

LIFE CYCLE MANAGEMENT – CONCEPT AND PRACTICAL POSSIBILITIES OF IMPLEMENTATION IN ORGANIZATIONS

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Abstract: *In the paper LCM is defined as the application of life cycle thinking to modern business practice, with the aim to manage the total life cycle of an organization's products and services towards more sustainable production and consumption. Relevant systems, methods and tools connected with LCM concept are presented. The case of an application of LCM in connection with industrial processes is indicated in the end of the paper*

1. INTRODUCTION

Our environment is of material nature, first of all. There are a lot of technical objects produced, used and then disposed in the world. It has the great influence on different areas: economy, safety and environment. Recently, specially the last one is of great interest to many organizations worldwide. They undertake various efforts to reduce the impact of their products or services on environment. Some of them try to do it in broader sense, introducing Life Cycle Management (LCM). This practical approach is focused on minimizing the environmental burdens associated with products and services over their entire „life” through better, environmentally oriented, decision making.

Our Polish economy is still on its way from centrally-steered to market-oriented. Free market rules have had to be accepted, but the fulfillment of several different regulations, among them of environmental character, is still the challenge. Although LCM is still rather the concept then the consequently structured regulation it has the chance to be formed in the future in the shape of integrated tool. It should attract the developed organizations in Poland and other Central and Eastern European (CEE) countries, as a support tool on their way to improve environmental image. Other tools or solutions of other nature, which could assist LCM implementation in companies, are analyzed in this paper.

2. LCM AND OTHER TOOLS

Summarizing, as a starting point to further considerations, one can say that now Life Cycle Management:

- is practical approach focused on minimizing the environmental burdens associated with products and services over their entire „life” through better, environmentally oriented, decision making,
- is still rather the concept then the consequently structured regulation/standard,
- should attract the developed companies in Poland and other Central and Eastern European countries, as a support tool on their way to improve environmental image.

Considering the basis for development now LCM systems in organizations in CEE countries it seems that the attention should be focused on introducing in organizations the rules of Total Quality Management and the regulations of such a standards as ISO 9001 (Quality systems – Model for quality assurance in design, development, production, installation and servicing) and ISO 14001 (Environmental management systems – Specification with guidance for use).

Other tools and ideas, also being introduced in Poland and other CEE countries, which could assist in developing LCM in companies are:

- 1) Cleaner Production (CP) concept, which:
 - brings formal principles,
 - uses criteria of awarding CP certificate to the organizations,
 - has the position in environmental management systems of organizations,
- 2) Extended Producer Responsibility, which:

- is an environmental protection principle, aiming at the reduction of total impact from product,
- makes the producer responsible for the entire life-cycle of product, specially post-consumer phase,
- stimulates, through economical and administrative measures, environmental friendly changes in the product design [1].

3. LCM AND TQM

At the beginning of XXI century, some Polish quality experts stated that an introduction of the Total Quality Management (TQM) is one of the last chances for the Polish economy to revitalize it. It is obvious in the situation of the entry of Poland into global market now and joining the European Union. Our country and neighbor countries have lately undergone transformation, but the necessity of adaptable works which still should be done is evident. The best methods in this field are coming from TQM area. They could be applied at the different levels of economy, being specially suitable in the organizations [2].

TQM as a way of organization management, which is characterized by system approach, orientation on strategic goals, ability to continuous and for ever improvement, includes also close contacts from one side with suppliers and customers from the other side. It should allow for easier negotiations with them on environmental topics.

Practically, the steps of formalization and implementation of TQM may include:

- establishing, by organization board, the team in charge of TQM policy implementation,
- self-evaluation of managerial staff,
- training of all employees on TQM policy,
- training of all employees on psychological and social work environment,
- internal and external promotion of TQM policy,
- self evaluation of the company,
- rendering the source materials to all supervisors,
- contest for the most interesting solution within TQM,
- establishing quality circles and developing their methodology.

