Impact of ISO 14001 on Small and Medium Size Manufacturing Companies in Chonburi Province, Thailand

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'Green production' manufacturing has become a very important issue in manufacturing, driven by environmental laws and regulations governing manufacturing emissions, and growing global environmental certification requirements, such as ISO 14001. Small and medium size manufacturing companies activity has a significant impact on the environment it is vital to consider how to improve the environmental performance of small and medium size manufacturing companies. The ISO 14001 provides manufacturing enterprises with the tool to address, in a structured manner, the adverse impact of their operation.

In this work, a questionnaire survey was conducted to ascertain the perceptions of small and medium size manufacturing companies in Thailand on the impact of the implementation of ISO 14001 on their operations. Major problems of ISO 14001 certification and implementation were identified.

Environmental management issues have gained a high priority in a growing number of manufacturing industries because of external environmental pressures, and environmental laws and regulations. Therefore, green production has become an important

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issue to manufacturers (Clark and Fujimoto 1991, Boothroyd et al.,1994). The need for giving greater consideration to environmental issues in the context of sustainable development has been accepted by industries, governments and international organisations. The Sustainable Process Index (SPI) is based on an operational definition of sustainability, which relies not only on the environmental risk, but also on economic and technical feasibility as well as political compromise.

The manufacturing industry has been challenged to seek to meet a growing need by customers for facilities for production, services and leisure, while conserving and protecting the environment and natural resources base essential for future development. Bourdeau (1999) mentioned that the challenge for manufacturing is to identify new and innovative practice, technology and ways of working which satisfy the need for both internal and external environmental demand. It is suggested that, to achieve this challenge, organisational changes and targeted investment are required.

Recently, environmental quality factors are becoming an essential component for manufacturing organisations' competitiveness. Communities demand the increasing attention of top management and management level staff (Giuntini 1996, Angell and Klassen 1999). The environmental situation of companies is a very dynamic process, which may evolve from a reactive position, that seeks exclusively the compliance with the legislation, to the decision to adopt an environmental management system to obtain certification, in order to take advantage of the opportunities that attention to the environment offers (Hunt and Auster 1990, Klassen and Angell 1998, Henriques and Sadorsky 1999).

This work studies the impact of the ISO 14001 standard on small and medium size of manufacturing companies, with a value of less than 200 million Thai baht in Thailand by carrying out the following research:

- To determine the awareness of the ISO 14001 standard on small and medium size manufacturing companies in Thailand;
- To assess prospects for, and driving forces of, the implementation of environmental management systems in small and medium size manufacturing companies in Thailand;

- To evaluate problems which might be encountered in implementing ISO 14001 in the manufacturing industry; and

This paper is based on a questionnaire survey of practitioners. Various statistical methods were used to analyse the data.

Environmental management systems (EMSs) Hawken (1993) mentioned that, because of environmental external demands, businesses are faced with the challenge of integrating environmental considerations into their production and marketing. Small and medium size manufacturing companies have to learn and understand the nature and impact of the environmental pollution they cause and take practical measures to address the environment problems.

The Environmental Management System or "EMS" is a tool to monitor, protect, measure, and improve the environment. It is not a set of goals or performance standards to be achieved, although it includes a process for setting performance goals. The International Organisation for Standardisation (ISO) defines an EMS as:

A part of the overall management system which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy (Sayre 1996).

An EMS provides a systematic way of addressing and managing immediate and long-term impacts of an organisation's products, services and processes on the environment, and gives order and consistency to address environmental concerns through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes. The EMS can be implemented in many different ways depending on the precise sector or activity and the needs perceived by management. However, several common core elements should be present: environmental policy, environmental programme or action plan, organisational structure, integration into operations, a documentation system in order to collect, analyse, monitor corrective and preventive action, EMS audits, management review, training, and external communications (Taylor et al. 1994).

The EMS creates an overall site-specific management system that addresses environmental concerns through the alloca-

tion of resources, assignment of responsibilities, and ongoing evaluation of practices, procedures, and processes to achieve sound environmental performance (Sayre 1996).

