness
4. Fundamental knowledge of ISO 14000
5. Regulations of ISO 14000
6. Advantage
7. Company's environmental problems

The instructions of the three hours core courses, it was found that one company (Soil) invited in internal resource persons and the other company (Fire) invited in external resource persons.

By external resource persons. I myself was responsible for this course because I have already taken the course concerning the environment and I have been awarded with the certificate (Soil).

- *By external resource persons whom we considered from their teaching experiences in this course (fire).*

Methods being invited in resource persons, it was found that the resource persons of both companies (Soil, Fire) invited in the lecture with the practicum, while one company (Soil) invited in the lecture and the video.

- *Mainly by the lecture, the Video and the workshop. There was also a field study in the department to write an aspect plan (Soil).*
- *By the lecture, and the workshop (fire).*

The training evaluation, one company (Soil) invited in the post-test, which the other company (Fire) evaluated by both pre-test and post-test

- *The resource person's performance was also performed. The participants' knowledge was evaluated from the post-test with 70% criteria. If they failed, they would take another test until they could pass it (Soil).*
- *From the pre-test and the post-test. Everyone passed (Fire).*

Details were shown in table III

Group III: Core courses (two hours)

The study was found that there was only one company (Wine) which spent two hours in the core courses. The numbers of the participants were forty, and the position of the participants ranged from manager to general personnel. Some of the participants worked for the group related to the company. The core courses contents were the same in six items as follows:

1. Company's policy
2. Personnel's role and duties
3. Awareness
4. Fundamental knowledge of ISO 14000
5. Regulations of ISO 14000
6. Advantages

The training resource persons, It was found that the sample invited in internal resource persons together with external resource persons.

- *By the external resource persons from Thailand Environment Institute, Ministry of Industrial The Federation of Thai Industries whom we considered from their experiences and the work because they understand our production process. However, for the next courses, the participants were instructed by our own personnel. (Wind).*

It also found that the resource persons invited in the lecture for the core courses (two hours).

- *By the lecture with transparencies. This course took only two hours. It focused in only on the important process (Wind).*

The training evaluation, the sampled invited in the pre-test and the post-test.

- *From the pre-test and the post-test with 50% criteria (Wind)*

Details were shown in table III.

Table III: Core courses

NO.	Companies / Course details	Stone	Water	Cloud	Rain	Sky	Sand	Fox	Fire	Soil	Wind	Total N=10
1.	**Duration (hour)**	6	6	6	6	6	6	6	3	3	2	-
2.	**Number of the participants a session**	60	50	50	40	40	40	20	50	40	40	-
3.	**Contents of the core courses**											
3.1	- Company's policies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.2	- Personnel's role and duties	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.3	- Awareness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.4	- Fundamental knowledge of ISO 14000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.5	- Regulation of ISO 14000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.6	- Advantages	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.7	- Company's environmental problems	✓	✓	✓	✓	✓	✓	✓	✓	✓		9
3.8	- General environmental problems	✓	✓	✓	✓	✓	✓	✓				7
3.9	- Usage of operational manuals and instruction	✓	✓	✓	✓	✓	✓	✓				7
3.10	- Waste management	✓			✓	✓	✓	✓				5
3.11	- Related laws	✓			✓			✓				3
3.12	- Energy conservation	✓		✓				✓				3
3.13	- Safeguards against chemicals' accidents and emergency	✓		✓	✓							3
3.14	- Evaluation of environmental impacts			✓	✓							2
	Total	**13**	**9**	**12**	**13**	**10**	**10**	**12**	**7**	**7**	**6**	-
4.	**Resource persons**											-
4.1	- Internal	✓	✓			✓	✓			✓		5
4.2	- External			✓	✓				✓			3
4.3	- Both							✓			✓	2
	Total	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**10**
5.	**Training methods**											
5.1	- lecture	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
5.2	- Video	✓	✓			✓	✓	✓		✓		6
5.3	- Practicum			✓	✓		✓		✓	✓		5
5.4	- Role playing				✓							1
5.5	- Case study						✓					1
	Total	**2**	**2**	**2**	**3**	**2**	**4**	**2**	**2**	**3**	**1**	-
6.	**Training evaluation**											
6.1	- Both pre-test and post-test	✓				✓		✓	✓		✓	5
6.2	- Only the post-test			✓						✓		2
6.3	- Training attendance				✓		✓					2
6.4	- Question-answer method		✓									1
	Total	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**10**

2. Compulsory courses

Compulsory courses were course which workers of each development have to participated

The study was found that workers of each department in ten companies were required to take two compulsory courses as follows:

2.1 Internal audit course

2.2 Work instruction course

2.1 Internal audit course

2.1.1 Duration of training

Four companies spent twelve hours internal audit course, which three companies spent twenty four hours and the other three companies spent six hours.

2.1.2 Participants

The participants participated in taking the internal audit course of three companies were thirty, three companies were eight, two companies were twelve, and in each of the other two companies were fifty and twenty. The positions of the participants were supervisor, a chief or manager.

2.1.2 Contents

The contents of the internal audit course of ten companies were the same in three items as follows:

1. Method of identifying non-conformance
2. Steps of conducting an audit
3. Techniques of conducting an audit

They were different in six items as follows:

1. Risk evaluation
2. Audit according to the regulations
3. Revisions of ISO 14000 basic
4. Establishment of operational manuals and instructions
5. Establishment of the company's environmental plan
6. Advantage of conducting an audit

2.1.4 Resource persons

The majority of them (six companies) invited in external resource persons for the training of the internal audit course, while four companies invited in internal resource persons.

2.1.5 Training methods

All of ten companies invited in the lecture and practicum. Each of the two companies invited in case study and group meeting.

2.1.6 Training evaluation

Almost of them (nine companies) evaluated the training by practicum, while another company evaluated it by the pre-test and the post-test. Some companies invited in more than one method: the practicum and the post-test(four companies), the practicum and the training attendance (three companies), another company invited in the practicum and the question-answer.

This study, the internal audit course could be divided in terms of the duration into three groups as follows:

Group I: Internal audit (twenty four hours)

Group II: Internal audit (twelve hours)

Group III: Internal audit (six hours)

Group 1 : Internal audit (twenty four hours)

This study was found that three companies (Water, Fire, Stone) spent twenty four hours training their internal audit course. The numbers of the participants were 8-30. The positions of the participants were section chief or section manager. The course contents were the same in seven items as follows:

1. Method of identifying non-conformance
2. Steps of conducting an audit
3. Techniques of conducting an audit
4. Risk evaluation
5. Audit according to the regulations
6. Revisions of ISO 14000 basic
7. Establishment of operational manuals and instructions

They were different in two items as follows:

1. Establishment of the company's environmental plan (Water, Fire).
2. Advantage of conducting an audit (Stone).

The resource persons of the twenty four hours internal audit course, it was found that two companies (Stone, Water) invited in internal resource persons, while the other company invited in external resource persons.