Above mentioned aspects indicate crucial role of TQM in process of LCM implementation. The reason is that LCM should become part of an organization's policies so that its importance encompasses all levels of the organization. LCM policies should be visionary and long-range while also being realistic and concrete, parallel to its types of goals. There are at least three different types of features common for TQM and LCM:

- internal readiness and commitment to continuous improvements,
- the desire for life cycle improvement of products,

- the desire to take the complex characteristics of products a step further by reporting and marketing activities and thereby create general organizational successes.

Additionally, the natural consequence of TQM can be common participation of range of employees who ensures that the LCM initiatives will be deeply rooted in the organization and that the focus will be on concrete improvements to a product. Furthermore, broad participation in LCM activities ensures that the LCM program doesn't die if a key employee involved leaves the organization [4].

4. LCM AND ISO 9001

The International Standard ISO 9001 is one of international standards dealing with quality system requirements that can be used for external quality assurance purposes. The quality assurance model is there the broadest and encompasses: design, development, production, installation and servicing. There are several elements of this model which include the activities influencing the environment:

- 1) management responsibility – managers shall define and document their policy for quality, which shall be relevant to the expectations and needs of customers (initiation of actions to prevent the occurrence of any nonconformities related to the product, process and quality system, also connected with environment),
- 2) design control – establishing and maintaining of documented procedures to control and verify the design of the product in order to ensure that the specified requirements are met (design input requirements reacting to the product, including environment related),
- 3) purchasing - establishing and maintaining the procedures ensuring that the purchased product conforms to specific requirements (the supplier shall evaluate and select subcontractors on the basis of their ability to meet subcontract requirements including the environment influences),
- 4) process control – identification and planning the production, installation and service processes, which directly affect quality (environment) and shall ensure that these processes are carried out under controlled conditions,
- 5) inspection and testing – establishing and maintaining of documented procedures for inspection and testing activities in order to verify that the specified requirements for the product are met (the supplier shall ensure that incoming product is not processed until it has been inspected or otherwise verified as conforming to environment requirements),
- 6) corrective and preventive action - establishing and maintaining documented procedures for implementing corrective and preventive action appropriate to the magnitude of problems.

In practice, a system based on an International Standard ISO 9001 can help the organization to address strategic planning, overall management, product and process development, procurement, production, distribution, marketing, communication and other functions in a more systematic and comprehensive approach. The organization will typically in the beginning focus on what is going on at the site and those inputs and outputs connected to its own activities. After achieving the easy improvements of quality the organization will have to expand its focus [4].

5. LCM AND INTERNATIONAL STANDARD ISO 14001

In the context of increasingly stringent legislation, the development of economic policies and other measures to foster environmental protection, and a general growth of concern from interested parties about environmental matters, including sustainable development, organizations of all kinds are concerned to achieve and demonstrate sound environmental performance, by controlling the impact of their activities, products and services on environment, taking into account their policy and objectives.

International standards covering environmental management (e.g. ISO 14001) are intended to provide organizations with the elements of an effective environmental management system which can be integrated with other management requirements, to assist organizations to achieve environmental and economic goals [3].

The ISO 14001 standard specifies the requirements of such an environmental system, which could be applicable to all types and sizes of organizations and to accommodate diverse geographical, cultural and social conditions. A system of this kind enables an organization to establish and assess the effectiveness of procedures to set an environmental policy and objectives, achieve conformance with them, and demonstrate such conformance to others. The overall aim of this standard is to support environmental protection and prevention of pollution in balance with socio-economic needs. Many of the requirements may be addressed concurrently or revisited at any time.

The adoption and implementation of a range of environmental management techniques in a systematic manner can contribute to optimal outcomes for all interested parties. However, adoption of this standard will not in itself guarantee optimal environmental outcomes. In order to achieve environmental objectives, the environmental management system should encourage organizations to consider implementation of the best available technology, where appropriate and where economically viable. In addition, the cost effectiveness of such technology should be fully taken into account.

