Journal of Maritime Research, Vol. V. No. 2, pp. 11-22, 2008
Copyright © 2008. SEECMAR

Printed in Santander (Spain). All rights reserved
ISSN: 1697-4840

PROPOSAL OF AN ENVIRONMENTAL CODE OF PRACTICE: IMPROVEMENT OF ENVIRONMENTAL SENSITIVITY IN SHIPBUILDING AND SHIP REPAIR INDUSTRY

E.R. Zuhal[1]

Received 8 October 2007; received in revised form 22 October 2007; accepted 13 June 2008

Abstract

One of the mostly discussed topics in the 21st century regarding all industries without exception is the environmental sensitivity which focuses basically on environmental protection and environmental impacts of organizations. Environmental standardization contains the major elements for the realization of environmental sensitivity, including environment side, affection for the general process and product and services those are performed in the organization. For the shipbuilding industry, as being an international market, the importance of quality is beyond doubt. Although quality concept has already proven its necessity in the market, for the 21st century's multi-directional points of view, it is not enough for a successful manufacturing organization. Consequently, the need for the improvement of environmental sensitivity has arisen as a result of the decisive studies of environmentalist organizations, which leaded to toughened national and international legislations. This paper, starting with a environmental policy proposal for the shipbuilding industry, gives an overview of the industry for both the European and the World markets. On the practice part, environmental management system, a useful tool for the improvement of environmental sensitivity is analyzed.

Key words: Shipbuilding, Shipyard, Environmental Sensitivity, Environmental Aspect

1 Asst Prof Dr, ITU Maritime Faculty of Istanbul Technical University (erzuh@itu.edu.tr), Tuzla Istanbul Turkiye, 34940 Istanbul Turkiye.

INTRODUCTION

Shipbuilding industry has strategic importance in many respects. It develops advanced technologies that offer considerable spin-offs to other sectors; it provides essential means of transport for international trade; and it supplies modern navies with advanced vessels.

In high-tech industry sectors such as shipbuilding, success is first of all based on knowledge. Only in Europe exists such a dense network of shipyards, equipment suppliers, research centers and other providers of advanced technologies and engineering services.

European Shipbuilding is a strong and dynamic industry. As a result of an impressive streamlining, coupled with pro-active outsourcing strategies and continuous innovation in production methods, a network of highly specialized companies has developed to become one of the competitive advantages of the European shipbuilding industry. Typically 60 to 75% of the values of a new ship are goods and services provided by marine equipment and service industries.

Shipbuilding is an important and strategic industry in a number of EU Member States. Shipyards often play a significant role for the regional industrial infrastructure and with regard to military shipbuilding, for national security interests.

There are more than 150 shipyards in the EU, with about 40 of them active in the global market for large sea-going commercial vessels; 350.000 people are directly employed by yards and the marine equipment industry (which has around 9.000 companies). More than half of the industry's turnover of about 34 billion Euro is achieved through exports.

The European shipbuilding industry is the global leader in the construction of complex vessels such as cruise ships, ferries, mega-yachts and dredgers. It also has a strong position in the building of submarines and other naval vessels. Equally, the European marine equipment industry is world leader for a wide range of products, from large diesel engines to electronics.

- The European shipbuilding industry holds approximately 20% of the world shipbuilding capacity.
- Member Shipyards provide more than 100,000 high qualification jobs through direct employment and generate at least three times as many in the marine equipment and service industries in Europe.
- The annual turnover of shipyards represented by Community of European Shipyards' Association (CESA) in 2006 was 14.4 billion Euro in merchant shipbuilding and 2.1 billion Euro in ship repairing. Exports accounts for roughly 70% of the total turnover.
- As key drivers of maritime excellence, European shipyards invest on average approximately 10% of their turnover on research, development and innovation (CESA,2007).