- *By internal resource persons (Stone, Water).*
- *By external resource persons from the consultant firm (Fire).*

The training methods, it was found that three companies (Water, Fire, Stone) invited in the lecture and the practicum. The case study was additionally preformed by one company (Fire)

- *By the lecture and the workshop (Water, Fire, Stone).*
- *By the lecture. The case study was also preformed to check which regulations or laws the work did not comply with and then the study result was presented (Fire).*

The training evaluation, the study was found that two companies (Water, Fire) evaluated by the practicum and the other one (Stone) invited in both pre-test and post-test.

- *From the participants' work practicum. There was no test (Work).*
- *From the participants' work practicum. There was no test (Fire).*
- *From the pre-test and the post-test with 50-50 criteria. No one failed (Stone).*

Details were shown in Table IV.

Group II: Internal audit (twelve hours)

The study was found that four companies (Soil, Sky, Wind, Rain) spent twelve hours training the internal audit course. The numbers of the participants were 12-30. The positions of the participants were supervision, chiefs or manager of section. The internal audit course contents were the same in three items as follows:

1. Method of identifying non-conformance
2. Steps of conducting an audit
3. Techniques of conducting an audit

They were different in five items as follows:

1. Risk evaluation (Soil, Sky, Wind)
2. Audit according to the regulations (Soil, Sky, Wind)
3. Revision of ISO 14000 basic (Soil, Sky, Rain)
4. Establishment of the company's environmental plan (sky, Wind, Rain)
5. Advantage of conducting an audit (Soil)

The training resource persons, it was found that three companies (Soil, Sky, Rain) invited in external resource persons while the other company invited in internal resource persons.

- *By external resource persons from Thailand Environment Institute (Soil).*
- *By external resource persons from the consultant firm (Sky).*
- *By external resource persons from Thailand Environment Institute because they had more experiences (Rain).*

- *By external resource persons (Wind).*

The study was found that the resource persons of four companies with the twelve hours internal audit invited in the lecture and the practicum.

- *By the lecture and the workshop (Rain, Sky, Soil).*
- *Not many training techniques were invited in. By the lecture with transparencies and giving examples of actual problem facing the factory for discussion. Workshop was also performed because it was a good learning method and it encouraged the participants to express their ideas (Wind).*

The training evaluation, four companies evaluated by the practicum together with other methods. Three companies (Rain, Sky, Soil) invited in the post-test and two companies (Rain, Wind) evaluated it by the training attendance

- *From the training attendance, the post-test with 70%criteria and from the practicum (Rain).*
- *The participants had to be able to conduct an audit according to the regulations and the resource person's requirement. They also had to take the post-test. If they pass it, they would be awarded the certificates (Sky).*
- *From the post-test with about 70% criteria to assess the participants' knowledge. In case they failed, they would take another test unit they could pass it. The participants also had to be able to conduct an audit (Soil).*
- *From the 80% training attendance. The participants also had to be able to conduit an audit. There was no test (Water).*

Details were shown in Table IV.

Group III : Internal audit (six hours)

The study was found that three companies (Fog, Cloud, Sand) spent six hours the internal audit course. The numbers of the participants were 8-50. The training for this course were supervisors, chiefs or managers. The contents were the same in three items as follows:

1. Method of identifying non-conformance
2. Steps of conducting an audit
3. Techniques of conducting an audit

The training resource persons, two companies(Fog, Cloud) invited in external resource persons while the other company invited in internal resource persons.

- *By external resource persons from the consultant firm because they understand our work, problems and work procedures (Fog).*
- *By external resource persons from the consultant firm (cloud).*
- *By internal resource persons. Most of them were our own personnel or from our cement group (sand).*

The training methods,it was found that three companies invited in the lecture and the practicum. One company (Sand) also invited in the group meeting and the lecture.

- *By the lecture and the workshop (Cloud, Fog).*
- *By the lecture and transparencies. The real case and problems were discussed. Workshop was also performed because it was a good learning method and it encouraged the participants to express their idea (Sand).*

The training evaluation, three companies evaluated by the practicum. Other methods were also. One company (Fog) evaluated by the question-answer ,another company (Cloud) evaluated by the post-test, while the other company (Sand) evaluated by the training attendance.

- *From the participants' practicum. They had to able to describe the procedures and to conduct an audit. The resource person also evaluated the participants' understanding by asking them some question. No evaluation from the test (Fog).*

- *From the post-test with 60% criteria. The participants also had to be able to conduct an audit (Cloud).*

- *The participants' knowledge was not evaluated but they had to be able to conduct an audit. The training attendance was also invited in for evaluation because this course was the compulsory one and it had to be recorded in the employees' profile according to ISO 14000 regulations (Sand).*

Details were shown in table IV.

Table IV: Internal audit courses

NO	Companies / Course details	Water	Fire	Stone	Soil	Sky	Wind	Rain	Fox	Cloud	Sand	Total N=10
1.	**Duration (hour)**	24	24	24	12	12	12	12	6	6	6	-
2.	**Number of the participants a session**	8	8	30	12	12	30	30	8	20	50	-
3.	**Contents of the Core courses**											
3.1	- Method of identifying non-conformance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.2	- Steps of conducting an audit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.3	- Techniques of conducting an audit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.4	- Risk evaluation	✓	✓	✓	✓	✓	✓					6
3.5	- Audit according to the regulations	✓	✓	✓	✓	✓	✓					6
3.6	- Revision of ISO 14000 basic	✓	✓	✓	✓	✓		✓				6
3.7	- Establishment of operational manuals and instructions	✓	✓	✓								3
3.8	- Establishment of the company's environmental plan	✓	✓			✓	✓	✓				5
3.9	- Advantage of conducting an audit			✓	✓							2
	Total	8	8	7	7	7	6	5	3	3	3	-
4.	**Resource persons**											
4.1	- External		✓		✓	✓		✓	✓	✓		6
4.2	- Internal	✓		✓			✓				✓	4
	Total	1	1	1	1	1	1	1	1	1	1	10
5.	**Training methods**											
5.1	- lecture	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
5.2	- Practicum	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
5.3	- Case study		✓									1
5.4	- Group meeting										✓	1
	Total	2	3	2	2	2	2	2	2	2	3	-
6.	**Training evaluation**											
6.1	- Practicum	✓	✓		✓	✓	✓	✓	✓	✓	✓	9
6.2	- Post-test			✓	✓	✓		✓		✓		5
6.3	- Training attendance						✓	✓			✓	3
6.4	- pre-test			✓								1
6.5	- Question-answer method								✓			1
	Total -	1	1	2	2	2	2	3	2	2	2	-

2.2 Work instruction course

When the overall of the work instruction course in the study was analyzed, it was found that:

2.2.1 Duration

Seven companies spent three hours training the work instruction, while the other three companies spent two hours.