The ISO 14001 standard shares common management system principles with the ISO 9000 series standards. Organizations may elect to use an existing management system consistent with the ISO 9000 series as a basis for its environmental management system. The application of various elements of management system may differ due to different purposes and different interested parties. While quality management systems deal with customer needs, environmental management systems address the needs of a broad range of interested parties and evolving needs of society for environmental protection.

In the ISO 14001 standard requirements for an environmental management system are specified, to enable an organization to formulate policy and objectives taking into account legislative requirements and information about significant environmental impacts. It applies to those environmental aspects which the organization can control and over which it can be expected to have an influence.

The organization shall establish and maintain an environmental management system, the requirements of which are in following fields:

- 1) environmental policy – top management shall define the organization's environmental policy and ensure that it includes a commitment to comply with relevant environmental legislation and regulations, and with other requirements to which the organization subscribes and it is appropriate to the nature, scale and environmental impacts of its activities, products and services,
- 2) objectives and targets – environmental objectives and targets, at each relevant function and level within the organization should be established and maintained, considering the legal and other requirements, significant environmental aspects, technological options and financial, operational and business requirements
- 3) planning – procedure should be established and maintained to identify the environmental aspects of the activities, products or services that it can control and over which it can be expected to have and influence, in order to determine those which have or can have significant impacts on the environment (aspects related to significant impacts should be considered in setting environmental objectives),
- 4) legal and other requirements – procedure should be established and maintained to identify and have access to legal and other requirements to which organization subscribes, that are applicable to the environmental aspects of its activities, products or services
- 5) environmental management programs – should be established and maintained for achieving objectives and goals,
- 6) implementation and operation – management shall provide resources (human, financial and

technology resources) essential to the implementation and control of the environmental management system,

- 7) operational control – organization shall identify those operations and activities that are associated with the identified significant environmental aspects in line with its policy, objectives and targets,
- 8) emergency preparedness and response – procedures should be established and maintained to identify potential for and respond to accidents and emergency situations, and for preventing and mitigating the environmental impacts that may be associated with them,
- 9) monitoring and measurement – procedures should be established and maintained to monitor and measure, on regular basis, the key characteristics of operations and activities in organization that can have a significant impact on environment.

The ISO standards on environmental management systems and tools can assist in the process – but common sense is still needed, e.g. do not to implement one or the other side alone, but use the synergy of combining by product-oriented environmental management systems. Product oriented environmental management overlaps with the concept of life cycle management or corresponds to the environmental dimension of life cycle management. An examples from Netherlands and Denmark show, that good practice in product-oriented environmental management means:

- link between organization environmental initiatives and the market,
- complement environmental studies with market studies and analysis of interested parties expectations,
- direct integration of environmental requirements into the product development,
- common and continuous analysis, improvement objectives setting, networking and evaluation activities,
- knowledge building [4].

On the base of above mentioned information it is easy to indicate, that success of product oriented management systems implementation in companies depends on the stage of specific organization in the ecodesign and formalized environmental (and quality) management learning curves.

6. CASE WATER METER FACTORY POWOGAZ SA

Water Meter Factory PoWoGaz SA has a certificate of an Integrated Management System made up of three mutually-related and complementary subsystems: Quality Management System, Environmental Management System and Health and Safety Management System. The certificate issued by two authorized bodies: Polish Research and Certification Centre and German DQS confirms compliance of the Integrated Management System

with the standards of PN-ISO 9001, PN-N-18001 and PN-N ISO 14001, and are also active in Cleaner Production Program. This company is very good example of organization engaged in building the bases to introducing LCM approach in practice.

The Quality Management System developed and implemented in POWOGAZ SA has created a certain pattern of behavior that is followed by staff in all fields of their activity.