Commercial shipbuilding and ship repair have always operated in a truly global market, with yards competing for contracts within and outside their own countries. This early and comprehensive exposure to the forces of globalization makes shipbuilding substantially different from most other manufacturing industries. However, market mechanisms are not allowed to function properly due to government interventions in several countries. While a strong state aid discipline exists in the EU, no specific discipline applies at international level.

While most industries are effectively covered by existing multilateral trade rules, shipbuilding, due to its own characteristics, is not easily amenable to the application of those rules. Today, shipbuilding is not subject to an anti-dumping discipline or to custom duties. Consequently, the shipbuilding sector is practically the only industry without effective protection against unfair trading practices.

ENVIRONMENTAL POLICY CODE

In order to establish an environmental policy code, it is better to foresee the main environmental objectives which the shipbuilding sector should aim to achieve. These are listed below:

1. To develop a sustainable shipbuilding infrastructure, for both new building and repair segments with the idea of continual improvement by generating new knowledge and technology and developing sustainable techniques which combine environmental effectiveness and cost efficiency. The aim is to achieve self-regulation and develop a bottom-up approach. Even if the governments decide to issue environmental regulations, the existing self-regulatory instruments, developed by the shipyards themselves and which address day-to-day practice, will provide a background to be used as a basis for governmental environmental policy. This will enable legislation to be more easily supported and implemented.
2. To encourage cooperation between shipyard managements and the relevant stakeholders (ship owners, shipyard workers, public, NGOs) to facilitate the reconciliation, at an early stage, of differing interests and the acceptance of shipyard projects by the local community.
3. To enhance cooperation between shipyard managements in the field of environment and facilitate the exchange of experiences and implementation of best practices on environmental issues to avoid unnecessary duplication and enable shipyard managements to share the costs of environmental solutions. This can be notably achieved through the participation of shipyards in a network. The aim is to create a level playing field by limiting poor environmental practice as a competitive factor between shipyard managements.
4. To encourage shipyard managements to conduct appropriate environmental impact assessments for shipyard projects and appropriate strategic environ-

mental impact assessments for shipyard development plans to assess, at an early stage, how their effects on the environment can be minimized.

ENVIRONMENTAL FRAMEWORK FOR SHIPYARD MANAGEMENTS

The role of shipyard managements in coping with the environmental issues can be analyzed in two different perspectives:

— Shipyard area (land and sea)

— Ship / Shipyard interface

The following sections will demonstrate that the shipbuilding and repair industry is committed to developing voluntary schemes in order to move towards self-regulation.

Development of the Shipyard Area

The activities of industries located in the shipyard area affect the shipyard area as a whole. As a result, the interests of the shipyard management are also related to the environmental effects of the actions undertaken by industries in the shipyard.

Global competition puts pressure on European shipyard managements to offer quality and economy which accommodate the wishes of their customers. On the other hand, shipyard development in Europe is more and more constrained by scarcity of land, urban development and ecological considerations. Shipyard development can be affected by the requirements of a series of Directives: Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), Conservation of Wild Birds and Conservation of Natural Habitats and of Wild Flora and Fauna. Moreover, shipyard development should be seen in the context of Integrated Coastal Zone Management (ICZM). This approach requires a comprehensive assessment, setting of objectives and planning of coastal systems and resources (EU Directive, 2001).

The environmental principles set in the above-mentioned Directives can conflict with the interests of shipyards, as the fulfillment of these requirements may hamper the development of shipyard projects, therefore lead to great delays in their completion and increase costs. The implications are heavily influenced by the way legislation is transposed into national legislation, as well as by the national and regional-specific rules.

Bearing in mind the legal framework and the system of planning consents as operated in each member state, it is recommended that:

— Shipyard managements conduct appropriate environmental impact studies where possible, even if not strictly required under the terms of the Environmental Impact Assessment Directive;

— All shipyard management's plans make sure they collect the public opinion in the planning period, according to the Strategic Environmental Assessment

Directive; a carefully designed public outreach program can ensure the involvement of all stakeholders;

— Shipyard managements get involved in the early processes of designation of protected areas.