2.2.2 The participants

The numbers of the participants participated in taking the work instruction of six companies were 5-10, and the other four companies were10-15. The participants of this course were operational employees of each department.

2.2.3 Contents

The contents of the work instruction of ten companies were the same in only one item about knowledge of the work related to the regulations of the environmental management system ISO 14000. The environmental laws and waste & rubbish management were also added in the work instruction for one company.

2.2.4 Resource persons

Ten companies invited in their own internal resource persons

2.2.5 Training methods

Ten companies invited in the lecture and the practicum.

2.2.6 Training evaluation

Ten companies evaluated by the practicum.

From the analysis of this study, the work instruction could be divided in terms of the duration into two groups as follows:

Group 1: Work instruction (three hours)

Group 2: Work instruction (two hours)

Group 1 : Work instruction (three hours)

The study was found that seven companies (Cloud, Water, Sand, Fog, Rain, Fire, Stone) spent three hours training the work instruction. The numbers of the participants were 5-15, The participants were operational employees of each department. The content was about the knowledge of the work related to the regulations of the environmental management system ISO 14000. The contents on the related law and the waste & rubbish management were added for the training of one company (Sand).

The study was found that seven companies with the three hours work instruction invited in internal resource persons.

- *By internal resource persons because they could teach more exactly what the company required than the external resource persons (Cloud).*

- *By the boss and our training team because our company has the environmental committee (EMR) (Water).*

- *By internal resource persons. Most of them were our own personnel or from our cement group (Sand).*

- *By internal resource persons. Who were the personnel responsible for the system because they understood the company's work well (Fog).*

- *By internal resource persons because they could teach the exact subject related to the participants' work. This also saved cost and made it convenient to do the follow-up (Rain).*

- *I was one of the internal resource persons. The supervisors who have already been trained were the resource persons for this course as well (Fire).*

- *By internal resource persons of our training department. They have already been trained. This also save the company's cost (Stone).*

The training methods, seven companies invited in the lecture and the practicum.

- *By on- the job training (Cloud).*

- *By giving the participants advice together with the actual practicum at work (Water).*

- *By the actual practicum together with giving instruction. The participants were also given knowledge of the regulation related to their work (Sand).*

- *By on-the job training. The participants were also asked some questions to check their understanding and they could manage it (Fog).*

- *The supervisor inspected the participants' practicum and gave them some advice about the regulations related to their work (Rain).*

- *First by inspecting whether the participants followed the regulations or not. Then, the supervisor gave them additional knowledge at work according to the work instruction (Fire).*

- *The supervisor inspected while the participants were working and gave them some advice together with the actual practicum (Stone).*

For evaluation, seven companies were evaluated by the practicum.

- *From the audit while the participants were working to see if they followed the procedures or ignored what they had been taught. If they worked by habit, they would be given CAR (Corrective Action Request) (Cloud).*
- *No formal test but the participants' understanding was evaluated from their work (Water).*
- *From the participants' practicum (sand).*
- *From the participants' work. They had to be able to describe work procedures. Moreover to check their understanding, the resource person asked them some question. There was no formal test (Fog).*
- *From the participants' practicum. (Rain)*
- *From the participants' practicum to check whether they followed the regulations and they could solve the problems or not. (Fire)*
- *From the participants' practicum by conducting an audit. (Stone)*

Details were shown in table V.

Group II: Work instruction (two hours)

The study was found that three companies (Wind, Soil, Sky) spent two hours work instruction. The numbers of the training were 5-10. The participants were operation employees. The contents of the work instruction were the knowledge of the work related to the regulations of the environmental management system ISO 14000.

The resource persons, It was found that three companies invited in internal resource persons.

- *By internal resource persons who have already been awarded the certificates for this course (Wind).*

- *By internal resource persons who have already been awarded the certificates for this course because they understand the work well (Soil).*

- *By internal resource persons. The participants were also given related manuals (Sky).*

The methods training, It was found that three companies invited in the lecture and the practicum for the work instruction.

- *By on-the-job training by supervisors who have already been awarded the certificates for this course (Wind).*

- *By the lecture according to the work instruction manual given by EMS. It was also on-the-job training (Soil).*

- *By on-the-job training (Sky).*

The training evaluation, it was found that three companies evaluated by the practicum.

- *From the participants' practicum to see whether after the training. They still followed the regulations, and their working habit was changed or not (Wind).*

- *From the participants' practicum and documents according to the regulations (Soil).*

- *From the participants' practicum to inspect whether it complied with the regulations or not. There was no test (Sky).*

Details were shown in table V.

Table V: Work instruction courses

NO	Companies / Course details	Cloud	Water	Sand	Fox	Rain	Fire	Stone	Wind	Soil	Sky	Total N=10
1.	**Duration (hour)**	3	3	3	3	3	3	3	2	2	2	-
2.	**Number of the participants a session**	5 - 10	5 - 10	5 - 10	10-15	10-15	10-15	10-15	5 - 10	5 - 10	5 - 10	-
3.	**Contents of the course**											
3.1	- Knowledge	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
3.2	- Related laws			✓								1
3.3	- Waste &Rubbish management			✓								1
	Total	1	1	3	1	1	1	1	1	1	1	10
4.	**Resource persons**											
4.1	- Internal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
4.2	- External											-
	Total	1	1	1	1	1	1	1	1	1	1	10
5.	**Training methods**											
5.1	- Lecture	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
5.2	- Practicum	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
	Total	2	2	2	2	2	2	2	2	2	2	-
6.	**Training evaluation**											
6.1	- From the Practicum	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
6.2	**Total**	1	1	1	1	1	1	1	1	1	1	10

Part III: Supporting factors and suggestions for the human resource development for the environmental management system ISO 14000.