Each EMS is created by a site-specific team of employees and takes into account the geographic location, stakeholder and employee concerns, past uses of the site, corporate goals, and other factors when designing goals and objectives to achieve positive environmental and financial results. An EMS describes what will be accomplished, how and by whom. It includes benchmarking and process improvement.

In order to obtain certification of an environmental management system, manufacturing companies need many resources. It is necessary that companies have to invest, which may be more or less, especial for training and qualifying personnel and management with respect to these aspects (Walley and Whitehead 1994, Van der Veldt 1997, Noci and Verganti 1999). However, manufacturing companies know the importance of the environment that really encourages the decision to advance from an environmental perspective, and finally to succeed in adopting and achieving certification of an environmental management system (Azzone et al. 1997, Russo and Fouts 1997, Klassen and Angell 1998).

ISO is used around the world to present the organisation - "International Organisation for Standardisation". International Organisation for Standardisation is a non-government organisation that promotes an international standardisation and its member are not, therefore, national governments, but are the standards institutes in their respective countries. ISO was established in Geneva, Switzerland in 1946. It is made up of national standards institutes from countries large and small, industrialized and developed, in all regions of the world. ISO develops voluntary technical standards, which adds value to all types of business operations. They contribute to making the development, manufacture and supply of products and services more efficient, safer and cleaner. They make trade between countries easier and fairer. ISO standards also serve to safeguard consumers, and users in general of products and services - as well as making their lives simpler (Nestel et al. 1996).

Rothery (1995) noted that the ISO standards are generic management system standards. Both ISO 9000 and ISO 14000 are families of standards. On one hand, ISO

9000 is concerned with "quality management". The definition of "quality" in ISO 9000 refers to all those features of a product or service, which are required by the customer. "Quality management" means what the organization does to ensure that its products conform to the customer's requirements.

On the other hand, ISO 14000 is concerned with "environmental management". It means what the organization does to minimize harmful effects on the environment caused by its activities (Rothery 1995).

The ISO 14000 standard is a voluntary management tool developed by the International Organisation for Standardisation to provide organisations with methodically structured and disciplined control over all the aspects of their environmental impacts. This standard system allows organisations to avoid risks and costly confusion, by incorporating environmental controls into daily operations in a predictable and cost-effective manner, as needed by such organisations. With ISO 14000, organisations can set policies based on their own assessment of the environmental aspects and the environmental goals. ISO 14000 does not mandate environmental performance beyond management's commitment, compliance to existing regulations, or to a dedication to continuous improvement (Johnson 1997).

As defined by Johnson (1997), ISO 14000 is a series of international environmental management standards written to promote a continual improvement system in an organisation's environmental performance, through adoption and implementation of an environmental management system.

The ISO 14000 standards describe the basic elements of an effective environmental management system, routinely referred to by the acronym EMS (Nestel et al. 1996). An effective environmental management system can help an organisation manage, evaluate and improve the environmental aspects of its operations. It can lead to more efficient compliance with mandatory and voluntary environmental requirements. Also, it can help the organisation to effect a culture change as environmental management practices are incorporated into its overall business operations (Johnson 1997).

Today, many manufacturing companies take the environment into account in order to improve their company's image

within the business environment in which they carry out their activity. If this is undertaken with legitimate action of real support, it may become a good distinguishing factor that provides considerable business advantages. Implementation and certification of an environmental management system is a means to achieve these objectives (Azzone et al. 1997). ISO 14001 is one of the most world wide recognised environmental management systems.

Other factors providing business opportunities and encouraging manufacturing companies to obtain ISO 14001 certification are the market requirements derived from the influence of "green" consumers. These may encourage a company to compete in new market niches (Klassen and Angell 1998). Moreover, environmental management system ISO 14001 can enable companies to improve their efficiency. For example, by means of the use of productive processes, companies may consume less material resources or energy, or may recycle or reuse generated wastes. Also, clean practices can involve savings in legal actions, sanctions, the cost of cleaning, and retaining a good company image, and conforming to civil responsibilities (Dooley and Fryxell 1999). The ISO 14001 standard is an environmental management system that can help manufacturers improve an external image, gain better access to new market niches and, even, provide increases in the efficiency of their manufacturing environmental management processes.