Environmental Aspects of Shipyard Phenomena and Shipbuilding Industry

An environmental aspect is defined as an element of a facility's activities, products or services that can or does interact with the environment. These interactions and their effects may be continuous in nature, periodic, or associated only with events, such as emergencies. Traditional environmental impacts related to building processes are considered to be emissions of noise and dust during sandblasting and painting. In addition, the efficiency of the usage of steel plates has been of some concern. Important processes are cutting, forming, joining, grinding, sandblasting, painting and outfitting. The most important environmental aspects concerning those processes are mainly local aspects with relation to air and water (Hayman et al., 2000).

An environmental impact is defined as any change to the environment, whether adverse or beneficial, resulting from a facility's activities, products, or services. A significant environmental aspect is one that may produce a significant environmental impact (EPA,2003). In short, the aspect is the cause and the impact is the effect. Some major environmental aspects and their impacts in the shipyard phenomena is illustrated in Table 1.

Environmental Aspect	→	Environmental Impact(s)
Emissions of volatile organic Compounds (VOC's)	→	Air pollution, smog
Discharges to stream	→	Degradation of aquatic habitat and drinking water supply
Spills and leaks	→	Soil and groundwater contamination
Electricity use	→	Air pollution, global warming
Use of recycled paper	→	Conservation of natural resources

Table 1. Environmental impact and aspect samples for shipyard organizations.

There are numerous techniques and data sources to assist in identifying and evaluating environmental aspects and impacts at the facility. Note that much of the data collected to date will be useful as environmental aspects are identified and their significances are determined. In determining environmental aspects, considerable consensus building and professional judgments are required to develop conclusions about risk. This is because how to evaluate all the factors that determine ecological risk is not well defined and is the subject to interpretation. Individual measures must weighted by the quality and reliability of their data and risk must be estimated from the preponderance, magnitude, extent, and strength of causal relationships between the data on exposure and effects. Some major examples of a shipyard's environmental impacts can be counted as dredging (OSPAR, 1992) and disposal of dredged material (Yozzo, et al., 2004), similarly soil contamination, wastes were discussed by Page et al, (2005) and by Song et al, 2005. Similarly air pollution, noise pollution and water pollution prevention for shipyards were discussed in advanced by the following authors and companies: Kwan (2001), Kellems et al. (2001), Stromwater Ltd (2000), Walker et al. (2005).

Techniques and Data Sources	**When Best Used**
Emission Inventories	Used to quantify emissions of pollutants to the air. Some data on emissions or chemicals of concern may already be available.
Environmental Compliance Audits	Used to assess compliance with federal, state, and local environmental regulations. These methodologies are in common use. Their scope and level of detail vary.
Environmental Cost Accounting	Used to assess the full environmental costs associated with activities, products, or services.
Environmental Impact Assessments	Used to satisfy requirements regarding the evaluation of environmental impacts associated with proposed projects.
Environmental Property Assessments	Used to assess potential environmental liabilities associated with facility or business acquisitions or divestitures.
Failure Mode and Effects Analyses	Commonly used in the quality field to identify and prioritize potential equipment and process failures as well as to identify potential corrective actions.
Life Cycle Assessments	Used to assess the cradle-to-grave impacts of products or processes, from raw material procurement through disposal.
Pollution Prevention or Waste Minimization Audits	Used to identify opportunities to reduce or eliminate pollution at the source and to identify recycling options.
Process Flow Diagrams	Used to allow an organization to visualize and understand how work gets accomplished and how its work processes can be improved.
Process Hazard Analyses	Used to identify and assess potential impacts associated with unplanned releases of hazardous materials.
Project Safety/Hazard Reviews	Used to assess and mitigate potential safety hazards associated with new or modified projects.
Risk Assessments	Used to assess potential health and/or environment risks typically associated with chemical exposure.

Table 2: List of techniques and data sources for determining environmental aspects.