1. Supporting factors for the human resource development for the environmental management system ISO 14000

The supporting factors for the human resource development of the sample for the environmental management system ISO 14000 could be divided into four parts as follows:

1.1 Activities for previously implemented before ISO14000

1.2 Executives

1.3 Employees

1.4 Persons who were responsible for the human resource development

1.1 Activities previously implemented before ISO 14000

The study was found that the sample have previously implemented other activities as ISO 9000, 5S activities, or TQM before the implementation of ISO 14000

- *We have implemented the ISO 9000 before there is no problem about the system (Sand).*
- *We have implemented the ISO 9000 so our work is systematic with the persons responsible for the system. Moreover, 5S activities had been implemented before ISO 9000 (Wind).*
- *We have implemented TQM. Before ISO 9000 and ISO 14000 (Soil).*
- *We have implemented ISO 9000 before and our work is systematic only document is increased and We have to follow the regulation (Sky).*
- *Our company has implement 5S activities and ISO 9000 before. This makes it easier to implement ISO 14000 because of the same documentation system (Rain).*
- *Our work is systematic. We have implement 5S. Activities before ISO 9000 and ISO 14000 (Fog).*
- *Our work is systematic and we have already trained for the quality activities as 5S, and ISO 9000. More documents are added. It means more work but only at the first stage (cloud).*
- *Other activities such as 5S and TQM have been implemented. Our work is systematic so it is easier to implement ISO 14000 (Water).*
- *Our work is systematic and we have already implemented 5S. Activities and ISO 9000 so it is easier to implement ISO 14000 (Stone).*

1.2 Executives

The study was found that the executives supported the human resource development in the companies by apportion the budget, defining the policy, and being cooperative in the training activities as well as the follow-up.

- *The executives were cooperative in attending the training and in work follow up. All section were also cooperative (Sand).*

- *It was the executives' policy. There were very cooperative (Stone).*

- *The executives were cooperative in attending the training because it was the company's policy (Cloud).*

- *The executives were very cooperative because it was the company's policy and good image (Fog).*

- *The executives supported us all. This made it easy and convenient to work (Water).*

- *The executives were very cooperative in the system implementing, all expenses especially in the initial stage and also the training (fire).*

- *The executives and all sections realized the importance of the training (Soil).*

- *The executives realized the importance of training they were very cooperative and also supported the budget of the training (Sky).*

- *The executives were cooperative and there was no problem about the budget (Rain).*

1.3 Employees

The study also found that the companies' employees supported cooperative in conducting and attending the training activities.

- *All employees were cooperative because it was the company's policy. Moreover, They knew that these activities brought about advantages to them and good working surroundings (Rain).*
- *All employees were very cooperative (Water).*
- *The employees were very cooperative (Soil).*
- *All employees followed the policy. They had to learn the regulations so that they could answer when being asked. They could answer because it was their routine work (Fog).*
- *All employees have been trained for the ISO 14000 (Sand).*
- *To conform to the company's regulation, it was all employees' duty to attend the training (Stone).*
- *We had to set the training sihidyle before and informed it to the supervisors to divide the employees into group to attend the training. All of them were very cooperatives (Fire).*
- *All employees attend the training. It was their duty and responsibility. Not an additional work (Water).*
- *The employees were divided into grouped and each group was trained as schedules. Supervisors and all employees were cooperative (Cloud).*
- *All employees were interested in attending the training. Some were sometimes busy but finally all of them have been trained (Sky).*

1.4 Persons who were responsible for human resource development

The study was found that the sample had appointed the persons from related departments responsible for the environmental management system.

- *The people responsible for the training of the ISO 14000 regarded it as one of their duties. However, SHE was responsible for determines plan and curriculum and the training department only coordinated for this course (Cloud).*
- *The persons in charge of the training could manage the training because it was like other ones but focusing on environment issues of which EMS supported the curriculum plan. The document department was responsible for the employees' records (Sky).*
- *The persons in charge realized that it was their regular duty (Rain).*
- *The persons in charge considered it a duty not an additional work (Water).*
- *All sections were cooperative and followed the plan (Sand).*
- *We followed the regulation and plan submitted by EMS (Stone).*
- *The company's team followed the training plan of the ISO 14000 because it was their duty (Wind).*
- *The person in charge was assigned to do this work. It was not regarded as an additional work (Soil).*
- *All sections related to the training and the ISO 14000 were very cooperative (Fog).*

2. Suggestions for companies which plan to develop the human resource development for the environmental management system ISO 14000.

The interviewees of ten companies suggested for the successful human resource development in preparation for the environmental management system ISO 14000 as follows:

2.1 Motivation, encouragement and follow-up

All interviewees suggested that the motivation as well as the encouragement must be developed, and followed -up all employees' work must be performed continually and regularly.

- *Continuity is important so continual improvement should be performed. The training, the refreshment meeting, morning talk on environment, notices are provided to increase the employees' knowledge. Moreover, the employees should be informed of their duties, the advantages of energy conservation because this encourages them to be more cooperative (Fire).*

- *Retraining must be provided continually. This encourages the employees' interest in continually performing their duties and builds up their awareness. Moreover, documents, journals, and boards are provided and our employees are more interested (Soil).*

- *Continual training activities, good public relations as the publishing of internal journals, should be provided. The employees' environmental awareness, working surroundings, the company's image as well as the waste reduction are obviously better (Cloud).*

- *All employees should be aware of the importance of the environment. Top executives should also be cooperative and find out a way to encourage the employees awareness about the environment for the company's good image as well as for their safety (Sky).*

- *The training for the ISO 14000 aimed to cultivate the employees' awareness. Monitoring if the employees follow the regulations must be conducted continually, Moreover, to increase the employees knowledge of the environmental issues, our company provides them with a board presentation, internal journals and intrane. (Rain).*

- *Working surrounding is better. The employees convinced that they gain advantages from the implementation of ISO 14000. This encourages them to cooperate with the company (Water).*

- *We can see its advantages obviously. We were accepted from the community. A lot of factories in Mabthaputh have implemented the ISO 14000 so we had to implement it as well (Sand).*

- *All employees should be informed and realized of the advantages of the implementation if the ISO 14000 : better work surroundings, better image of the company (Stone).*

- *There should be a reliable system accepted by the society. All employees should be aware of the environmental conservation. They can make it a habit from being often trained (Wind).*

- *By making the employees recognize the conservation save cost. Moreover, the implementation of the ISO 14000 affects the goods selection of customers. We are sometimes asked if we have implemented the ISO 14000 and we always feel proud that we have already done it (Fog).*

2.2 Cooperation

The interviewees of nine companies suggested that the cooperation of the employees at all levels were necessary for the human resource development for the environmental management system ISO 14000.

