Benefits and Barriers in Implementing and Maintaining Environmental and Health and Safety Management Systems

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ABSTRACT

Environmental management and health and safety management are two core areas which must be managed efficiently and effectively by all industries. The proper management of these two disciplines can lead to increased cost savings, increased competitiveness, increased morale within the workforce and positive public image. Environmental Management Systems (EMS) and Health and Safety Management Systems (HSMS) are becoming increasingly popular and many industries are now installing them. While there are many benefits to be accrued from installing such systems, there are also many barriers most notably cost, time and excessive documentation.

This Dissertation examines the benefits and the difficulties associated with the installation and the maintenance of these systems with particular reference to the pharmaceutical industry and the IPC/IPPC licensed food and drink companies in Ireland. The work has found that while it would appear that the barriers associated with EMS's and HSMS's are surmountable, more work needs to be done to ensure that all of the perceived benefits are achieved particularly the areas where cost savings can be made most.

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List of abbreviations

EHS   Environmental Health and Safety

EMS   Environmental Management System

HSMS   Health and Safety Management System

GDP   Gross Domestic Product

CSO   Central Statistics Office

EPA   Environmental Protection Agency

IPC   Integrated Pollution Control

IPPC   Integrated Pollution Prevention Control

BAT   Best Available Techniques

ISO   International Standards Organisation

EMAS   Eco Management and Audit scheme

IDA   Irish Development Authority

IBEC   Irish Business and Employers Confederation

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SECTION 1 -INTRODUCTION

This research dissertation involves a detailed examination of the benefits and the difficulties associated with environmental management and health and safety management with particular reference to the pharmaceutical sector and IPC/IPPC licensed food and drink companies in Ireland.

The management of environmental health and safety (EHS) affairs is an important component in all manufacturing industries nowadays. Most companies now recognise its importance and manage it as a business function with focus on increased efficiency, cost savings, risk reduction, and reputation management. Many of the efficiencies gained in EHS management have occurred at a time when most large multinational companies have experienced significant restructuring due to acquisitions, divestitutes or efforts to position the company for stronger competition and performance in the marketplace (www.icfconsulting.com).

While the potential pressures on the environment are growing, the means to combat them are keeping pace through an increasing range of laws and policies as well as structures and procedures for their implementation. At international level, there have been further developments in relation to controlling greenhouse and acidifying gas emissions and to the protection of air and water quality. At national level, the statutory controls on industrial activities and waste management have been strengthened, while policies have been devised to counter the regionally unbalanced nature of development in Ireland. It has been observed that Irish people now seem more aware of and concerned with environmental issues than they were a decade ago

and show an increased willingness to act in a manner that benefits the environment (EPA, 2004).

Environmental management essentially means the management of operations in such a way that the surrounding environment will be least affected. The environment includes the air, water and land. The Environmental Protection Agency and the Local Authorities are responsible for the enforcement of environmental protection in Ireland. Industries which discharge effluents must ensure their effluents are treated and do not pose a threat to the environment. Environmental management systems are a tool which many companies adopt to help them manage their environmental operations as effectively as possible.

Safety is also of extreme importance in the workplace. Poor attitudes towards safety lead to increased accidents, increased absenteeism and decreased staff morale. A positive safety culture within an organisation contributes to increased morale and higher productivity levels.

The aims and objectives of this dissertation are:

- To identify and discuss the benefits of environmental management and health and safety management in the pharmaceutical and the IPC/IPPC licensed food and drink sector in Ireland with particular emphasis on Environmental Management Systems (EMS's) and Health and Safety Management Systems (HSMS).

- To identify and discuss the barriers associated with both environmental management systems and safety management systems in the aforementioned sectors.

- To identify whether the companies are realising the perceived benefits associated with EMS's and HSMS's.

- To identify which benefits are most applicable.

- To identify which barriers are the most prominent.

SECTION 2 LITERATURE REVIEW

2.1 Overview of pharmaceutical industry in Ireland

Ireland is a key global location for the pharmaceutical industry. Foreign Direct Investment for the pharmaceutical sector in Ireland is 40 years old with Squibb (now Bristol-Myers Squibb) being the first pharmaceutical company to locate in Ireland in 1964. Currently thirteen of the top fifteen companies in the world have substantial operations in Ireland. In total, there are eighty-one facilities employing more than 17,000 people in Ireland.

Ireland is now one of the world's largest exporters of pharmaceuticals with €34 billion of intermediates and finished pharmaceuticals exported in 2002. 6 out of 10 and 12 out of 25 of the world's top selling drugs are produced in Ireland including Lipitor and Zocor. Products are manufactured for global markets.

The pharmaceutical cluster in Ireland is supported by a sophisticated infrastructure of serviced sites, public utilities as well as specialist support companies and services. Many of the pharmaceutical companies in Ireland have established multiple activities in Ireland, including:

- Fermentation e.g. Schering-Plough, Wyeth
- Active Pharmaceutical Ingredient (API) e.g. Merck, Pfizer, Yamanouchi,
- Sterile Fill/Finish e.g. Genzyme, Allergan
- Formulation e.g. Wyeth, Takeda, Pfizer
- Shared Services/Supply Chain Management e.g. Allergan, Pfizer, Novartis
- Research & Development (R&D)/Process Dvelopment e.g. Wyeth, Bristol-Myers Squibb, Glaxosmithkline

The sector's satisfaction with Ireland is exemplified by several examples of repeat investment with major pharmaceutical companies having multiple plants; for example, Pfizer operates six manufacturing sites as well as a Corporate Bank and a European Financial Shared Services Centre.

The sector has become increasingly integrated in recent years. Early investment in fine chemical plants producing bulk active materials has been followed by investments in finished product pharmaceuticals. Many plants are now engaged in product development for Irish and other plants (www.idaireland.com).

Figure 1 below illustrates the growth in employment in the pharmaceutical industry from 1988 to 2002. Between 1988 and 2002, employment in the pharmaceutical industry in Ireland quadrupled increasing steadily over this fourteen-year period going from 5000 in 1988 up to 20,000 in 2002.

Figure 1: Showing number of people employed in pharmaceutical industry in Ireland from 1988-2002. (www.recruitireland.com)

The industry in Ireland is a highly sophisticated one, incorporating advanced manufacturing technology, state of the art equipment and stringent quality control.

Global pharmaceutical companies are attracted to Ireland for a wide variety of reasons. The combination of high quality available science graduates and the generous tax incentive offered compliment the overall low operating costs. Also the specialist skills required by the pharmaceutical industry are readily available in Ireland. Output from the third level sector is being continually refined to meet the sector's needs. Further, the considerable growth in the Irish economy over the last ten years has seen very significant repatriation in skilled people. In addition, Ireland is seen as a desireable expatriate location with a minimum of bureaucratic obstacles, an excellent educational system that facilitates family relocation and has free movement of labour within the enlarged EU. Ireland has an exemplary compliance record with the regulatory agencies. Thirty pharmaceutical companies are FDA approved with no warning letters issued since 1998. (www.recruitireland.com)

2.2 Overview of the food and drink industry in Ireland

With an output of over €16 billion the Irish food and drink industry accounts for 9% of Gross Domestic Product (GDP), 8% of exports and 55% of exports by Irish owned companies. The industry employs 9% of the workforce, just over 155,000 people. It is an industry that has developed and emerged as a resourceful and successful competitor in the fast moving, dynamic and challenging global marketplace. Irish food and drink products are sold in over 170 countries with exports valued at €7.17 billion. According to Mary Coughlan Minister of Agriculture and Food, the Irish food and drink industry contributes significantly to our balance of payments and net foreign earnings. The Minister also states that the Department of Agriculture and Food has invested heavily in technology that enables international best practice systems of production and control to operate and their control agencies are themselves subject to control and assessment by independent external agencies so that the

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transparency that is so vital to consumer confidence can be maintained. (www.agriculture.gov.ie)

The latest estimated gross output of the Irish agri-food and drink industry is valued at €16.6 billion. According to the Central Statistics Office (CSO's) Census of Industrial Production, 678 companies are engaged in the food and drinks sector giving direct employment to 47,000 people. A further 108,200 people are employed in agriculture. Therefore 155,200 people are employed in the Irish agri-food and drink sector. In 2003, Irish agri-food and drink exports amounted to €6.66 billion. The UK was the main destination for Irish agri-food and drink exports accounting for 47% of all exports. 30% of exports went to Continental EU markets while the remaining 23% went to international markets. The latest estimates of the distribution of our agri-food and drink exports in 2003 by sector was as follows: dairy products and ingredients (24%), prepared consumer foods (23%), beef and live animals (19%), beverages (15%), pigmeat and poultry (7%), sheep and sheepmeat (2%), mariculture (5%) and edible horticulture (3%). In 2003, gross agricultural output was valued at €4,870 million. Milk accounts for the largest share of gross agricultural output at 30 percent while cattle and beef account for almost 26 per cent. Other sectors to have a share in GAO include pigmeat (6%), sheep (4%), cereals (3.5%), root crops (3.6%) and forage plants (13.4%).

The dairy sector output of almost €3 billion and exports of €2.2 billion is hugely important to Ireland. This sector has been very successful and has given a good return to farmers. There are almost 28000 dairy farmers dedicated to the production of milk in Ireland. The Irish dairy processing industry constitutes approximately 36 co-operative including 23 milk processors with 27 milk processing sites, 15 butter plants,

13 powder plants, 10 cheese factories and 7 casein plants (www.icos.ie). There are almost 1.1 million dairy cows in Ireland according to the CSO's December census.

In 2003, total Irish milk output amounted to 5,200 million litres. From the total milk output, Irish milk processors produced over 408 million litres of whole milk and 122 million litres of skim/semi-skimmed milk. In addition to this 140,000 tonnes of butter, 112,000 tonnes of cheese and 78,000 tonnes of skim milk powder were produced.

There are approximately 136,300 family farms in Ireland (estimate for 2002 - actual as per the 2000 Agricultural census is 141,527 in 2000) broken down as follows: specialist tillage (3%), specialist dairying (19%), specialist beef production (50%), mixed grazing livestock (15%), specialist sheep (9%), mixed crops and livestock (3%) and other types (1%).

The total land area of Ireland is 6.9 million hectares of which 4.4 million ha is used for agriculture.   80% of Irelands farmland is grassland.   The average farm size is approximately 32 hectares (www.bordbia.ie).

2.3 Introduction to Environmental Management

Environmental management is management of the activities of a firm that has or can have an impact on the environment. By over extracting raw material from the environment and by overloading it with waste, the environment becomes degraded. Environmental management aims to find ways of carrying out business activities that reduce or halt this degradation. Environmental management encompasses a range of approaches aimed at improving the environmental performance of industrial processes, products and services. The aim of environmental management approaches is to design, develop, and operate industrial activities, products and services that

prevent or minimise environmental impacts while still being economically competitive. Previous approaches to environmental protection focussed on managing environmental impacts e.g wastes and emissions to air and water after they were created. Modern approaches aim to prevent or minimise environmental impacts in the first place. This can bring business benefits in terms of cost savings, competitiveness and market opportunities.