Systematically weighing the evidence of risk rendered conclusions about risk in a manner that was clearly defined, objective, consistent, and did not rely solely on professional judgment (Johnston et al., 2002). In table 2, list of techniques and data sources for determining environmental aspects are given with the correct situations to be used.

SHIPYARDS AND THEIR ENVIRONMENTAL MANAGEMENT

The environmental role of shipyard managements depends on national laws. In certain cases, national legislation already foresees environmental requirements for shipyard users. Environmental duties are also given to public authorities or administrations different from shipyard managements.

An environmental management system (EMS) is a management framework for reducing environmental impacts and improving organizational performance over time. EMSs provide organizations of all types with a structured approach for managing environmental and regulatory responsibilities to improve overall environmental performance, including areas not subject to regulation such as unregulated risk, resource conservation, and energy efficiency (Ross Ltd., 2004) . An EMS helps an organization better integrate the full scope of environmental considerations and get better results, by establishing a continuous process of checking to make sure environmental goals are met. The EMS approach is based on the concept of Total Quality Management (TQM), which was initially developed as a tool by the private sector to achieve higher and more consistent product quality. The framework is based on a plan-do-check-act continual improvement approach that leads an organization through a regular cycle of planning, implementation, performance monitoring and review/improvement.

With an EMS, an organization develops and routinely evaluates processes and procedures to identify and manage its environmental footprint. An organization looks at selected operations associated with its significant impacts and makes them visible, measurable, manageable and therefore subject to improvement. An EMS does not impose new technical requirements. Rather, it helps an organization develop its own short and long-term environmental goals and objectives, its own operational controls, and its own improvement requirements. The EMS may lead an organization to adopt new methods, modify existing ones or accept the practices it already has in place. The EMS framework can be adapted to support the needs, priorities and circumstances of the implementing organization. Typically, an EMS is used to support continual improvement of activities relevant to environmental performance by helping an organization identify and act on opportunities for improvements (Sayre, 1996).

An organization's decision about whether to implement an EMS, and potentially seek third-party certification (e.g., ISO 14001, EMAS) for it, is typically based on a comparison of the perceived costs and benefits (ISO 14001, 2004) and (Melnyk et al., 1999). To pursue an EMS, organizations typically must decide that one or more of the following outcomes are important to business success:

— A strong environmental compliance management system that reduces the risk of non-compliance situations;
— An effective management system for driving environmental policy objectives through the organization, including into core operations;
— A system to support continual improvement of environmental management processes and performance; and
— A system that generates documentation for purposes of internal and/or external auditability.

In addition to organizations' desires to achieve one or more of these outcomes, there are other drivers that can shift the EMS decision dynamics, such as peer pressure within an industry sector, supply chain pressures or expectations, and the presence of incentives for pursuing an EMS. When the cost effective analysis of EMS integration for a shipyard organization is taken into account, the cost factors can be classified as internal costs and external costs. The internal cost can be realized as the cost of efforts that shall be spent for the execution, coordination and implementation of system requirements in the shipyard that can be recognized as the labor cost (it represents the bulk of the EMS resources expended by most facilities) and the cost for the enhancement of infrastructure related with environmental pollution prevention in the shipyard. Similarly the external cost could be the possible consulting assistance and external training of shipyard key personnel. The benefit perspective of EMS integration into shipyard organization can be listed as the improved environmental performance, enhanced compliance assurance, prevention of pollution and resource conservation, new customers/markets, increased efficiency/reduced costs, enhanced employee morale, enhanced image with public, regulators, lenders, investors, and employee awareness of environmental issues and responsibilities and reduced risk.