- *It is better if the training enables the employees to understand and be cooperative. How to increase the employees' awareness should be provided (Water).*
- *Activities for training and the refreshment meeting were provided to make the employees in all sections realize the importance and advantages of the cooperation (Fire).*
- *All employees were cooperative because it was the company's policy. Moreover, they knew that these activities brought about advantages to them as better working surroundings (Rain).*
- *All employees were cooperative (Soil).*
- *All employees followed the policy. They had to learn the regulations so that they could answer when being asked. They could answer because it was their routine work (Fog).*
- *Awareness is important. Top executives must also be cooperative (Sky).*
- *The executives were cooperative in attending the training, monitoring and follow up the work. All sections were also cooperative (Sand).*

- *The executives were cooperative in the system implementing, all expenses and the training as well (Fire).*

- *The executives played an important role in making everyone in the company understand the objective of the policy (Stone).*

2.3 Knowledge of the environment

The interviewees of five companies suggested that all employees must be educated and understood the environment.

- *All employees must be informed clearly of the ISO 14000 and its advantages (Sand).*

- *All employees must be informed of the ISO 14000 so that they have the same understanding. The executives also plan an important role in making everyone in the company understand the objective of the company (Stone).*

- *All employees should be trained to realize their roles and duties. They also had to be made to realize and accept these activities so that they would be cooperative(Fire).*

- *There must be a good system and motivation. All employees should be aware of the environment by giving them knowledge and information (Sky).*

- *To make the employees aware of the importance of the environment was very difficult. The trainer must have rousing techniques in training. The contents must be interesting and encouraging. The obvious examples are better than other training methods (Wind).*

2.4 The training approach of the human resource

The interviewees of five companies suggested that the field trip was also an important for the successful human resource development for the environmental management system ISO 14000.

- *We took a field trip at the factories, which have already been awarded the certificates for ISO 14000. This is very useful and it made us ready for the prevention of problems in the future. We can also work more quickly(Water).*

- *By sending the keyman to take a field study in the foreign countries in our neighborhood or in Europe to gain the experiences for the development of the company and to exchange the knowledge and information. We have also made the study visit at the companies which have not been certified to the ISO 14000 yet but they had the good environmental management system, documentation system so that we can apply these system for our work. For this industries, these is a project to visit the company in the neighborhood to witness the production process, the environmental management, waste treatment, and their problems so that they can be invited in as guidelines for working (Soil).*

- *We took a field trip at the companies, which have already been awarded the certificates for ISO 14000. This can be guidelines for us to work more quickly (Fog).*

- *The executives took a field trip and them they informed the employees of what they had seem so that we can correct our mistakes (Sky).*

- *We took a field trip. It was very useful. It helped our work be done more*

quickly. We have been informed of the problems of the companies we visited to compare with ours. Moreover, we have to prepare ourselves and get ready for this (Rain).

In summary, the supporting factors for the human resource development of companies in the chemicals and chemical products related industries for the environmental management system ISO 14000 were: the previously activities, the training environmental knowledge to the employees, the cooperation of employees, motivation, encouragement from administrators, continual follow-up, and field trips.

CHAPTER V

DISCUSSION

This study investigated how human resource of companies in chemicals and Chemical products related industries were developed for the environmental management system ISO 14000. The sample for this study were executive or persons who were resposible for the human resource development of the companies which had been certified with the environmental management system ISO 14000.

Part I: Demographic data of the sample and the person in charge

1.1 Duration of the achievement of the environmental management system ISO 14000.

It was found that the least and the most amount of time taken for the Implementation of the human resource development of the sample for the environmental management system ISO 14000 were six months and twenty-four months, respectively. Most spent 6-12 months.

The reasons why the companies spent less time achieving the ISO 14000 certification were:

1. They have already implemented other activities before, such as, ISO 9000, 5S activities, so their persons had experiences in implementing the system activities. This made the work be performed systematically and easily.

2. These companies did not have so many employees so it was easier to implement the human resource development thoroughly.

3. They had the consultant firms that were experienced and experts in the ISO 14000 system manage the whole system for them.

The reasons why the companies spent a lot of time achieving the ISO 14000 certification were:

1. Owing to the limited budget and the cost saving, these companies used their own human resource in studying and managing the ISO 14000 system. They had the consultant firm manage the system only when they had problems.

2. Some of these companies were large with a lot of employees so it took them a lot of time to develop their human resource.

In conclusion, the previous implementation of other activities, and having the experienced and skilled consultant firm manage the system were important factors for the contribution to the human resource development of companies for the environmental management system ISO 14000.

It was noted that the important factors in the implementation for the Environmental Management System ISO 14000 were not only the human resource development but also other supporting factors as buildings, surroundings of the company, place for water treatment, waste treatment, the period of producing goods to meet the customers' demand, budget for the investment in purchasing machinery or hiring experts in machinery, budget for purchasing chemicals and protective equipment, etc.

1.2 Persons who were responsible for the human resource development

This study was found that most of the personnel responsible for the human resource development of the companies for the environmental management system ISO 14000 did not directly graduate in the field of the environment. They graduated in the fields of Engineering, Chemistry, Law, Business Administration and Personnel Administration. Therefore, it was not necessary that the personnel in charge graduate in the field of the environment. However, they could conduct the human resource development for the achievement of ISO 14000 certification. They gained knowledge on the matter through the training on the environment, the field trip at other companies and the self-study. Moreover, there was a working group consisting of representatives of other departments to be responsible for the coordination with other related departments. The companies also had the consultant firm which was an expert in the implementation of the environmental management system be their coach. In addition, the Environmental Management Representatives (EMR.) were appointed by the executives to have authority of the management of the ISO 14000.

In summary, it was not necessary for the person to be appointed as EMR. to be responsible for the human resource development for the environmental management system ISO 14000 directly graduate in the field of the environment because they could be developed to have ability to perform this task.

Part II: Courses provided for the human resource development for the environmental management system ISO 14000

2.1 Course

This study was found that there were two courses provided for developing the human resource for the environmental management system ISO 14000. They were :

2.1.1 Core courses

2.1.2 Compulsory courses

2.1.1 Core courses

The course of fundamental knowledge of environment provied for developing the human resource in companies (the course name can be called differently) was only one core course that all employees had to take. The course contents were related to fundamental knowledge of ISO 14000, general environmental problems, the company's environmental problems, the company's policies, personal's roles and duties, awareness, regulations of ISO 14000, and benefits gained from the ISO 14000 implementation. From this course, the employees were given knowledge and better understanding. This contributed to the employees' realization and cooperation in the implementation of the company's activities.

These data were consistent with Casio (1998: 48) who mentioned that the regulations of the training for the environmental management system ISO 14000 were: To enable the person to know what should and must be done and why they have to know this, to enable the person to have awareness and desire to do the things

beneficial to the environment, to enable the personnel to work efficiently and still maintain the system.

It was considered that duration of training the company spent for their core course was different. Some companies spent two hours, while other companies spent six hours.