Effective environmental management can be applied to the processes used in any industry as well as to the products and services provided. For production processes, this might involve conserving raw materials, water and energy; eliminating toxic and dangerous raw materials; reducing the quantity and toxicity of all emissions and waste at source during the production process. Environmental management of products and services include incorporating environmental concerns into the design and provision of products and services; reducing the environmental, health and safety impacts of products over their entire lifecycle, from raw materials extraction, through production and use, to the end of life recovery and/or ultimate disposal of the product (www.envirocentre.ie).

2.3.1 Benefits of environmental management

There are a number of advantages of undertaking environmental management and these include:

- Cost savings

- Ensuring legislative compliance

- Anticipating future legislation

- Reduced environmental risk

- Meeting supply chain requirements

- Improved relations with regulators

- Improved public image and community relations

- Increased market opportunities

- Employee enthusiasm (EEA, 1998).

- Improved process control and product quality

- Reduced waste collection, treatment and disposal costs especially in the case of hazardous waste

- Capability building

- Improved competitiveness

- Improved corporate reputation (www.envirocentre.ie).

- Improved communication channels, skills, knowledge, and attitude

- Attraction of new business and customers and satisfaction of customer requirements (Hillary, 1999).

2.3.2 Environmental Management Systems

An Environmental Management System (EMS) is as Higgins (1998) described, "A management tool designed to help a company manage the environmental aspects of its operation". The EMS is the engine that drives continual improvement of environmental performance with each employee required to establish and implement an EMS so that measurable targets can be set to minimise, and, where practicable, eliminate adverse environmental effects. According to Hunt & Johnson (1995), the initial planning phase typically involves:

- Defining the overall aim.

- Understanding the constraints.

- Identifying the task elements.

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- Setting the overall timetable.

- Determining the resources needed.

- Deciding on the project management approach.

- Establishing progress monitoring systems.

The EPA is the first regulatory body in Europe to insist on an EMS as a mandatory licence condition appropriate to the nature and scale of the activity concerned (EPA, 2000b). It is important to be aware that while IPPC licensed companies in Ireland are required to install an EMS, the EMS does not need to be certified.

2.3.2.1 Certified Environmental Management Systems

There are two types of internationally recognised EMS's that companies can be accredited to. These are ISO 14001 and EMAS. ISO 14001 is the most recent edition of EMS and the version that is most widely adopted. The standard is relatively young, having been adopted by the voting members of the International Organisation for Standardisation in October 1996.

In the development of an EMS, it is important that a lot of time is spent planning.

ISO 14000 is a set of standards designed to help corporations establish and objectively evaluate environmental management systems. The standards are voluntary and will not be legally binding. Contrary to common perception, the standards do not establish a set of quantitative targets for environmental performance levels or specific methods for measuring environmental output. Instead, ISO 14000 focuses an organisation by providing a process -driven set of standards and guidelines from which companies can build and maintain an EMS; ISO 14000 describes the type of management framework needed for an effective EMS and how to establish it. Under ISO 14000, companies are required to define environmental policy, set goals

for implementing environmental management improvements, create a culture of preparedness and commitment to environmental performance, and conduct objective evaluations of progress and deficiencies in environmental management. The standards also establish a process for third party auditing and certification of environmental management systems and guidance for product evaluation and labelling. All of the standards are short, simple documents and have been flexibly written to allow for implementation in facilities of different sizes and functions and in countries with varying regulatory structures and technological levels (www.eiltd.net).

2.3.2.2 Reasons for obtaining certification and benefits of EMS's

Much of the literature identifies benefits of EMS's. According to Rondinelli & Vastag (2000), advocates of ISO 14001 claim substantial operational, managerial, and competitive benefits for corporations that adopt the international guidelines. According to McDonald et al (2001), organisations have many reasons to seek ISO 14001. These are briefly discussed below.

Regulatory compliance: ISO 14001 requires that a company commit to compliance with all relevant legal and other requirements. Many companies are implementing systems for this reason.

Customer Requirements: Some companies now require their suppliers and subcontractors to develop and implement ISO 14001. For example Ford required suppliers to have all facilities certified by mid 2003, and General Motors required that its suppliers implemented Environmental Management Systems by the end of 2002. Many companies are obtaining certification strictly because they want to retain customers that require it.

Trade barriers: Some companies have found that as with ISO 9001, international trade requires certification to ISO 14001. Companies have encountered barriers that have hindered trade with customers in other countries.

Insurance cost reductions: Some insurance companies are promising reduced premiums for companies that have an ISO 14001 Environmental Management System. The insurance companies consider that an EMS will reduce the risk of an environmental incident, and they can reduce premiums accordingly.

Right thing to do: Some companies are implementing ISO 14001 to demonstrate that they are sensitive to environmental issues.

Manufacturing/operating costs reduction: If properly implemented ISO 14001 will reduce manufacturing and operating costs. Any cost savings associated with manufacturing or operations is reduced expenses. There are not many case studies to support claims of cost reductions associated with ISO 14001 environmental management systems. However there are a large number of case studies associated with pollution prevention projects that evaluate the cost savings that result from waste reduction. These case studies show that reducing waste can save large sums of money.

A United States study known as the National Database on Environmental Management Systems study questioned 83 facilities in 17 states (NDEMS, 2003). Dr Richard N. L Andrews of the University of North Carolina at Chapel Hill carried out the study. Those facilities ranged from big manufacturers, electric utilities and small businesses to military bases and municipal water treatment plants. Researchers asked what the organisations-to whom they promised anonymity-were doing, how they created their EMS system, what they had done previously and what happened since the system was in place. "There was enormous variation in what the facilities actually

did," Andrews said. Some focussed on major environmental problems such as hazardous waste, while others used them simply to train employees to be more ecologically efficient with water, energy and materials to save themselves money. Overall most organisations said they were glad they developed their EMS, and 86% reported that they had reaped benefits from them. That does not mean that they were in perfect compliance with environmental standards or were superior across the board.

One Irish study assessed the benefits of EMS implementation at a printing company. Following the establishment of its EMS, the company was able to identify and solve a wide range of environmental problems although the main benefit cited was that the company was aware and sometimes even ahead of planned legislation and had the controls in place to ensure compliance with environmental legislation. Other results were:

- the company had a thorough knowledge of its environmental effects;

- improved image vis-à-vis customers;

- improved energy-efficiency:

- up to 80 per cent recycling of all waste produced on site;

- cost-savings through heat recycling and waste management;

- elimination of internal dust problem;

- on-site recycling of chemicals;

- environmental inquiries from customers are now answered by return post.

The publicity which Printech's EMS has received has also been a great bonus for the company. It is regularly featured as a case study company demonstrating best environmental practice in the printing sector in various journals, publications, seminars and conferences.

According to Bridgen & Helm (2000) facilities implementing ISO 14001-based EMSs are moving towards hazardous/toxic substance reduction, air pollution reduction, water pollution reduction, improved management of compliance activities, and development of procedures to manage change.

2.4 Barriers associated with EMS's

In 1999, the Department of Enterprise, Trade and Employment stated that the majority of companies accredited to ISO 14001 in Ireland at that time were large indigenous organisations or the subsidiaries of large multi-national corporations. Many of these certified companies are now examining the environmental performance of their downstream suppliers, many of them Small Medium Enterprises (SME's), and ultimately may require them to become certified to ISO 14001. In many cases the SMEs themselves are anxious to demonstrate environmental probity by adopting and implementing environmental management system standards, but are reluctant to do so for the following reasons

- Fear of the unknown
- Lack of resources
- Lack of technical expertise
- More pressing business imperatives
- Lack of direction
- Fear of failure.

According to McDonald et al (2001) EMS's today have evolved into systems with the ultimate goal of managing the impact that an organisation has on the global environment. The evolution is a significant change from the traditional focus of reacting to meet legal and regulatory requirements or even going beyond that to reacting to concerns from neighbours and the local community. EMS's now require that organisations take a proactive stance in addressing environmental impacts.

Critics contend that ISO 14001 does not ensure either legal compliance or continued performance improvements. They claim that at plants or facilities already complying with environmental regulations, ISO 14001 certification may merely be an image building or public relations effort. Critics also point out that ISO 14000 is not a panacea for environmental management problems and questions its efficacy in moving corporations towards sustainable development. The most often heard criticism is that ISO 14001 certification does not measure the actual environmental performance of a plant or company (Krut and Gleckman, 1998).

The standards merely assume that a company that certifies its EMS has a management system in place to deal effectively with its environmental management. Certification implies that companies meet regulatory requirements to achieve continuous environmental improvements, but it is not the practice to externally verify that such improvements actually occur. The ISO 14001 guidelines simply assume that good environmental management systems will, if they are implemented effectively, reduce or eliminate negative environmental impacts and move a company toward better environmental performance. Sceptics contend that voluntary approaches such as ISO 14000 often result in developing goals and objectives based on consensus within a

company that may be sub-optimal and implementation often relies primarily on peer pressure and management incentives that may be ineffective (Wallace-Jones, 1998).

Critics also point out that the costs of developing, documenting, and certifying EMSs may discourage many small and medium sized companies from seeking certification (Carraro and Leveque, 1999). Maintaining environmental management systems and improving performance can be compromised because there is no provision for de-certifying a company that becomes lax in its environmental practices (Powers, 1995).

In a study compiled by Dr Ruth Hillary of the Network for Environmental Management and Auditing, which analyses 33 separate studies published between 1994 and 1999, it was found that internal barriers to EMS adoption are more important than external ones. The internal barriers to EMS adoption and for SMEs considering environmental issues are many and varied. One problem was that lack of human resources, rather than financial ones, is the major internal barrier to EMS implementation and becomes increasingly important as the size of the company decreases. Also EMS implementation is an interrupted and interruptible process in Small to Medium Enterprises (SME's). Practical problems with EMS implementation exist and include how to determine environmental aspects and assign significance and how to achieve internal auditor independence in small and micro firms. SMEs are largely ill-informed about EMS's, how they work and what benefits can be gained from their implementation. Positive personal attitudes towards the environment are not translated into actions in SMEs. The view held by many in SMEs is that their firms have low environmental impact or face no environmental issues. SMEs also seem to be sceptical about the benefits, cost savings and customer rewards associated with positive environmental action, and there is a belief that benefits accrue slowly

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but costs increase quickly in EMS implementation. The environment is not a core business issue in the majority of SMEs and intransigent company culture and the lack of allocation of resources conspire to keep the status of environmental issues low on the business agenda.