A recent U.S. National Aeronautics & Space Administration (NASA) study established a gold standard for measuring EMS implementation costs. NASA compiled implementation cost information at three centers piloting EMS, including estimates on in-house civil servant and contractor support. Though costs may be slightly different for a shipbuilding facility, the NASA costs range between $111 and $138 per capita with a range of hours spent from 1.3 to 2.3 per capita. The returns on such investments tend to have two-year paybacks and can generate savings of about $3.50 for every dollar invested (ICF, 2001). Another tool for the application of an environmental management system this time, is implementing an integrated management system, by combining quality and environmental issues. As all management systems share a lot of common practices, the integration will make the recordkeeping, audit, review and some other processes much easier. In this respect quality management system and environmental management system integration in generic principles were offered by Beechner and Koch (1997), and its total quality management approximation was discussed by Karapetrovic and Willborn (1998). Besides integrated management system implementation philosophy for small enterprises was analyzed in advanced by Douglas and Glen (2000). Then the enhancement of shipyard facilities in developing countries utilizing with the integration of ISO 9001:2000 and ISO 14001:2004 standards were proposed by Nomak and Er (2004).

Compliance with legal requirements is one of the main pillars upon which the environmental management system should be based because the potential costs of non-compliance (possible damage to the environment, revenue loss and impact on public image, for example) can be very high.

An effective EMS will build on what already is and should include processes to:

— identify and communicate applicable legal and other requirements; and
— ensure that these requirements are factored into the facility's management efforts.

New or revised legal requirements might require modification of the environmental objectives or other EMS elements. By anticipating new requirements and making changes to the operations, some future compliance obligations and their associated costs might be avoided.

Furthermore, national legislation can vary for different countries. For instance, Japan appears to have established environmental policies designed to protect human health and the natural environment. Various laws such as the Air Pollution Control Law, the Water Pollution Control Law and the Chemical Substances Control Law provide the basis for establishing standards on waste releases. Under these laws, environmental standards were established for maintaining ambient air and water quality, and preserving the natural environment in Japan. It is important to note that Japan gives highest priority to environmental impact assessments and environmental Based on the regulations reviewed in this paper, it is hard to get a clear picture on the impact of the environmental standards on shipyards, and the level of environmental compliance by the Japanese shipyards. However, because of the complex processes and chemicals employed in shipyards, it is reasonable to expect that Japanese shipyards are strictly regulated under the current environmental laws (Kura et al. 1997).

CONCLUSION

The total cost of processes handled in order to fulfill the requirements of both national and international environmental legislation, results in an increasing amount day by day. Both states and international organizations are in a race of putting sanctions into motion about environmental care and protection.

Mostly affected bodies from the toughening legislations are the industrial enterprises, especially the heavy industries having various environmental aspects. As the shipbuilding and repair industry is one of them, negative influences of new codes and directives show noteworthy effect on the market share of ones which are faced with tighter legislation. As commercial shipbuilding and repair operates in a global market, with yards competing for contracts outside their own countries, comprehensive exposure to different legislative forces makes shipbuilding absolutely different from most other industries. While a strong state-based discipline exists in the EU, no specific discipline applies at international level, especially in far-eastern countries.

In conclusion, the shipbuilding sector is practically the only industry without effective protection against unfair trading practices. Consequentially, the need for optimizing the cost due to environmental legislation has arisen. The best practice for the minimization of costs without facing with penalties is developing and following an environmental policy code, possibly guided by a management system, which is both a guarantee for the continuation of the system and a tool for optimizing the job done.

An environmental management system, once to be seen luxury for most enterprises, is an indispensable tool to cope with the environmental legislation. The system both eases the prosecution, reduces risks, provides continual improvement and obtains noteworthy decrease in the cumulative running costs.

The implementation period of an environmental management system differs from case to case, for different sizes of organizations, various scopes of production and dynamism. But on the implementation process, the most important fact is the managerial commitment. If the management can persuade the working team on the need of the system, the implementation phase will be painless.

As a result of these, in order to cope with the rapidly arising environmental legislation both nation-wise and internationally, implementation of an environmental policy code, guided by a management system is an indispensable tool for shipyard managements, both for the continuation of productivity and competitive position in the world market.

REFERENCES

Beechner, A.B. and Koch, J.E. (1997), Integrating ISO 9001 and ISO 14001, Quality Progress 30 (2), 33-36.