After studying in details, it was found that

1. In spite of spending two hours training the core courses, the resource persons prepared activities: To evaluate the participants' knowledge before training, the tests were sent to each unit a day before. Later, the training will be provided for two hours. After studying the documents for a week, the participants would take a post-test and their test results had to be at least 50%. In case they failed the test, they would have to take another test (but the test questions were the same as the previous ones). The companies gave reasons for conducting the two hours core course that it helped save training cost as well as save working hours of employees in order not to affect the production of the companies. (Wind) However, to call attention of the employees, there were board presentation, exhibitions, and video presentation on the environment during the lunch break. In addition, during the meeting, the supervisors always repeated the knowledge on the environment to the employees (Wind, Soil, Fire).

2. For the sample spent six hours training the core courses, it was found that spending enough time in training the core courses could help the learners gain more knowledge and awareness for long term benefit. These companies give reasons that six hours' time did not affect their production. Some of them had the employees attend the course on holidays and gave them money for compensation in order not to affect

the production of the companies. Other activities were also provided to call the employees' interest.

After studying the regulations, it was found that it did not specify how long the companies had to spend in training the core course. It was, however, required that all employees be trained for this course and evidences of the training be provided as the training report, the training content and the training follow-up report. (Thawin Sirichochaikul, 1999: 374)

Therefore, the duration of training the core courses could vary in duration of training because according to the regulation of the ISO 14000 system.

2.1.2 Compulsory courses

There were two compulsory courses provided for developing the human resource in each department. There were

2.1.2.1 Internal audit course

2.1.2.2 Work instruction course

1.2.2.1 Internal audit course

Internal audit course was a training course for supervisors or department managers who were appointed as staff of the audit team. The course contents were related to about methods of identifying non-conformance, steps and techniques of conducting an audit, risk evaluation, audit according to the regulations, revision of ISO 14000 basis, establishment of operational manuals and instructions, establishment of the company's environmental plan and benefits of conducting an audit.

The above-mentioned contents were essential for the persons who were appointed auditors to use for checking, controlling and supervising the working performance of each section and department to be in accordance with the regulations.

2.1.2.2 Work instruction course

Work instruction course was the training about work instruction of which the contents included knowledge of the work related to the regulation of the ISO 14000. It was the compulsory training for each department, which varies in work details. The employees of each department were also required to learn their work related to the regulations.

This course content was very necessary and important for all employees in each department because it enabled them to perform their work according to the regulations and pass the audit.

2.2 Duration of training, contents and training methods

This study was found that the most and the least amount of time taken by the sample for training each course were twelve hours, and two hours, respectively. Most of them spent 6-12 hours training the core course and 2-12 hours training the compulsory course.

Owing to the long training duration, there was a large number of training contents. Moreover, in conjunction with lecture, various forms of training technique could be used such as group meeting, case study, role-playing, practice and video. This made the participants gain clear knowledge and understanding as well as have an opportunity to practice for skill and good attitudes to what they have learned.

These data were consistent with Somkid Isarawatana (2000: 128) who mentioned that the considerable amount of time to be taken and the appropriate learning strategies played important roles for the training. Only lecture was not enough; therefore, other activities as simulation, role-playing, games, and practice were also applied in conjunction with the lecture so that the learners could participate in those activities. Therefore, more amount of time was taken for the training focusing on attitudes than the one focusing on knowledge.

For the companies spending less time in training, it was found that their resource persons used only lecture for training the learners. Although the lecture might enable the learners to perform their tasks, there was no retention in the learning.

The mentioned data were consistent with Somkid Isarawatana (2000: 134) who mentioned that only the lecture, it was difficult to achieve the three targets: knowledge, working skills, and good attitudes. The learning aimed only to give knowledge and understanding to the learners was the surface learning without any retention. Therefore, to increase the effectiveness of the learning, the resource persons should be skilled in giving the lecture, as well as should improve their training techniques by encouraging the learners to participate in the training video, slides, brainstorming, games, role-playing and so on.

2.3 Resource persons

2.3.1 Internal resource persons

This study was found that most resource persons of the core course and the work instruction course were the internal resource persons.

It was noted that the resource persons of the fundamental course for the environmental management (core course) and the work instruction course should be the internal resource persons because the contents of these courses were related to the work in the organization related to the regulations of the ISO 14000. These internal resource persons were responsible for the environmental issues of the companies and they have already been trained from other outside training organizations. They were also knowledgeable about the work and capable of transferring knowledge consistent with the requirements of the organization. In addition, the training by the internal resource persons also helped the organization save cost.

These data were consistent with Somkid Isarawatana (1999: 5) who mentioned that the working system of each department were different; therefore, the personl of each department played the most important role for the encouragement development and improvement of each department.

2.3.2 External resource persons

This study was found that the resource persons of the internal audit course were the external resource persons who had knowledge, ability, skill and experiences consistent with the course contents. Since after taking this course, the participants were expected to be the internal auditors of the company, the resource persons were required to be experts in the regulations of the auditing for ISO 14000 system, to have experiences in conducting an audit, and to have ability in transferring knowledge to the participants.

These data were consistent with Jongkolnee Chutimataiwin (1999:14) who mentioned that it was better to have the external resource persons or

honoured resource persons who had ability in transferring knowledge in conjunction with their experiences pass on the technical knowledge to the participants.

2.4 Training evaluation

This study was found that the majority of the sample evaluated their core course training through pre-test and post-test, while all samples evaluated the training for the Internal audit course and the work instruction course through practice.

It was noted that the evaluation for the core course training aimed to evaluate the learners' knowledge by means of pre-test and the post-test. The evaluation through the test was an the appropriate method because the test result could indicate what level the learners' knowledge was in both before and after the training and whether it met the company's criteria or not.

For the internal audit and work instruction courses, the learners' knowledge was evaluated by means of practice of the relevant work according to the ISO 14000 regulations. The evaluation through practice was an appropriate method because the learners could perform the real practice together with be coached and inspected by the resource persons. This method enabled the resource persons to know whether the learners could perform the practice properly or not.

These data were consistent with Thawin Sirichokechaikul (1999: 384) who mentioned that the objectives of evaluating the training effectiveness for the environmental management system ISO 14000 were: to see if the human resource were trained suitably, to know how much the environment gained benefits from the training activities provided by the organization and to see whether after the training the human resource had ability as expected and planned or not. These data were also consistent with Thai Industrial Standard Institute (1998) which mentioned that after

each raining, there had to be the training evaluation to assess the participants' knowledge, understanding and ability. In addition, the training evaluation could take various forms, such as, through work practice or through asking questions and each of these forms should have the concrete assessment criteria.