Also according to Hillary, the external barriers to EMS adoption are varied. SME's face inconsistencies in and barriers from the certification and verification systems and complain bitterly about the high costs associated with being certified to ISO 14001 and registered to EMAS. Many SMEs experience insufficient drivers for EMS adoption and are uncertain about the market benefits of such systems. SMEs need support and guidance to implement EMSs but experience difficulties gaining consistent quality information and experienced consultants of good quality. The lack of sector specific guidance and material tailored to different sizes of firms is an added problem.

Another external barrier identified is customer indifference to SME's environmental performance, in particular the performance of micro firms, is a key reason why these enterprises consider environmental issues unimportant to business.

SMEs found that more resources than expected, in terms of costs, time and/or skills were required for EMS implementation. They are also aggrieved by the cost and quality of consultants advising them. Some firms have been misadvised and developed bureaucratic and ineffective systems. Identification of non-compliance was viewed as a double-edged sword, being a benefit if the company could readily rectify the cause of the non-compliance and a disbenefit if action could not be taken because of lack of resources or unwillingness to allocate them. SMEs also expressed dissatisfaction with the fact that benefits had not materialised as expected.

2.5 Elements of effective environmental management systems

According to the Guidance Document issued by the Commission for Environmental Co-operation, (CEC, 2000) the ten elements for improving environmental performance and compliance are environmental policy, environmental requirements and voluntary undertakings, objectives and targets, structure, responsibility and resources, operational control, corrective and preventative action and emergency procedures, training awareness and competence, organisational decision making and planning, document control, and continuous evaluation and improvement.

The environmental policy should set out the organisation's commitment towards a cleaner environment. It should include provision for compliance with environmental requirements, commitment to continuous improvement in environmental performance (including in areas not subject to regulation), commitment to pollution prevention that emphasises source reduction, commitment to continuous reduction of environmental risks and commitment to sharing information with external stakeholders on environmental performance against all EMS objectives and targets.

The EMS should provide a means to identify, explain and communicate all environmental requirements and voluntary undertakings to all employees, on-site service providers and contractors, whose work could affect the organisation's ability to meet those requirements and undertakings. Environmental requirements include statutes, regulations, permits, enforceable agreements. Voluntary undertakings include any environmental principles or industry norms that an organisation may choose to adopt. Examples include voluntary codes of practice for safety, risk management and energy efficiency issues. An EMS should include procedures for ensuring that the organisation meets these environmental requirements and voluntary undertakings

The EMS should establish specific objectives and targets for achieving and maintaining compliance with environmental requirements, environmental performance, demonstrating continuous improvement in regulated and non-regulated areas, pollution prevention that emphasises source reduction and sharing information with external stakeholders on environmental performance against all EMS objectives and targets. The EMS should establish appropriate time frames to meet these objectives and targets.

The organisation should ensure that it is equipped with sufficient personnel and other resources to meet its objectives and targets. The EMS should spell out procedures and steps for achieving those objectives and targets. For example it should define the compliance roles and responsibilities of environmental protection personnel, specify how they and management will be held accountable for achieving and maintaining compliance, and describe how environmental performance and compliance information will be communicated to relevant employees, on-site service providers and contractors. The EMS should also establish procedures for receiving and addressing concerns raised by these personnel regarding environmental performance and compliance

The EMS should identify and provide for the planning and management of all the organisation's operations and activities with a view to achieving the objectives and targets. For example, facility maintenance may be an important aspect in achieving and maintaining compliance and enhancing environmental performance.

The organisation, through its EMS, should establish and maintain documented procedures for preventing, detecting, investigating, promptly initiating corrective action, and reporting (both internally and externally, in accordance with country's

applicable laws) any occurrence that may affect the organisation's ability to achieve the EMS objectives and targets. Such measures should pay particular attention to incidents that may have an effect on compliance with environmental requirements as well as on environmental performance in regulated and non-regulated areas. Examples of such situations include equipment malfunctions, operator errors and accidental releases of hazardous substances.

Training, awareness and competence includes the establishment of procedures to ensure that all personnel whose job responsibilities affect the ability to achieve EMS objectives and targets, have been trained and are capable of carrying out these responsibilities. In particular, the training should highlight means to enhance the ability of personnel to ensure compliance with environmental requirements and voluntary undertakings affecting the organisation

Organisational decision-making and planning includes the description of how these ten elements should be integrated into the organisation's overall decision-making and planning, in particular, decisions on capital improvements, product and process design, training programmes, and maintenance activities.

Document control includes the establishment of procedures to ensure maintenance of appropriate documentation relating to its objectives and targets and should also ensure that those records will be adequate for subsequent evaluation and improvement of the operation of the EMS. For example, it should document the organisation's state of compliance with environmental requirements as well as environmental performance relating to non-regulated aspects. All records should be maintained in accordance with relevant laws for document retention and protection.

Continuous evaluation and improvement is the periodic, documented and objective auditing of the organisation's performance in achieving its objectives and targets and how well the EMS assists the organisation in achieving those objectives and targets. The goal of the review should be to allow management to bring about overall improvements. The scope and frequency of the review should depend upon the size and complexity of the organisation and other factors that are determined relevant in each organisation and country.

2.6 The Environmental Audit

Environmental Audits are defined in the International Chamber of Commerce guide to effective environmental auditing as "A management tool comprising a systematic, documented, periodic, and objective evaluation of how well environmental organization management and equipment are performing, with the aim of helping to safeguard the environment by

i.   Facilitating management control of environmental practices, and

ii.   Assessing compliance with company policies."

Audits are a powerful management tool, which can establish how an organization conforms to the compliance of either procedures or standards, which it has put into place, or which exist in the legislation or codes of practice, and which specify and control its environmental performance. They are carried out to generate the information from which management can identify and initiate improvements.

According to Cleaver (1995) properly conducted audits will establish:

- Extent of compliance with environmental legislation

- Extent of compliance with company environmental policy and procedures

- Extent of compliance with best current practice

- Degree of environmental training and awareness of the staff

- Extent to which management systems meet environmental requirements

According to Wehrmeyer (1995) the environmental audit is voluntary and has no fixed frequency.

2.7 Environmental legislation

Ireland is now one of the most stringently regulated countries in Europe with regard to environmental protection. A whole plethora of environmental legislation now exists in Ireland covering several media and activities including waste licensing, Integrated Pollution Prevention and Control (IPPC) licensing and noise. Furthermore, with the growth of voluntary standards such as EMAS and ISO 14001, companies are obliged to compile registers of the environmental legislation that is affecting them (www.ctc-cork.ie). The main pieces of legislation, which Irish industry has to comply with, are discussed below.

2.7.1 The Local Government (Water Pollution) Act 77-90

The principal framework for the prevention and control of water pollution in Ireland is Local Government (Water Pollution) Act, 1977 (No. 1 of 1977) and the Local Government (Water Pollution) (Amendment) Act, 1990, (No. 21 of 1990). These

Acts include a general prohibition on causing water pollution, provisions concerning licensing of discharges to waters and to sewers, water quality standards, water quality management plans, nutrient management plans. All sections of the 1977 Act, except sections 25 and 34 have been brought into force. All sections of the 1990 Act came into force on its enactment on 18th July 1990, except sections 4, 5, 6, 13, 14, 15, and 16, which came into operation on 1st November 1992. (www.enfo.ie).

The 1959 Fisheries Act provides powers to Fisheries Boards to prosecute water pollution offenders under sections 171. The Fisheries Boards also have powers of prosecution under the Water Pollution Acts. Under the Local Government (Water Pollution) Act, 1977 and 1990, Local Authorities are responsible for issuing of licences for discharge of effluents to waters (Section 4) and Sanitary Authorities are responsible for discharge to sewers (Section 16). It is an offence under Section 3 of the Act to allow polluting matter into waters. Under Section 14 of the Act, industries are obliged to notify their local authority of any accidental discharge of polluting material that is likely to gain entry into waters. Some of the pharmaceutical industries that do not require an IPC licensed may be required to obtain a discharge licence under section 4 of the Act.

2.7.2 The Air Pollution Act, 1987

The Air Pollution Act, 1987 was introduced to control atmospheric pollution in Ireland. It also enabled full effect to be given to various pieces of EU legislation. It provided for Best Practicable Means (BPM) to be used to "prevent or limit" an emission from an activity. Under this Act, it is an offence for any person to operate an industrial plant specified in the Third Schedule of the Act, other than an existing plant without a licence after the 1/12/89. In addition, the Air Pollution Act, 1987

(Licensing of Industrial Plant) Regulations, 1988 provides for 10 classes of existing industrial plant for which a licence is required for air emissions after 1989. Both the EPA and the Local Authorities monitor air pollution in Ireland.

2.7.3 The Environmental Protection Agency (EPA) Act, 1992

The EPA Act introduced the concept of Integrated Pollution Control (IPC) for industries specified as having "significant polluting potential". For those industries subject to legislation, control of environmental pollution passes from the local authority to the EPA, and a single IPC licence is issued dealing with all aspects of pollution control (IBEC, 1997). While IPC licensing was being implemented in Ireland since 1994, the IPPC Directive (96/61/EC) was finalised in September 1996. Since the Directive came into force in October 1999, the EPA has, in general, implemented its requirements for installations using the principles of direct effect. The IPPC Directive was transposed into Irish law in 2003 with the enactment of the Protection of the Environment Act (PoE) Act 2003.

While the 1992 Act anticipated and implemented most of the requirements of the Directive, the PoE Act, 2003 made legislative provision for the remaining elements. Though some of these were technical or procedural in nature, they all contribute to a significantly strengthened regulatory framework for environmental protection. The EPA Act, 1992 and Part 2 of the PoE Act, 2003 are collectively referred to as the Environmental Protection Agency Acts 1992 and 2003. In 2004, the licensing regulations were amended to provide for the necessary changes to the licensing system set out in the PoE Act 2003, and these came into effect on the 12th of July 2004.

2.7.4 Waste Management Act, 1996-2001

The introduction of the Waste Management Act, 1996 (amended in 2001) has updated waste legislation incorporating the principles of waste management developed at EU level. It provides a framework for the implementation of EU Directives, some of which had not been implemented in Irish national legislation, and for the regulation of waste management in Ireland into this century. The concept of producer responsibility, which could require a producer to take responsibility for the environmental impacts of products throughout their lifecycle, is introduced under this legislation. This piece of legislation gives wide ranging powers to the Minister of the Environment to regulate the management of waste and place special emphasis on prevention and reduction of waste at source (IBEC, 1997).

Waste prevention and minimisation strategies have a positive effect on the environment and are an integral aspect of IPPC licensing. The National Hazardous Waste Management Plan was published by the EPA in 1999 and sets out how hazardous waste prevention can benefit Irish industry and minimize hazardous waste costs. According to EPA (2000a), IPC licensing has to date resulted in the prevention of significant quantities of hazardous waste.