Background of developments and environmental in Thailand

In the last four decades, the Thai people have enjoyed their life with beautiful green rice fields, forests, slowly running streams, and rivers. However, when western culture and high technology came to Thailand, many rice fields were changed into industrial towns. Toxic fumes from industries and vehicles overwhelm the environment of all big cities.

As a result of Thailand's structural changes from agriculture to industrialization, the area of agriculture holdings was decreased, and total hazardous wastes continued to increase. The serious pollution in Thailand is mainly caused by industrial waste. Heavy metal pollution in rivers and the air involves copper, zinc, cadmium, lead, and mercury. Almost all of the heavy metal pollutants are from industrial waste.

Today, the Thailand Government provides most environmental protection under the umbrella of The Ministry of Natural Resources and Environment (MONRE). The Ministry of Industry (MOI), and The Ministry of Public Health (MOPH) are also responsible for a small amount of environmental protection.

The Ministry of Natural Resources and Environment was established in 2002. It mandates the establishment of environmental management policies and quality standards that encompass the broad environment: water quality, air quality, soil quality, conservation of natural resources, waste management, land use, utilization of ground and surface water, preservation of national resources, population-environment balance, integration of environmental education, and provision for tax incentives for the importation and manufacture of pollution control equipment and devices. The Ministry of Natural Resources and Environment has several government agencies, each one assuming a lead role and direct responsibility according to its area of expertise, with the others lending a helping hand.

Thailand is one of the early countries in Asia to start certification to ISO 14001. The Ministry of Industry promotes the ISO 14001, as it will improve the environmental performance of Thailand firms. Most of the large size manufacturing companies in Thailand have achieved ISO 14001 certification or adopted other systems such as TQEM. However many small and medium size manufacturing companies in Thailand did not have any environmental management systems.

Background of the research location - Chonburi Province

Thailand is located in the heart of the Southeast Asia. The country is divided into 76 provinces in the six natural regions: the North, the Central, the East, the West, the Northeast, and the South.

Chonburi Province is the leading city of the East region. The Thailand government made the development of the East region in the Fifth National Economic and Social Development Plan (1982-1986). Industrialisation in the Eastern Seaboard region has progressed remarkably, and the region has developed into the country's second largest industrial center after Bangkok metropolitan area. The Eastern Seaboard comprised of three provinces is Chachoengsao

Province, Chonburi Province, and Reyong Province. These areas are a good environment for industrial development due to its proximity to the capital of Bangkok and the possibility for topographical deep-sea port construction. This research study looks at the small and medium size of manufacturers in the area of Chonburi Province.

Research method

A questionnaire base survey was conducted in small and medium size of manufacturing companies in Thailand. Such a survey was suitable for obtaining the perceptions, attitudes and expectations of practitioners on the ISO 14001. Preparation of the questionnaire was preceded by a review of the literature on the ISO 14001 standard and the impact of its application.

The survey was accomplished by mail with an explanatory letter and prepaid return envelope, an efficient way to cover a large sampling base. The manufacturing companies were random sampling 250 small and medium manufacturers in Chonburi Province from the list of small and medium size manufacturing companies at the Department of Industrial Work, Ministry of Industry.

The researcher put together the list of manufacturers' names in the computer and then used the computer to sample 250 manufacturers.

The questionnaire was distributed to only production department managers or quality control department managers working in the sample manufacturers (by mail). This particular research design was considered appropriate because it provided the most efficient means of answering the research questions concerning the response of the manufacturers' staff to the social impact of pollution from their manufacturers.

This study used the statistical software package Spreadsheet Excel to analyse the survey results. The respondents were asked to rank their views on factors on a five-point Likert scale, where 1 indicates that unimportant, and 5 indicates that the most important. Due to the small number of the manufacturers' managers who responded to the survey, their opinion could be superficial. As respondents were not required to provide the companies' details, the opinions given can be unbiased.

The respondents profile of the 250 questionnaires distributed to the managers in the sample manufacturers, 31 were duly completed and returned, giving a response rate of 12.4%. Most of the respondents had obtained ISO 9000 series certification (90.3%), and 67.7% of respondents had obtained ISO 14001 series certification (or plan to have in the near future).