In summary, the evaluation of the training for the human resource development for the environmental management system ISO 14000 could various forms such as through the pre-test, post-test and practice.

Part III: Supporting factors for the human resource development for the environmental management system ISO 14000

3.1 Activities previously implemented before the ISO 14000

This study was found that the previously implemented activities as ISO 9000 or 5S activities were basic factors supporting the human resource development for the environmental management system ISO 14000. Moreover, the previous implementation of other activities enabled the person to have experiences as well as to understand the working methods and this made it easier to implement the ISO 14000 system.

These data were consistent with the research results of Kitthi Ngamsakulrungroj(1995: 2) stating that the ISO 9000 implementation helped all the employees be responsible and clearly understand the working methods and this made it easier to implement other quality system management.

These data were also consistent with the research results of Kornkanok Maneepun(1995: 1) and Krogkaew Tipmanee (1996: 2) stating that suggestions for 5S.

activities could be applied for the organizational development. Moreover, 5S activities were the basis for increasing the effectiveness in all aspects of the production and surroundings.

3.2 Executives

This study was found that the company's executives were important supporting factors. They defined the policy, supported the budget, and gave cooperation in conducting and following up the training activities. It was also noted that the executives' played an important role for the human resource development for the environmental management system ISO 14000.

These mentioned data were consistent with the research results of Pittaya Waradee, 1996: 5; Wijit Awakul, 1997: 27; Nayika Jaidee, 1999: 133. stating that the executives were the ones who had authority in making decision and approving the budget. Therefore, whatever the executives decided, the employees had to follow. The executives at all levels had to participate in supporting activities of the training, the education, and the other aspects of the development provided in their companies. Therefore, the executive's support essential for the human resource development.

3.3 Person

This study was found that the implementation of the environmental management system ISO 14000 was the duty of all employees. If they had a good attitude towards it, they would be cooperative in this activity.

These data were consistent with Skrovan J.Dancil (1983: 126) who mentioned that the human resource were required to be developed. They had to be cooperative and take part in the activities to achieve the objectives.

3.4 Person in charge

This study was found that the persons in charge were representatives form each department and then are formed to be a working group. They played an important role for the coordination with other relevant departments.

These data were consistent with the research of Nuchcharin Rujchukul (1991:27) and Prayoon Archanan (1995: 64) mentioning that the coordination meant the working together in harmony of the individuals or sub-divisions. To achieve the organization's objective, they had to plan and setting policy. Therefore, if there was good coordination during each department, policy and planning would be done carefully.

In conclusion, the previously implemented of other activities, the executive's support, the employees cooperation and the efficient coordination were essential factors supporting the success human resource development for the environmental mmanagement system ISO 14000.

CHAPTER VI

CONCLUSION

The study investigated how human resource of companies in chemicals and chemical products related industries were developed for the environmental management system ISO 14000. The sample of this study were companies which have been certified with the environmental management system ISO 14000.

6.1 Summary

Part I: Demographic data

1. Demographic data of the sample

The sample of this study were ten companies in the chemicals and chemical products related industries located in Rayong province. All of these companies were certified with the environmental management system ISO 14000 since 1998. The majority (six companies) have carried out their enterprises for more than ten years. Seven of them achieved the ISO 14000 certification in 1999 from Thai Industrial Standards Institute almost half of them spent 6-12 months conducting their human resource development.

2. Interviewees

The interviewees for this study were ten executives who were responsible for the human resource development of the sample. Nine interviewees were male at the age between 36-45, and got bachelor's degree. Seven interviewees graduated in the

field irrelevant to the environment. The duration for being in the present position were between 2-5 years. Moreover, the work experience of nine executives were 5-25 years and have been working in their present companies for more than five years.

Part II: Activities for human resource development of companies for the environmental management system ISO 14000

There were two courses that ten companies provided for developing their human resource for the environmental management system ISO 14000. They were core course and compulsory course.

1. Core course

Fundamental knowledge of the environment (the course name can be called differently). It took one core course that all employees have to take. Seven companies spent six hours to train core course. The number of the participants were 31-40 person of each section. Employees at all levels prticipants in the course fundamental knowledge of ISO 14000, the company's environmental problems, the companies, policies, personnel's roles and duties, and awareness. The resource persons of seven companies were the internal resource persons. The methodologies used for this core course was lecture. The evaluation of six companies were the pre-test and the post-test.

2. Compulsory courses

There were two compulsory courses that the employees of each department have to take. They were internal audit course and work instruction course.

2.1 Internal audit course

The participants of this course were supervisors or managers who were appointed as auditors. Almost half of the sample spent twelve hours in the training this course. The number of the participants were 8-12 person for each section. The contents were related to methods of identifying non- conformance as well as steps and techniques of conducting an audit. The resource persons were the external resource persons and lecture, practice were used in training this course. The practice was also used for evaluating the training.

2.2 Work instruction course

The participants of this course were employees of each department. Seven companies spent three hours in the training this course. The number of the participants were 5-10 person for each section. The content were related to the knowledge of the work related to the regulation of the environmental management system ISO 14000. The resource persons were the internal resource persons and they used the lecture together with practice in training this course. The practice was also used for evaluating the training.

Part III: Supporting factors for the human resource development for the environmental management system ISO 14000 and suggestions

3.1 Supporting factors for the human resource development

The study was found that the supporting factors for the human resource development of the sample for the environmental management system ISO 14000 were : the other activities which have previously been implemented, the executives

who determined the policy and fully supported it, the employees who were cooperative and the environmental working group which was responsible for coordinating with other related departments.

3.2 Suggestion for the human resource development

The interviewees suggested that the factors contributing to the successful human resource development for the environmental management system ISO 14000 were : the executives have to build up the motivation, the encouragement as well as have to follow up the working performance according to the regulations and increase the knowledge of the human resource through the field trip.

6.2 Conclusion

6.2.1 Top executive play an important role for the successful human resource development.

6.2.2 It is not necessary for the personnel in charge of the human resource development for the environmental management system ISO 14000 to directly graduate in the field of the environment. However, they can develop themselves to fulfill their duty through the training, the field trip or the self-study.

6.2.3 The participation and the cooperation from all departments the human resource development contribute to the achievement of work undertaking and of the organization's objectives and goals.

6.2.4 The building-up of recognition and awareness plays a key role for the human resource development for the environmental management system ISO 14000.

6.3 Suggestion

6.3.1 Top executives of the company

It was found that top executives are important for achievement of the environmental management system ISO 14000 certification. They are the key persons who have major roles in initiating and defining the policy, participating in activities, the motivating and supporting in activities of the human resource development.