CESA (2007), Community of European Shipyards' Associations Annual Report 2006-2007, Brussels, Belgium.

Douglas, A. and Glen, D. (2000), Integrated management systems in small to medium enterprises, Total Quality Management 11 (4) 686-690.

European Community Directive (2001), 2001/42/EC of the European Parliament on the assessment of the effects of certain plans and programs on the environment.

EPA (2003), Environmental Management Systems (EMS) Implementation Guide for the Shipbuilding and Ship Repair Industry, Environmental Pollution Agency Publications.

Hayman, B., Dogliani, M., Kvale, I., Fet, A.M., (2000), Technologies for reduced environmental impact from ships - Ship building, maintenance and dismantling aspects, TRESHIP 2000 Conference, 4.-6.September, Newcastle, UK, pp. 1-10.

ICF Consulting (2001), NASA Environmental Management Systems Costs and Benefits.

ISO 14001 (2004), Environmental management systems specification with guidance for use, International Organization for Standardization, Geneva, Switzerland.

Johnson, R.K., Munns, WR Jr., Tyler, P.L., Marajh-Whittermore, P.Finkelstein, K, Munney, K., Short, F.T., Melville, A., Hahn, S.P. (2002), Weighing the evidence of ecological risk from chemical contamination in the estuarine environment adjacent to the Portsmouth Naval Shipyard, Kittery, Maine, USA, Environmental Toxicology Chemistry 1, 182-94.

Nomak, H.S. and Er, D. (2004), Enhancement of shipyard facilities in developing countries utilizing integrated management system standards, The International Association of Maritime Economists Annual Conference.

Karapetrovic S. and Willborn, W. (1998), Integration of quality and environmental management systems, TQM Magazine 10 (3) 204-213.

Kellems,B.L., Sanchez, F.F., Haumschilt, L.P. (2001), Alternatives for Control, Collection, and Treatment of Shipyard Stormwater, 11th Annual Southern States Environmental Conference, 24-27 September, Mississippi, USA, pp.134-143.

Kura, B., Knecht, A., McManis, K., Lea, W.R. (1997), Comparison of Japanese and U.S. Environmental Regulations Impacting Shipbuilding, Journal of Ship Production (13), 171-177.

Kwan, K. (2001), Managing shipyard stormwater discharges, 11th Annual Southern States Environmental Conference, 24-27 September, Mississippi, USA, pp.49-57.

Melnyk, S.A., Sroufe, R., Montabon, F., Calatone, R., Tummala, R.L., Hinds, T.J. (1999), Integrating environmental issues into material planning: green MRP. Production and Inventory Management Journal 40 (3), 36–45.

OSPAR (1992), Commission Report The Convention for the Protection of the Marine Environment of the North-East Atlantic.

Page, D. S., Ozbal, C. C. and Lanphear, M. E. (1996), Concentration of butyl tin species in sediments associated with shipyard activity, Environmental Pollution, 91 (2), 237-243.

Ross & Associates Environmental Consulting, Ltd. (2004), Findings and Recommendations on Lean Production and Environmental Management Systems in the Shipbuilding and Ship Repair Sector.

Sayre, D. (1996): Inside ISO 14000: The Competitive Advantage of Environmental Management. St. Lucie Press, USA.

Song, Y.C., Woo, J.H., Park, S.H., Kim, I.S. (2005), A study on the treatment of antifouling paint waste from shipyard, Marine Pollution Bulletin, 51, 1048-1053.

Stormwater Management Inc. (2000), Technical Report, Pilot waste treatment trial at shipyard, Filtration and Separation, November 2000, 13.

Walker, G.M., Hanna, J-A., Allen, S.J. (2005), Treatment of hazardous shipyard wastewater using dolomitic sorbents, Water Research 39, 2422-2428.

Yozzo, D.J., Wilber, P., Will, R.J. (2004), Beneficial use of dredged material for habitat creation, enhancement, and restoration in New York–New Jersey Harbor, Journal of Environmental Management 73, 39-52.