The Waste Management Act places an obligation on agricultural, commercial, and industrial operators to take all reasonable steps necessary to prevent or minimize waste arising from their activities or products including steps to be taken at design stage of product. It provides for a wide range of measures to be applied to promote and support waste recovery. It prohibits the holding, transport, recovery, or disposal of waste in a manner, which causes or is likely to cause environmental pollution. It provides for the establishment by the EPA of a Toxics Release Inventory. The Waste Management (Packaging) Regs 2003 provides for the establishment of Repak-an

industry sponsored initiative for the co-ordination and financing by industry of systems for recycling packaging waste. (DoE, 1997).

2.7.5 Protection of the Environment (PoE) Act (2003)

The main purpose of this Act is to incorporate into Irish law the provisions of the EU Directive on Pollution Prevention and Control (IPPC) (CEU, 1996). The Directive requires adjustments to the scope of the licensing provisions of the EPA Act, 1992; these adjustments are relatively few as the 1992 Act anticipated the nature and scale of most of the activities covered by the directive. The general approach to pollution control specified in the Directive is based on a requirement for BAT (Best Available Technology) as opposed to BATNEEC (Best Available Technology Not Entailing Excessive Costs) as specified in the 1992 Act; however, this change has already been anticipated by the EPA in more recent licensing decisions. The Act also gives greater scope than before to set conditions in licences for atmospheric conditions that contribute to transboundary pollution, thereby assisting with the state's commitments under the UN Gothenburg Protocol and Emissions Ceilings Directive. While it does not treat greenhouse gases as controllable pollutants, the Act gives the Agency discretion in licensing to require measures aimed at minimising the release of such substances. A further change provides for the requirements of the EU Groundwater Directive to be incorporated into the licensing system.

The 2003 Act also amends the Waste Management Act to bring it into line with the IPPC Directive and makes clear that where activities involving waste handling are undertaken in a facility subject to IPPC licensing, a licence under one or other of the Acts, but not both, is required. The amendments also give explicit powers to local

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authorities to make charges for waste services and to withdraw such services in cases of non-payment. Amendments to the Litter Pollution Act of 1997 include increased fines for offences under the Act and wider powers for local authorities to make anti-litter bye-laws and to restrict the placing of advertising material in public places (EPA, 2004).

2.8 Integrated Pollution Prevention and Control (IPPC) Licensing

A system of Integrated Pollution Prevention and Control (IPPC) Licensing came into effect in Ireland on 12th July, 2004. The primary aims of IPPC Licensing are to prevent or reduce emissions to air, water, and land, to reduce waste and to use energy efficiently. The IPPC system replaces Integrated Pollution Control (IPC) as the licensing regime applicable to certain industrial activities in Ireland.

Since 2004, any person or company involved in large-scale or complex industrial processes with significant polluting potential were required to have an IPC licence. Over 70 industrial classes came within the scope of IPC licensing and these are listed in the First Schedule of the EPA Act, 1992 now updated by the new First Schedule of the PoE Act, 2003. Since the commencement of IPC licensing 1994, the EPA had processed 675 applications and granted 624 IPC licenses by 31st July 2004.

One of the most significant changes to the licensing system is the number of additional activities that have been added to the list of activities that require a licence from the EPA. The activities most affected by the changes include certain intensive agricultural activities, the treatment and processing of milk, the slaughter of cattle, food production, and the production of paper, pulp, and board. Any person carrying

on a licensable activity in breach of the legal requirements may be subject to prosecution by the EPA. It is the sole responsibility of the person or company carrying on the activity to have or have applied for the necessary licence. The penalties for certain convictions range from €3,000 to €15,000,000.

Among the key changes to the licensing system introduced by the PoE Act, 2003 and supporting regulations are listed below.

- A requirement for an applicant to be a "fit and proper person".
- A change in the technical basis of the licensing system from best available technology not entailing excessive cost (BATNEEC) to best available techniques (BAT).
- Increased emphasis on energy efficiency in the carrying out of activities.
- Provision for the transfer and surrender of IPPC licences (similar to that already in place for waste licensing system).
- Provision for the revocation or suspension of licences.
- A greater emphasis on pollution prevention in the licensing system and on minimising environmental problems at source.
- Amendments to and an increase in the range of documentation to accompany an application for a licence.
- Extended powers to the EPA to reject a licence application where the applicant fails to provide additional information within specified timescales.
- An explicit requirement for the inclusion of emission limit values in licences.
- The EPA can regulate greenhouse gas emissions in IPPC licences where necessary.

- Provision for an objector to request the EPA to hold an oral hearing in relation to a proposed decision on a licence application.

- A clear legal basis for compliance with the requirements of EU Directive (80/68/EEC) on the protection of groundwater against pollution by certain dangerous substances through the IPPC licensing process.

- A comprehensive provision empowering the EPA to determine that, where a waste activity is carried on in a facility connected or associated with an IPPC activity, a licence under one of the regulatory codes, but not both, will be required.

- A power for any person to seek a High Court order where an activity is being carried out in contravention of licensing requirements.

The EPA must now satisfy itself with regard to the following additional criteria before it can grant a licence.

- The production of waste will be prevented or minimised or if produced will be recovered as far as possible.

- Energy will be used efficiently.

- Measures will be taken to prevent accidents.

- Pollution risks will be avoided in the case of cessation of the activity.

- The site of the activity will be returned to a satisfactory state.

- The applicant is a fit and proper person.

2.8.1 Best Available Techniques (BAT)

BAT was introduced as a key principle in the IPPC Directive. To meet the requirements of the Directive, relevant sections of the EPA Act 1992 were amended

to replace BATNEEC with BAT. The fundamental criteria for determining BATNEEC and BAT are very similar. In the identification of BAT, emphasis is placed on pollution prevention techniques including cleaner techniques and waste minimisation, rather than end-of-pipe treatment. Consideration must be given to energy efficient techniques and practices and to the efficient use of raw materials, chemicals, and water. Hazardous substance should be substituted by less hazardous substances whenever possible. Measures such as in-plant changes, process recycling and reuse, improved material handling and storage practices, must be employed to effect reduction in emissions.

The EPA will publish BAT notes for various sectors within the coming year, designed to provide guidance for those applying for licences. The objective of these BAT notes will be to identify the types of techniques that will be used by the EPA to define BAT for an activity. The EPA website has a link to the BREF (BAT Reference) documents prepared by the IPPC Bureau in Seville. The BREF documents which are published by the EU Commission are to be used to form the basis of the BAT notes for the individual Member States, and are therefore very useful documents (www.epa.ie)

2.9 Introduction to health and safety management

Health and safety management is a critical function in any industry. Between 1990 and 1999 in Ireland, accidents and ill health at work have resulted in over 600 deaths and 80,000 compensation claims (Byrne, 1997). According to the Institute of Engineers of Ireland (IEI) Health and Safety Seminar held in the South Court Hotel in Limerick on the 2nd of March of this year, in 2004, 50 people died in workplaces with a further 8,052 injured. It is unacceptable that someone dies at work every week.

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2005 has seen 12 people die between January and March compared to only 9 for the same period last year. Safety must be a core value for every business and can not be ignored according to the pressure of other factors. The IEI Health and Safety Seminar also stressed that when safety becomes a core value, its impact on work practices will be huge, and so too will the benefits that accrue. (Department of Enterprise, Trade and Employment, 2005).

2.10 Health and safety legislation

There is a huge volume of occupational safety and health legislation with which every employer has to comply. The main legislation is summarised here.

2.10.1 The Safety, Health and Welfare at Work Act, 1989

This Act sets out the general legal principles for the prevention of accidents and ill health in all places of work. The main elements of 1989 Act include the duties of employers to compile a safety statement, which is the employer's detailed management programme on safety, health, and welfare measures. The safety statement must be based on a comprehensive written identification of hazards and assessment of risks in the workplace.

Under the Act, employees must be consulted on matters relating to safety, health, and welfare and they have the right to select safety representatives.

Under the Act, employers have a duty to ensure so far as is reasonably practicable, the safety, health, and welfare of employees and non-employees. In practice the "reasonably practicable" test requires employers to check that workplace risks are controlled in accordance with legislation, codes of practice, standards, guidelines and good industry practice.

Under the Act, employees have a duty, whether at senior or junior levels in an organisation, to take reasonable care of their own safety and that of others.

The Act provided for the establishment of the Health and Safety Authority (HSA), a state body representing the social partners, to promote awareness of safety, health, and welfare issues and to enforce the legislation (Byrne, 1997). The HSA is a state-sponsored body under the Department of Enterprise, Trade, and Employment and operates under a board with employer and trade union representatives as well as ministerial nominees. Nowadays the bulk of legislation enforced by the HSA originates from EU Directives. The HSA acts as a national centre for information and advice to employers, employees and the self- employed on all aspects of workplace health and safety. To monitor compliance with legislation, HSA inspectors may gain access, without prior notice to a workplace. In Ireland they can take photographs, samples or any items they deem necessary and are entitled under law to full co-operation. In the event of poor safety standards, inspectors may serve a formal enforcement notice requiring improvements. Inspectors can stop work if there is a serious danger. The Authority can also prosecute a business or individual for breaches of legislation. In summary, the main functions of the HSA are to promote good standards of health and safety at work, inspect places and ensure compliance with the law, investigate accidents and causes of ill-health in the workplace, engage in and sponsor research, help develop laws and standards, and provide information and guidance. (www.business2000.ie).

2.10.2 Safety, Health and Welfare at Work (General Applications) Regulations, 1993

The most significant single set of regulations made under the 1989 Act is the Safety, Health, and Welfare at Work (General Applications) Regulations 1993. The 1993 Regulations are unusual because they cover nine separate areas rather than a single topic. The areas covered by the General Applications Regulations are

1) General Provisions Regulations 1993 (Part 11 of the General Application Regulations)

2) Workplace Regulations 1993 (Part 111)

3) Work Equipment Regulations 1993 and 2001 (Part IV)

4) Personal Protective Equipment (PPE) Regulations 1993 (Part V)

5) Display Screen Equipment (VDU) Regulations 1993 (Part VI)

6) Manual Handling of Loads Regulations 1993 (Part VII)

7) Electricity Regulations, 1993 (Part VIII)

8) First Aid Regulations, 1993 (Part IX)

9) Notifications of Accidents& dangerous occurrences (Part X).

Other important aspects of health and safety at work are dealt with in other Acts and Regulations. These include Fire Services Act, 1981, the Noise Regulations, 1990, the Biological Agents Regulations 1994 and 1998, the Chemical Agents Regulations 1994 and 2001, Occupiers Liability Act, 1995, Signs Regulations, 1995, Protection of Young Persons (Employment) Act, 1996 and Children and Young Persons Regulations, 1998, Organisation of Working Time Act, 1997 and Night Work &Shift Work Regulations, 2000, Radiological Protection Act, 1991; and Ionising Radiation Order 2000, and Confined Spaces Regulations, 2001.