6.3.2 Environmental working group

The staffs of the environmental working group should be the person appointed from all departments in the company. They have to understand the environment system ISO 14000, the training process, have vision of the human resource development.

6.3.3 Resource persons of the courses for ISO 14000

The resource persons of the core courses and the work instruction course should be the internal resource persons because they are knowledgeable of the working system and are well aware of problems and necessity of the company, Moreover, these resource persons should have ability to transfer knowledge to the participants or they have to be trained to be resource persons before.

The resource persons of the internal audit course should be the external resource persons, because they have a lot of knowledge, skill and experiences in conducting an audit of the ISO 14000. Moreover, they are capable of transferring knowledge and this enables the participants to gain knowledge, skill and to perform their work.

6.4 Suggestion for future studies

6.4.1 Training techniques were applied to enable the learners to gain knowledge skill and good attitudes as well as to retain the learning.

6.4.2 A study of the appropriate length of time for the core course training provided for the employees for the achievement of the environment management system ISO 14000 certification of the organization.

6.4.3 Motivation of the human resource development for the achievement of the environmental management system ISO 14000 certification.

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APPENDIX

Interview Guide

Human resource development in chemicals and chemical product related industries for the environmental management system ISO 14000.

Part 1 Demographics data of the samples (15 items)

1. Date of interview .....

2. Name of company .....

3. Location ..... Moo ..... Soi .....

Road ..... Tambol ..... Amphur .....

Province ..... Telephone No. ..... Fax. No. .....

4. The duration for carrying out the enterprise ..... year(s) ..... month(s).

5. The duration for implementing ISO 14000 ..... year(s) ..... month(s).

6. The year in which the company was issued with the ISO 14000 certificate.....

7. The institute from which the company was issued with the ISO 14000 certificate

.....

8. Position of the interviewee .....

9. The duration for being in this position ..... year(s) ..... month(s).

10. Sex ( ) Male ( ) Female

11. Age ( ) Under 25 years ( ) 25-35 years ( ) 36-45 years

( ) 46-55 years ( ) 56 and over

12. Education background

( ) Over high school but under bachelor's degree

( ) Bachelor's degree or equivalent

( ) Higher than bachelor's degree

13. How relevant is the field of your education to the International Standard for ISO 14000 ? ( ) directly relevant ( ) irrelevant ( ) partly relevant

14. Work experience

( ) Less than 5 years ( ) 5-10 years ( ) 11-15 years

( ) 16-20 years ( ) 21-25 years ( ) More than 25 years

15. Work experience in the present company

( ) Less than 5 years ( ) 5-10 years ( ) 11-15 years

( ) 16-20 years ( ) 21-25 years ( ) More than 25 years

Part 2 Activities for the human resource development in the company for the environmental management system ISO 14000 (2 items)

16. The course which all workers are required to take in order that the company can be entitles to the certification for the environmental management system ISO 14000

Item No.	Name of course	Duration	Target group	Number of target group	Scope of content	Training methods	Resource person	Training evaluation
1.								
2.								
3.								
4.								
5.								
...								

17. The training course which the workers in departments involved in the environmental management system ISO 14000 are required to take.

Item No.	Name of course	Duration	Target group	Number of target group	Scope of content	Training method	Resource person	Training evaluation
1.								
2.								
3.								
4.								
5.								
...								

Part 3 Factors and suggestion for the human resource development in the company for the environmental management system ISO 14000 (2 items)

18. Supporting factors for the human resource development in the company for the environmental management system ISO 14000

18.1 Infrastructure

18.2 Executive

18.3 Worker

18.4 Person responsible for the human resource development

18.5 Other (please specify)

19. What is your suggestion to other companies which require to develop their human resource for the environmental management system ISO 14000 ?

Thank you very much for your cooperation

Industrial Sector : Chemicals & chemical products

No	Company	Standard	Scope of certification	Certificated by
1	**Dynamic Polytech Co., Ltd.** 91/2 mu 1, Bang Pakphraek, Rayong 21140; tel (038) 961691; fax 961694	ISO 14001	Manufacture of phylon sheet and injecting compound	SGS 26-Jul-99
2	**Tuntex Petrochemicals (Thailand) Co., Ltd.** 3, I-7 Rd, Map-ta-phut IE, Rayong	ISO 14001	Manufacture of purified terephtalic acid, generation of electricity	AJA EQS 7-May-98
3	**Thai Plastic and Chemical PCL** 8, I-1 Rd, Map-ta-phut Indus.Estate, Muang, Rayong; tel 038 683900; fax 683392	ISO 14001	Manufacture of sodium hydroxide vinyl chloride monomer and polyvinyl chloride resin	TISI 9-Feb-99
4	**Thai Polypropylene Co., Ltd.** 10 I-1 Rd, Map-ta-phut IE, Rayong;	ISO 14001	Manufacture of polypropylene resins	TISI 30-Mar-98
5	**Thai Polyacetal Co., Ltd.** 1 Phadaeng Indus. Estate, Phadaeng Rd, Map-ta-phut, Rayong 21150; tel 038 685613; fax 684818	ISO 14001	Manufacture of polycarbonate resin and polycarbonate compounded resin	BVQI 29-Nov-99
6	**Thai ABS Co., Ltd.** 299 Sukhumvit Rd, Muang, Rayong	ISO 14001	Manufacture of natural colour and colour compounded ABS and SAN resin	MASCI 22-Oct-99
7	**Bangkok Polyethylene Public Co., Ltd.** 4 Map Ta Phut Industrial Estate, I-10 Road, Map Ta Phut, Muang District, Rayong 21150, Thailand	ISO 14001	Manufacture of High Density Polyethylene (HDPE) resins	MASCI 28-Jan-00
8	**Phattanaphan Chrmitech Co., Ltd.** 71/108 Mu 4 Amata City Industrial, Mabyangporn, Pluakdaeng, Rayong 21140 Tel: (038) 956033-4 Fax: (038) 956118	ISO 14001	Design and manufacture of Chemical Emulsion Latex	AJA EQS 22-Nov-99
9	**Sak Chaisidhi Co., Ltd.** 4, I-3 Rd, Map-ta-phut Indus. Estate, Rayong 21150	ISO 14001	Manufacture of pentane, hexane and rubber solvent	MASCI 28-Sep-99
10	**Vinythai PCL** 2 Map-ta-phut Indus. Estate, I-3 Rd, Muang, Rayong 21150; Tel 038 683112; fax 683112	ISO 14001	Manufacture, marketing, storage and distribution of suspension and paste of polyvinyl chloride	BVQI 8-Jul-99

BIOGRAPHY

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