The System complies with the international standards ISO 9000 regarding the following requirements:

- external quality assurance included in ISO 9001 and required in relations with customers,
- internal quality assurance included in ISO 9004 and necessary for quality management of all types of activities performed in the Factory.
- Revised Quality Management System was incorporated into Total Management System, and now it:
 - meets the requirements of PN-ISO 9001 and PN-ISO 9004,
 - is integrated with the systems of environment management and health and safety management,
 - respects assumptions stated in the project of a new standard called "Vision 2000".

In its activity POWOGAZ SA follows the principle of a balanced development that consists in an integration of a technical progress with an environmental protection. Awareness of the necessity to permanently diminish its negative effect on the environment has made its Management to embark on the Cleaner Production Project. In consequence of many efforts whose results were positively estimated by experts the Factory received Certificate of Cleaner Production in 1998. Development and implementation, within the Total Quality Management System, of Environment Management System based on PN-ISO 14001 was a natural increase of environmentally-friendly activity.

The policy of the Total Quality Management System is executed through some key targets, among which the following are regarded as the most important:

- improvement and development of the Total Quality, Environment, Health and Safety Management System,
- promotion of a refinement project with a constant aspiration for regular improvement and achieving a lasting perfection,
- encouraging technical progress to refine quality, increase safety and improve environment management.

The factory bears high expenditures for an improvement of technology processes in order to decrease their negative effect on the environment. To achieve the stated objectives it decided to shut down: the factory boiler house, the plating shop and in the obsolete paint-shop and foundry, which were replaced with advanced environmentally-friendly technologies and devices.

Environment Management System consists in an efficient management of factory processes and activities that:

- mould ecological awareness of the staff and maintain contact with the environment (through various publications, meetings etc.),
- facilitate a fully documented estimation of the factory's influence on the environment,
- allow for a complex monitoring of activities connected with the most important effects that the factory has on its environment,
- let to minimize the negative influence of the factory on its environment and to undertake counteractions,
- prevent pollution of all elements of the environment,
- meet expectations of the customers concerning protection of the environment,
- increase ecological reliability of organization.

Health and Safety Management System implemented in the factory in compliance with PN-N 18001 allows to find out how the factory affects its natural environment and then to eliminate hazards on workstations. The System defines sources of potential hazards, hazard prevention methods and activities aiming at elimination of hazards. Prevention against failures and accidents on work-stations is a crucial element of the system.

In order to improve safety in the factory the following measures have been taken:

- monitoring of safety levels in accordance with monitoring plans by trained groups, internal and external inspections, report preparation,
- examination of accidents and events of potential hazard through keeping records, watching behavior patterns of the working staff, distributing information on accidents and hazardous events including machine failures,
- determination of hazard zones and places: i.e. identification of hazards, fire-fighting equipment, marking buildings, tanks, routes, etc.,
- determination of hazard levels for particular workstations involving as many members of the working staff as possible,
- equipping the employees with accident-protection agents,
- providing professional trainings.

7. CONCLUSIONS

The problem of introduction of LCM is of key importance for small and medium enterprises (SME) because they constitute in Western World almost 2/3 of private sector and represent a major source of growth in employment, through new business start-ups. Thus the SME sector is an important target for competitiveness, innovation and environmental policies and practices but reveals low awareness of environmental issues. Results from research show that most SMEs:

- do not consider that their operations have an impact on the environment,
- are unfamiliar with either EMAS or other environmental systems, respond to regulation as the biggest stimulus for introducing environmental measures,
- are unaware that they have a legal Duty of care to ensure that their wastes are handled and disposed of properly [IPTS].

The Integrated Product Policy (IPP) suggested by the European Commission (some member countries) includes eco-design, green public procurement, eco-labeling and other product life cycle based concepts. Companies with a life cycle management system in place will have increased possibilities to comply with such product-related legislation, because early integration of environmental and social concerns into the design and development cycle is expected to reduce costs, promote innovation, facilitate supply chain integration and assure greening initiatives. We hope, that Poland and other CEE countries will also profit applying IPP.

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