Virtually all these Acts and Regulations involve implementation of EC, EU Directives on safety and health at work.

2.10.3 Safety, Health & Welfare at Work Bill, 2004

The Safety, Health, and Welfare at Work Bill is expected to become law by early September. While the Bill repeals and re-enacts most of the provisions of the SHWW Act 1989, the Bill imposes new duties on employers: to manage safety; to provide information and training in a manner and language which employees understand; to train employees upon recruitment and when transferred; to appoint one or more competent persons; to review risk assessments and safety statements annually; and to bring safety statements to employees' attention at least annually. The Bill also imposes new duties on employees; notably the duty not to be under the influence of an intoxicant to the extent that they may endanger themselves or others at work. The Bill provides for a maximum fine of 3 million and up to two years in prison for serious offences and €3000 and up to six months in jail for less serious offences. It also provides for on- the - spot fines, but specific regulations will be required to bring the provision into force HSR (2005).

2.11 Cost benefits of health and safety at work

Businesses have a duty to ensure their working environment is safe, secure, and healthy. Besides the legal duty, it makes business sense to manage social responsibility because a cost-benefit will accrue. For example, in the year 2000 alone, over 10,000 compensation claims with regard to work related injuries and ill health were lodged in Ireland at a cost of approximately £160 million. The Quarterly National Household survey for 2000 found that over 1.1 million working days were

lost due to work- related injuries and ill- health. Thus, reduction of preventable workplace accidents and the implementation of sound health and safety practices can deliver considerable savings to business (www.business2000.ie).

According to the Department of Enterprise, Trade and Employment (2005) claim figures represent only one element of the cost of an accident and studies carried out by the HSE in the UK and by the HSA in the past have clearly shown that once an accident happens, the insurance cover will only cover a small part of the overall cost. The cost to employers annually of injuries and illnesses in the workplace is substantial. In 2003, 2.4 million days were lost due to injury and illness, costing the Irish economy nearly 1.6 billion euro. While it does cost money to put proper control measures in place, the costs for not putting them in place are vast both in economic and human terms. The 2005 IEI Safety Seminar recommended that employers should stop focusing on the costs and start focusing on the solutions to reduce death and injury in the workplace. They need to put in place a proper health and safety management system to reduce and eliminate needless deaths and injuries. The larger organisations have discovered that by planning logically for preventing accidents and ill health cases, shortcomings will be found in the way things are done, efficiencies of procedures will be improved and errors will be cut out. In the end the business will be more economical. To do this, larger companies carry out health and safety training and use industry accepted best practices in order to succeed at workplace health and safety management. Smaller companies can do this at a more informal and local level. Their health and safety management needs to be simple and flexible and easy to use by all the workers. They should not set up very elaborate systems that will remain unused but rather develop simple action programmes that can be used as tools

for accident prevention. In today's workplace, a safety culture is not an optional strategy, which may or may not be chosen to pursue but, rather, it is a business imperative, which no company can afford to leave unmanaged (www.entemp.ie).

2.12 Accident reporting

The HSA accepts that accidents at work are under reported and they rely on social welfare and labour force studies to provide a more accurate picture of the true level of fairly serious accidents and ill health at work.

Among some of the key figures on types and frequencies of accidents are the following

- Manual handling and lifting accounts for about 30% of all reported accidents.

- Working at heights accounts for about 11% of all reported accidents (50% of the total in construction).

- Machinery accidents accounts for about 8% of the total accidents.

- Road traffic accidents are increasingly being taken into account in calculating the number of accidents at work.

Accidents and ill health are costly to workers and their families. They can also hurt companies because in addition to the cost of personal injuries, they may incur far greater costs from damage to property or equipment and lost production.

Health and safety differs from many other areas measured by managers because success results in the absence of an outcome (injuries or ill health) rather than a presence. But a low injury or ill-health rate, even over a period of years, is no guarantee that risks are being controlled and will not lead to injuries or ill health in the future. This is particularly true in organisations where there is a low probability of

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accidents but where major hazards are present. Here the historical record can be a deceptive indicator of safety performance.

Organisations need to recognise that there is no single reliable measure of health and safety performance. What is required is a "basket" of measures or a "balanced scorecard", providing information on a range of health and safety activities.

As organisations recognise the importance of managing health and safety, they become aware of the problems with using injury and ill-health statistics alone as the only measure of health and safety performance.

Some problems with injury/ill-health statistics are discussed in the following paragraphs

Under-reporting an emphasis on injury and ill-health rates as a measure, particularly when related to reward systems, can lead to such events not being reported so as to "maintain" performance.

Whether a particular event results in an injury is often a matter of chance, so it will not necessarily reflect whether or not a hazard is under control. An organisation can have a lower injury rate because of luck or fewer people exposed, rather than good health and safety management.

Injury rates do not reflect the potential severity of an event, merely the consequence.

For example, the same failing to adequately guard a machine could result in a cut finger or an amputation.

People can stay off work for reasons that do not reflect the severity of the event.

There is evidence to show that there is not necessarily a relationship between "occupational" injury statistics (e.g. slips, trips and falls) and control of major accident hazards (e.g. loss of containment of flammable or toxic material).

A low injury rate can lead to complacency.

A low injury rate results in few data points being available.

There must have been a failure, i.e. injury or ill health, in order to get a data point.

Injury statistics reflect outcomes not causes. (HSE, 2001).

2.13 Health and safety management

Hazard identification and risk assessment are two very important components of health and safety management. According to Stranks (1998), risk assessments are the starting point for most health and safety management systems. A risk assessment may be defined as

"An identification of the hazards present in an undertaking and an estimate of the extent of the risks involved, taking into account whatever precautions have already been taken"

It is essentially a four-stage process:

     a) the identification of all the hazards;

     b) the measurement of the risks;

     c) the evaluation of the risks;

     d) the implementation of measures to eliminate or control the risks.

There are different approaches that can be adopted in the workplace and these include the examination of each activity that could cause injury, the examination of hazards and risks in groups, e.g. machinery, substances or transport and the examination of departments, sections, offices and construction sites.

Stranks (1998) has mentioned the principle types of hazards to be considered when undertaking risk assessments and these include fall of a person from a height, fall of an object/material from a height, fall of a person on the same level, manual handling,

use of work equipment, operation of vehicles, compressed air, mechanical lifting operations, noise and vibration, biological agents, radiation, fire, electricity, drowning, excavation work, stored energy, explosions, contact with hot/cold surfaces, adverse weather, hazardous substances, storage of goods, housekeeping/cleaning and temperature, lighting and ventilation.

Useful information on checking performance against control standards can also be obtained reactively by the investigation of accidents and ill health, by the investigation of any damage to plant, equipment and vehicles and by the investigation of near miss situations.

2.13.1 Occupational safety and health management systems

There is an increasing demand from customers and government agencies to provide objective evidence that a company has effective health and safety management systems in place. The British Standards Institute (BSI) developed the occupational health ands safety management standard OHSAS 18001. This standard is designed to assist organisations achieve their occupational health and safety objectives. Although ISO has not as of yet adopted OHSAS 18001 as their occupational health and safety management system, it is anticipated that they will (www.environmental_expert.com).

2.13.1.1 OHSAS 18001 requirements

As with other management systems, the organisation should begin by setting objectives, in this instance occupational health and safety objectives. Management must define the organisations occupational health and safety policy and must establish what the legal requirements in relation to health and safety are. The next requirement

is that the organisation must carry out a comprehensive analysis of their operations in order to identify hazards and assess risks. Once identified, the company must then outline the controls to mitigate against these hazards and risks. The next requirement of the standard is to ensure that staff should be competent to perform tasks that may impact on health and safety in the workplace. It is critical to consult employees on every aspect of the OH&S management system and that pertinent OH&S information is communicated to all employees. The necessary controls required to mitigate against the risks identified must be established and implemented. These controls may include documented procedures, defined operating criteria for procedures and maintenance of equipment. The organisation should establish plans and procedures for emergency situations. The organisation must monitor how effective the management system has been in achieving the stated objectives. If it proves to be ineffective, the procedures and controls should be re-evaluated and improved. The organisation must maintain records pertaining to OH&S to demonstrate that they are conforming to the OH&S system. Audits should be conducted to ensure that the OH&S management system is being adhered to. The management system should be reviewed by top management at defined intervals in order to ensure its continuing suitability, adequacy, and effectiveness (www.environmental_expert.com).

2.13.1.2 Reasons for implementing OHSAS 18001

It will assist companies in meeting regulatory requirements and is a great marketing tool-certification may become a pre-requisite for tendering to EEC public bodies. It will increase a company's vendor rating by blue chip companies and may even become a requirement to do business with some blue chip companies and position to bid for contracts. It will reduce the risk of accidents and occupational ill health and

reduce lost time through employee illness and injury and may reduce your insurance premium. It will indicate to employees that the company is concerned about their welfare (www.environmental_expert.com).

In conclusion, the literature review has included the following

- An overview of the pharmaceutical and food and drink industries.

- An examination of the benefits and the barriers associated with EMS's.

- A discussion of the various pieces of environmental legislation.

- An overview of health and safety management and safety management systems.

- A discussion of the various pieces of occupational heath and safety legislation.

SECTION 3-METHODOLOGY

This chapter outlines the way in which research was conducted. The focus of the research is on the benefits and the difficulties associated with Environmental Management Systems (EMS) and Health and Safety Management Systems (HSMS) in industry in Ireland with particular reference to the pharmaceutical industry and the IPC/IPPC licensed food and drink companies.

There is a huge volume of information on environmental health and safety management on the internet and the Google search engine was used extensively to source information on the topic. A literature search was conducted to identify the benefits to be accrued from installing EMS's and HSMS's and the barriers that are associated with the installation and the maintenance of such systems.

3.1 Company selection

The pharmaceutical sector was chosen because they would be considered to have a good reputation with respect to both environmental management and health and safety management and it was felt that the majority of them would have comprehensive EMS's and HSMS's in place and that useful and insightful information would be gained with respect to the benefits and the barriers of such systems. The IPC/IPPC licensed sector of the food industry was chosen because being IPC/IPPC licensed, it is a requirement to have an EMS in place and also there are only 70 companies in this category so it is a manageable number to deal with. There are 81 pharmaceutical companies in Ireland according to the IDA website. The list was downloaded off the IDA website. The list of IPC/IPPC licensed food and drink companies was downloaded off the EPA website. It is important to note that while the list of IPC/IPPC licensed food and drink companies says there are 85 companies some of the

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same companies are listed twice and there are 70 individual companies in total. The list of pharmaceutical companies and IPC/IPPC licensed food and drink companies in Ireland are contained in Appendix 2. The list of IPC/IPPC licensed food and drink companies can be broken down in to the following categories

34 (49%) companies fall into the licence class of "The slaughter of animals".