Although the return percentages were low, the rates are normal in mail surveys and relate to a lack of interest, an inability to answer certain questions, or because of confidentiality fears deriving from the environmental inspecting from the government.

Most of the respondents (96.7%) indicated that they had heard about the ISO 14001 standard. They attributed their awareness mostly to conferences, training, or workshops (90%). The print media such as trade magazines (83.3%), newspapers (66.7%) were also significant sources of information. Other sources were manufacturing company's customers (46.7%), TV (26.7%), internet (26.7%). Nearly three-quarters (67.7%) of the respondents believed that an ISO 14001 EMS is relevant to small and medium size manufacturing companies, whereas only 6.7% of them did not consider it relevant.

Although, as mentioned, most respondents had heard of the ISO 14001 standard and considered it relevant to small and medium size manufacturing industries, 50% of them felt that the small and medium size manufacturing industry was not ready for the implementation of an ISO 14001 standard. The reasons given by the respondents for their negative response are summarised in Figure 1. The results show that respondents rated highly the economic (costs and benefits) and commercial (customers support) aspects, as well as practical constraints such as inadequacy of personnel.

Approximately 70% of the respondents intended to seek certification to ISO 14001. However, only 50% of these respondents felt that ISO 14001 certification would be worth the money spent. The reasons why the small and medium manufacturers would seek ISO 14001 certification are shown in Figure 2 (under 0.05 significance level). The respondents rated nine factors as important. The tests and classification criteria for the variables are the same as those explained above for Figure 1. The top three reasons are: avoiding infringing environmental laws and regulations, improving company's image, and reducing material wastage. The problems of ISO 14001 certification and

implementation, which the respondents believed that ISO 14001 certification would pose to small and medium size of manufacturing companies, are present in Figure 3.

Figure 1 : Reasons given by the respondents why small and medium size manufacturing companies are not ready for ISO 14001

- ISO 14001 will be too costly to implement
- Benefits of ISO 14001 will not out weigh implementation costs
- ISO 14001 will not bring tangible benefits
- Government does not support small and medium size manufacturing companies
- Small and medium size manufacturers already adopt adequate environmental measures
- ISO 9000 helps manufacturers achieve the same objectives as ISO 14001

Figure 2: The respondents' reasons for seeking ISO 14001 certification

- To enable manufacturer to avoid infringing environmental laws and regulations
- To enhance manufacturers' public image
- To enable manufacturer to reduce material wastage
- To increase manufacturer's competitiveness
- To help manufacturer improve workers' health, safety and welfare
- To help manufacturer to contribute to efforts to protect the environment
- To reduce manufacturer's operating costs
- To improve manufacturer's procedures
- ISO 14001 will be essential in the company's overseas drive

Figure 3: Problems of ISO 14001 certification and implementation

- There is a shortage of personnel who have good knowledge of ISO 14001
- ISO 14001 will have the effect of increasing costs
- The company's employees will resist the system
- Changing traditional practices is disrupting and costly

The manufacturing industry is one of the highest natural resource users and is responsible for pollution and much waste. The ISO 14001 system can help small and medium size manufacturing companies to achieve better results in environmental management. However, the small and medium size manufacturing industry in Thailand is adopting a wait and see attitude towards taking up the ISO 14001 standard.

The research results show that knowledge of the ISO 14001 standards within the small and medium size manufacturing companies in Thailand, while significant, is not widespread. More efforts could not be made to educate small and medium size manufacturing company personnel about the concepts and technical details of the ISO 14001. The government, trade organisations, NGOs and certification bodies should use the resources of the media to provide awareness of the ISO 14001 in small and medium size manufacturers.

Shortage of qualified personnel was considered a major hurdle to be faced by small and medium size manufacturing companies in their effort to formulate and implement ISO 14001. Educational and training programmes on ISO 14001 in small and medium size manufacturing should be provided more often.

Thailand's small and medium size manufacturing companies' commitment to the environment is hampered by their costs and benefits concerns. The ISO 14001 standard offers the opportunity for small and medium size manufacturers to pursue improved environmental performance in a systematic and structured manner.

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