 12 (17%) companies fall into the licence class of "Rendering of animal by-products".

10 (14%) companies fall into the licence class of "Commercial brewing and distilling, and malting.

9 (13%) companies fall into the licence class of "The manufacture of dairy products".

2 (3%) companies fall into the licence class of "The manufacture of fish-meal and fish-oil".

2 (3%) companies fall into the licence class of "The manufacture of sugar".

1 (1%) company (Abbott) in Cootehill. Licence class is not specified on EPA website. It manufactures infant nutritional products (baby food).

3.2 Structure of questionnaire

151 questionnaires comprising of 27 questions was posted to all of the pharmaceutical companies and all of the IPC/IPPC licensed food and drink companies in Ireland. The questionnaire is divided into two distinct sections (Section A and Section B). Section A deals with environmental management within the organisation, while Section B deals with health and safety management within the organisation. The questionnaire was laid out in a concise format, with the majority of questions requiring the

respondent to tick a box. Where further information was required on certain issues, a space accompanied the question to allow for further information to be provided. This "tick a box" format was mainly used to facilitate the respondent. A cover letter was enclosed with each questionnaire outlining the objectives of the survey and assuring that questionnaires would be treated in the strictest confidence. A self-addressed envelope was enclosed with each questionnaire. A copy of the questionnaire and cover letter is contained in Appendix 1.

3.2.1 Aims and objectives of questionnaire

The aims and objectives of the questionnaire were as follows

- To determine whether companies are realising the benefits that are perceived to be associated with Environmental Management Systems and Health and Safety Management Systems.

- To determine if companies have an Environmental Management System (EMS) in place and if not the reasons why they chose not to put one in place.

- To determine the attitudes of companies towards the costs of obtaining and maintaining an EMS.

- To determine the attitudes of companies towards the workload involved in obtaining and maintaining an EMS.

- To determine the costs associated with installing and maintaining an EMS and to get an estimate of the installation costs and the annual maintenance costs.

- To determine the main difficulties associated with installing an EMS.

- To establish whether the benefits of having an EMS outweigh the costs

- To establish whether company's insurance premiums have reduced since installing their EMS and to quantify what that reduction has been.

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- To establish whether companies have received any environmental awards as this is a perceived benefit of EMS's.

- To establish whether having an EMS has led to reduced manufacturing/operating costs and to quantify how much of a reduction there has been.

- To establish whether having an EMS has lead to reduced waste collection/disposal costs and to gain an estimate of the annual cost savings.

- To establish whether having an EMS has helped companies in legislative compliance.

- To establish whether having an EMS has led to a reduction in environmental complaints.

- To establish when companies last updated their safety statements.

- To establish whether companies have an accident reporting system in place.

- To establish how many reportable accidents companies have had in the last 3 years.

- To determine percentage absenteeism levels in the last three years.

- To determine whether companies have Safety Management Systems in place and if not the reasons why.

- To establish whether companies have received any safety awards as this is cited as a potential benefit of Safety Management Systems.

- To establish whether having a Safety Management System has led to reduced insurance premiums and to quantify the reduction.

- To determine company attitude toward the workload and the costs involved in obtaining and maintaining a Safety Management System.

SECTION 4-PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction to results section

Of the 151 questionnaires posted, 54 replies were received, a (36%) response rate. Of these 54 respondents 46 (85%) have an environmental management system and 42 (78%) had a safety management system.

In this section each question on the survey questionnaire is analysed individually and the results are summarised or are presented in either a tabular or a graphical format.

Question 1 on the questionnaire was a general opening question and was simply used to gain an idea of the size of the company. The results are outlined in Table 1 below.

Table 1: *Showing the size category in which the respondents to the questionnaire fall into*

Category	Number of respondents within each category	Percentage (%) of respondents within each category
<50	6	11%
50-250	24	44%
>250	22	41%
Didn't answer	2	4%
Total	54	100%

4.2 Presentation of questionnaire results-Environmental

The responses to question 2 are presented in Table 2 below.

Table 2: *Table showing how respondents feel towards whether time spent on environmental affairs interferes with production/competitiveness.*

Response	Number	Percentage (%)
Yes	3	5.5%
No	47	87%
Don't know	1	2%
Didn't answer	3	5.5%
Total	54	100%

The responses to question 3 (a) are presented in Table 3 below.

Table 3: *Table showing whether respondents have an Environmental Management System*

Whether or not respondents have EMS	Number	Percentage (%)
Respondents who have an Environmental Management System	46	85%
Respondents who do not have an Environmental Management System	8	15%
Total	54	100%

Question 3(b) asked companies to specify whether their EMS was certified to ISO 14001, certified to EMAS, or was uncertified. The results are outlined in Figure 1 below.

Figure 1: *Bar chart showing type of EMS held by respondents*
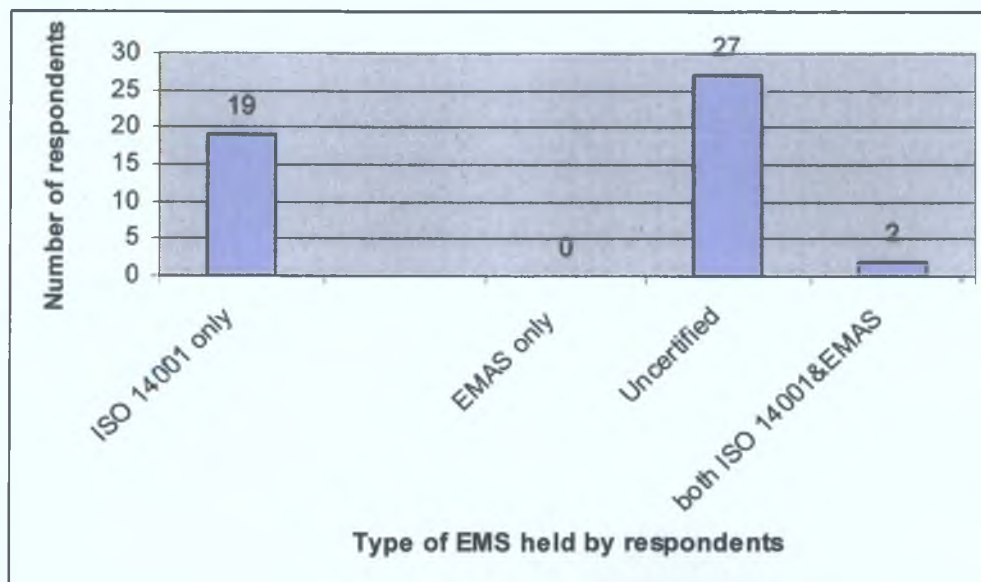
Question 3 (c) asked companies who did not have an EMS in place to specify the reasons why they chose not to adopt an EMS. Eight of the respondents did not have an EMS. 4 of them are currently putting one in place. One company cited "time and money" as the reason for choosing not to put in such a system while another company cited "lack of resources" as the ultimate reason in stopping them from putting in an

EMS. Another company stated that their environmental impacts were addressed in their quality management system that was certified to ISO 9001 while another company stated they had "too small of operation, low risk ingredients, low volume of wastewater" as the reason for not putting in an EMS.

Questions 4,5,6,7 and 8 were concerned with examining the barriers and difficulties associated with installing and maintaining EMS's. Question 4 and 5 asked companies to rate the workload associated with installing and maintaining EMS's. 39 (85%) of respondents with EMS's in place felt there was a moderate workload associated with installing them. 6 (13%) of respondents classified the workload as "excessive" while 1(2%) respondent categorised the workload as "low". 5 (11%) of respondents felt that there was a "low workload" associated with maintaining an EMS and 41 (89%) classified the workload associated with maintaining an EMS as "moderate". No company felt that there was an excessive workload associated with maintaining an EMS.

The data was analysed further to determine if there was a perceived difference in workload between those with certified and uncertified EMS. Of the 27 companies with uncertified EMS's, 23 (85%) classified the workload associated with installing an EMS as "moderate" with 4 (15%) classifying it as "excessive" while 26 (96%) felt that the workload associated with maintaining an EMS was moderate with 1 (4%) considering it excessive. Of the 19 companies with certified EMS's, 16 (84%) classified the workload associated with installing an EMS as "moderate" with 2 (11%) considering it "excessive" and 1 (5%) categorising it as "low" while 15 (79%) felt that

there was a "moderate workload" associated with maintaining an EMS and 4 (21%) classifying it as "low".

Question 6 and 7 attempts to ascertain how companies feel regarding the cost associated with installing and maintaining EMS's. 34 (74%) of the respondents considered installing an EMS as a "relatively expensive" process with 9 (19.5%) of the respondents considering it "inexpensive" and 3 (6.5%) respondents considered it to be a "highly expensive" process. 18 (39%) respondents considered it "inexpensive" to maintain an EMS with 25 (54%) categorising the cost as "relatively expensive" and 3 (7%) reckoning it was "highly expensive" to maintain an EMS. The data was analysed further to determine if there was any perceived difference in cost between those with certified and uncertified EMS's. Of the 27 companies with uncertified EMS's, 20 (74%) considered it to be "relatively expensive" to install an EMS with 4 (15%) considering it to be "inexpensive" and 3 (11%) considering it to be "highly expensive" while 18 (69%) classified the cost of maintaining an EMS as "relatively expensive" with 6 (23%) considering it "inexpensive" and 2 (8%) considering it "highly expensive". One company with an uncertified EMS did not answer this question. Of the 19 companies with certified EMS's 14 (74%) considered it "relatively expensive" to install an EMS with 5 (26%) considering it "inexpensive" while 11 (58%) considered it "inexpensive" to maintain an EMS with 7 (37%) classifying it as "relatively expensive" with 1 (5%) categorising it as "highly expensive".

Question 6b asked companies to provide an estimate of the installation costs. Only 17 companies answered this question. There was a significant variation in the estimates

given ranging from €4,000 to 100,000. Eleven of the seventeen (65%) companies that provided estimates for the cost of installing an EMS quoted figures of between €20k and 70k. The exact replies are contained in table 1 in Appendix 3. Question 7 (b) asked companies to provide an estimate of the annual cost of maintaining an EMS. Only 27 of the companies answered this question. As with the previous question, there was a variation in the answers given. 3 of the respondents gave very high figures. 1 company stated that the annual maintenance of their EMS cost a staggering €200k while another company quoted the cost at €100-150k and another company saying it cost €100,000. However 16 companies quoted figures at less than €20,000. The exact replies are contained in table 2 in Appendix 3.

Question 8 asked companies to rank on a scale of 1 to 5, with 1 being most difficult and 5 being least difficult, the main difficulties associated with putting together an EMS. The choices given were cost involved, time involved, lack of technical expertise, amount of paperwork/documentation and lack of resources. It is important to note that one company specified "standardising system across a number of sites" as a difficulty, while another company mentioned "getting involvement of others" as the biggest obstacle assigning it a number 1 rating. The results are presented in Table 4 below

Table 4: *Respondent ranking on scale of 1 to 5 of difficulties associated with putting together an EMS*

Common difficulties associated with EMS's	Ranking scale 1-5				
	1	**2**	**3**	**4**	**5**
Cost	5	2	16	15	8
Time	11	19	10	4	2
Lack of technical expertise	2	5	6	9	22
Amount of paperwork/documentation	21	11	9	3	2
Lack of resources	1	12	12	12	9

The literature review highlights many benefits, which are to be reaped from having an EMS in place. Questions 9, 10, 11, 12, 13, 14, and 15 attempts to determine whether and to what extent these benefits are being realised by the questionnaire respondents. Question 9 asked companies whether they felt the benefits associated with their EMS outweighed the costs.

37 (80%) respondents with EMS's felt that the benefits associated with their EMS outweighed the costs. Only 4 companies (9% of the respondents) felt that the benefits did not outweigh the costs and 5 companies (11% of the respondents) didn't know whether the benefits of their EMS outweighed the costs. Of the 27 companies with uncertified EMS's, 20 (74%) felt that the benefits outweighed the costs with 4 (15%) not knowing whether the benefits outweighed the costs and 3 (11%) feeling that the benefits did not outweigh the costs. Of the 19 companies with certified EMS's, 17 (90%) felt that the benefits outweighed the costs with 1 (5%) saying that the benefits did not outweigh the costs and 1 (5%) not knowing whether the benefits outweighed the costs.

The responses to question 10 (a) are illustrated in Figure 2 below.

Figure 2: *Displaying whether respondents insurance premiums have reduced since the installation of their EMS*
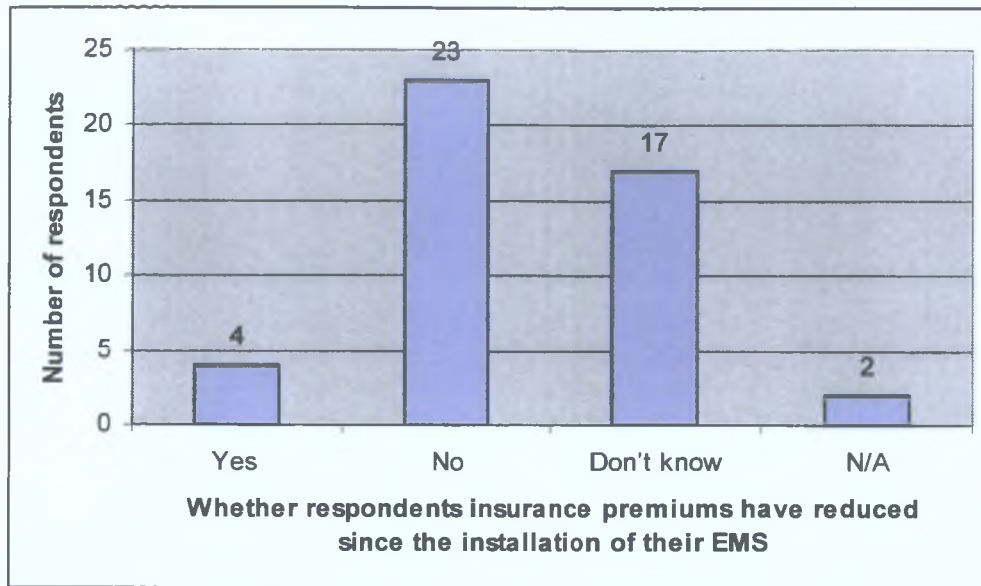
Of the 23 companies who answered "No" to this question 16 had uncertified EMS's and 7 had certified EMS's. Of the 4 companies who had experienced reductions in insurance premiums, 3 of these had uncertified EMS's while 1 had a certified system. Of the 17 companies who didn't know whether they had experienced a reduction in insurance premiums, 9 of these were certified and 7 were uncertified.

Question 10 (b) asked companies who had experienced a reduction in their insurance premiums since the installation of their EMS to quantify that reduction. Of the four companies that said they had experienced a reduction in insurance premiums since the installation of their EMS, one couldn't quantify the value of the reduction and three said it was less than 10%. The three companies who said they had experienced a reduction of less than 10% had uncertified EMS's while the company who could not quantify what the reduction was had a certified EMS.

Question 11 was divided into two parts. Question 11(a) asked companies whether they had received any environmental awards. The results are illustrated in Figure 3 below

Figure 3: *Pie chart displaying the respondent's results to question 11 (a) (whether the company had received any environmental awards)*
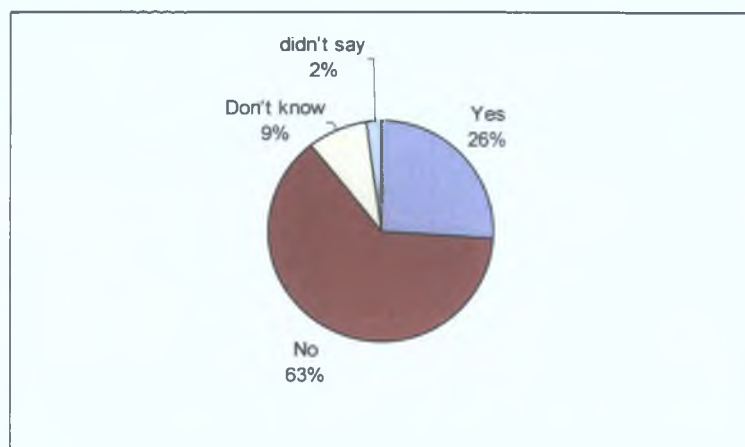
Question 11 (b) asked companies who had received environmental awards to name the awards. Only 12 (26%) of the respondents had received environmental awards. 7 of these companies had a certified system while 5 had an uncertified system. The results are presented in Table 5 below.

Table 5: *Displaying names of awards received by respondents*

Name of Award	Amount of companies who received that award
IBEC awards	4
Repak awards	2
Internal Company awards	3
NSAI award	1
Irish Good Environmental Management award	1
Bord Bia Food Safety and Environmental Best Practice award	1
Sustainable Energy Ireland (SEI) National award	1
Local Authority Business Award- Environmental Efforts	1
*Other	1

* Please note that this award refers to "boiler house of the year" "boiler man of the year" "ETA award" and "Energy Manager off the Year". One company specified that they received all of these awards. Please note that four companies received more than one award.

The results of question 12 (a) are illustrated in Figure 4 below.

Figure 4: *Bar chart showing respondents answer to question 12 (a) (whether their manufacturing/operating costs had reduced since the installation of their EMS)*
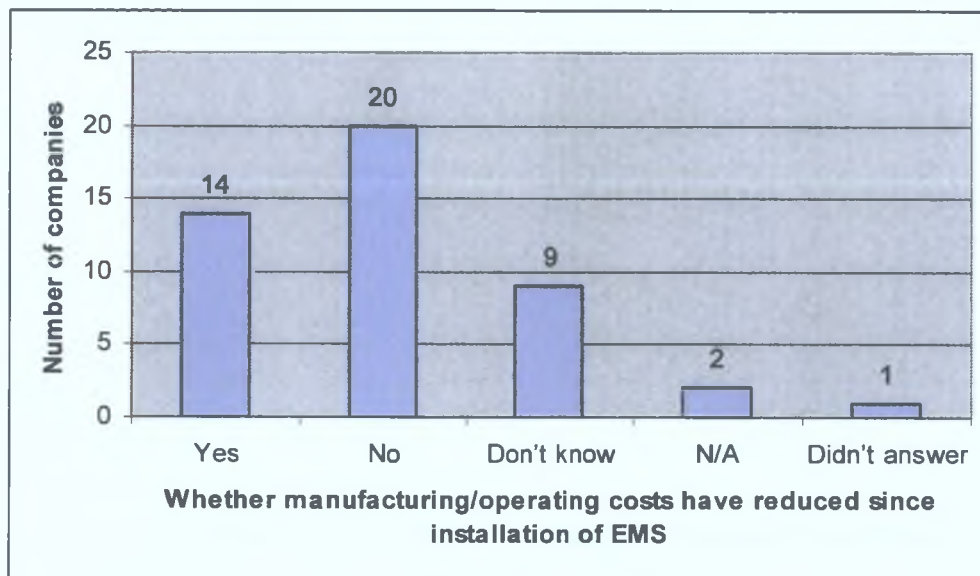
Of the 14 companies who had experienced reductions in manufacturing/ operating costs, 10 had uncertified EMS's while 4 had certified EMS's. Of the 20 companies who answered "No" to this question, 12 had uncertified EMS's and 8 had certified EMS's. Of the 9 companies who did not know whether their manufacturing/operating costs had reduced since the installation of their EMS, 4 had uncertified EMS's while 5 had certified EMS's.

Question 12b asked those respondents whose manufacturing/operating costs had reduced since the installation of their EMS to quantify what the reduction was. Only 14 of the 46 respondents (30%) had experienced a reduction in their manufacturing/operating costs since the installation of their EMS. Of these 14

companies, 4 didn't say, 4 claimed reduction amounted to less than €5000, 2 claimed

a reduction of between €5000 and €20,000, 2 claimed a reduction of between €20,000

and €50,000 and 2 companies said their manufacturing/operating costs had reduced by

greater than €50,000.

The findings of question 13 (a) are illustrated in Figure 5 below.

Figure 5: *Bar chart displaying the responses to question 13 (a) (whether waste collection/disposal costs had reduced since the installation of their EMS)*
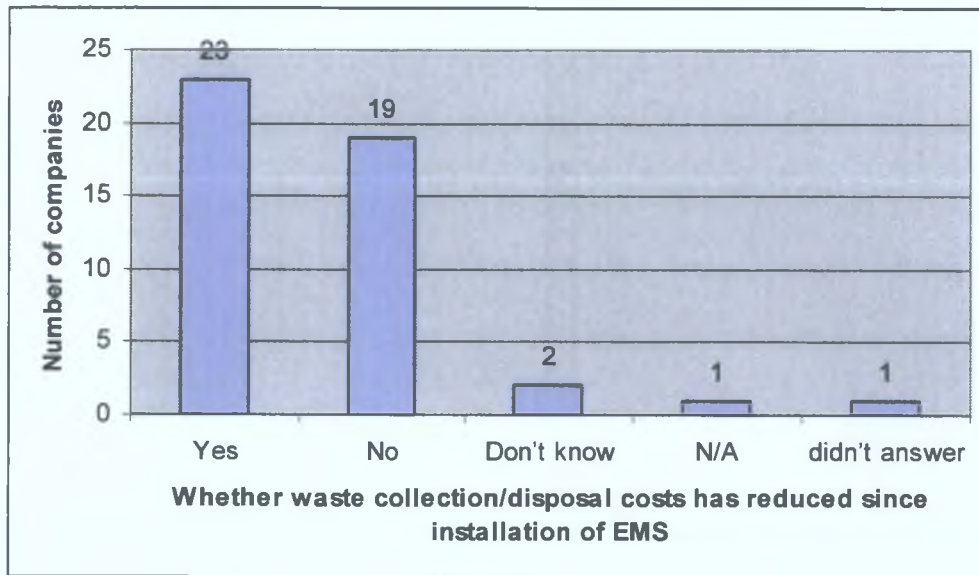
Of the 23 companies who said they had experienced reduced waste collection/disposal

costs since the installation of their EMS, 14 had uncertified EMS's while 9 had

certified EMS's. Of the 19 companies who had not experienced reductions in waste

collection/disposal costs 11 had uncertified EMS's and 8 had certified EMS's. Of the

2 respondents who did not know whether they had experienced a reduction in waste

collection/disposal costs, 1 had an uncertified EMS and 1 had a certified EMS.

Question 13(b) asked those companies who had experienced reduced waste

collection/disposal costs to give an estimate of the annual cost savings. 23 (50%) of

respondents had experienced reduced cost savings since the installation of their EMS.

Of these 23, 5 didn't say, 3 specified a reduction of €10,000, 2 specified a reduction

of 5000, 2 specified a reduction of €20,000, 1 specified a reduction of €5000-€20,000, 1 specified a reduction of €1,000, 1 specified a €200,000 reduction, 1 specified a €15,000 reduction, 1 specified a €25,000 reduction, 1 stated they had experienced a 20-30% reduction, 1 stated they couldn't provide an estimate, 1 stated it was N/A as it was a relatively new site, 1 stated it was a slight reduction only, 1 cited that they record their achievements/targets in tonnages/yields not always euros while 1 company stated that the cost had decreased for landfill only but the overall cost had increased. The exact replies are contained in table 3 in Appendix 3.

Question 14 asked companies whether they felt their EMS had helped them comply with legislation. 45 (98%) of the respondents felt that their EMS helped them to comply with legislation, while only 1 (2%) of the respondents felt that the EMS didn't help them to comply with legislation. The company who felt that their EMS had not helped to them to comply with legislation was certified to ISO 14001.

The responses to question 15 are illustrated in Figure 6 below.

Figure 6: *Pie chart displaying respondents answers to question 15 (whether the company had less environmental complaints since the installation of their EMS)*
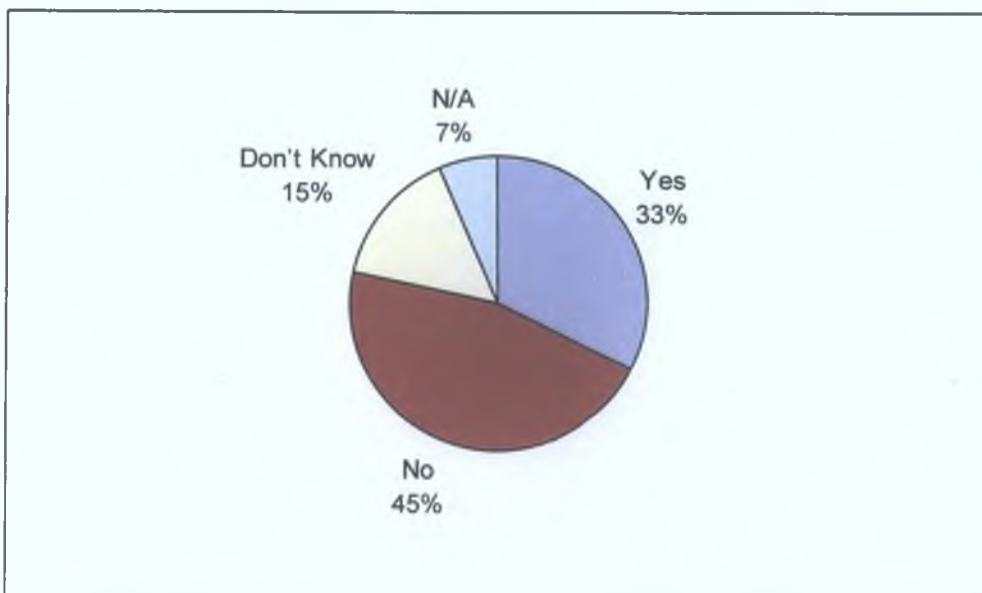
Of the 27 companies with uncertified EMS's, 14 (52%) said environmental complaints had not decreased since the installation of their EMS, 6 (22%) specified that they had fewer environmental complaints, 6 (22%) said they did not know whether or not they had less environmental complaints since the installation of their EMS while 1 (4%) said it was not applicable-they had no complaints before or after. Of the 19 companies with certified EMS's, 9 (47%) said they had received fewer environmental complaints since the installation of their EMS, 7 (37%) stated that they had not received fewer environmental complaints with 1 (5%) not knowing whether they had received fewer environmental complaints and 2 (10%) saying it was N/A.

4.2.1 Discussion of environmental results

This section consists of a discussion of the results of the section of the questionnaire addressing the benefits and the barriers associated with EMS's as experienced by the pharmaceutical industry and the IPC/IPPC licensed food and drink companies in Ireland.

The postal survey carried out revealed both positive and negative aspects. On a positive note, a vast majority of respondents to the questionnaire (87%) felt that time spent on environmental affairs didn't interfere with production/competitiveness. In a society where competitiveness is of utmost importance to survival, meeting production targets, making profits, minimising customer complaints by delivering a quality product can often be prioritised in industries and managing environmental impacts can often be neglected. McDonald et al (2001) highlights regulatory compliance as being a benefit of EMS's. (Section 2.3.2.2 of Literature Review). Commentators also mention legislation compliance as a benefit of undertaking

environmental management. The results of the questionnaire fully support this theory with 98% of respondents stating that their EMS had assisted them in achieving legislative compliance. Non-compliance with legislation can lead to heavy court fines and negative publicity. Therefore it is very positive that 98% of respondents felt that their EMS was a useful tool in aiding legislation compliance

Cost savings is quoted in much literature as being a perceived benefit of EMS's. The questionnaire attempted to find out whether and to what extent companies in the pharmaceutical and IPC/IPPC licensed food and drink sector have experienced cost savings by asking whether they had experienced reduced insurance premiums (Q10), reduced manufacturing/operating costs (Q12) and reduced waste collection/ disposal costs (Q13). Reduced insurance premiums are a perceived benefit associated with EMS's quoted in much literature (Section 2.3.2.2 of literature review). The results of this questionnaire do not back up this theory as most of the respondents have not realised this benefit. Only 9% of companies have experienced a reduction in insurance premiums since the installation of their EMS. Perhaps companies should put pressure on their insurance companies to reduce their premiums as a result of them having an EMS in place. Of the 4 companies who have experienced reduced insurance premiums, 3 stated that the reduction was less than 10%. Of these 4 companies 2 of them had 50-250 employees, 1 had > 250 employees and 1 didn't specify how many employees it had. The fact that 4 companies have experienced insurance reductions suggests that it is a benefit that can be achieved across the board. Companies who have gone to the trouble of installing environmental management systems must try to ensure that they are realising all of the benefits associated with them.

According to McDonald et al (2001) ISO 14001 certified EMS's will reduce manufacturing/operating costs. The results of the questionnaire only marginally support this theory with only 4 of the 19 companies with certified EMS's experiencing reductions in manufacturing/operating costs. For all of the companies who have experienced reductions in manufacturing/operating costs, it is indicative that they feel that their EMS is working well and is effective. For the companies who haven't experienced reductions in manufacturing/operating costs, this may mean that companies need to work harder and plan better to ensure that their EMS operates to its maximum effectiveness and efficiency. It may also mean that the EMS is in its early stages and is not operational long enough to see real reductions in manufacturing/operating costs or it may be that the companies are not looking at the costs in light of EMS. The fact that 9 (20%) respondents did not know whether their manufacturing/operating costs had reduced suggests that these companies need to make more of an effort to ensure that the EMS is delivering on its targets and that the potential benefits are being realised. The pharmaceutical sector and IPC/IPPC licensed food and drink sector would be considered to be fairly proactive towards environmental issues and many of them on their company brochures and websites would claim highly effective and efficient EMS's. The fact that only 30% of respondents have experienced reductions in manufacturing/operating costs since the installation of their EMS suggests that these companies may need to work harder to ensure that the maximum cost savings can be achieved.

The whole area of waste management and waste management costs is a source of huge debate in Ireland today. Recycling is a cheap and environmentally friendly manner of disposing of waste. Increased emphasis and much publicised advertising

campaigns along with the increased cost of disposal of waste at landfill has resulted in both the public and the private sector recycling more of their waste.

The Printech case study discussed in Section 2.3.2.2 of the literature review found that their EMS contributed to reduced waste costs. The results of the questionnaire indicate that the respondents are achieving cost savings with respect to waste collection/disposal costs much more so than manufacturing/operating costs or insurance reductions with 50% of respondents having achieved reductions in waste collection/disposal costs. The reductions in waste collection/disposal costs experienced by companies were fairly substantial with 9 companies stating they had experienced reductions of greater that €10,000.

26% of respondents received environmental awards. While environmental awards do not result in cost savings, they can lead to a feel good factor being created within a company. Recognition for good environmental performance can boost morale within a workforce. It also proves they display a commendable attitude towards the environment. It can also enhance the public perception of the image that the company portrays. All of these can be regarded as positives and they tie in with the benefits mentioned in Section 2.3.1 of the literature review. 7 of the 12 companies that received environmental awards had certified EMS's. Perhaps companies should be encouraged to apply for awards and the awards be better publicized.

Improved public image and community relations are benefits cited in the literature. If companies are having improved public image and community then they would be having reduced environmental complaints. 33% of respondents have identified it as a benefit. One would imagine that with the increased awareness towards environmental

issues introduced as a result of having an EMS in place that a greater proportion of respondents would have had less environmental complaints since putting in their EMS. 4 companies who answered "No" to this question specified that they never have received environmental complaints. Perhaps many of these companies do not keep a complaints register. One company stated that they did not record their environmental complaints before they put in their EMS.

Questions 4, 5, 6, 7, and 8 on the survey questionnaire deal with the barriers facing companies having EMS's. These questions attempt to ascertain how strong these barriers are and which barriers are most prominent. The literature indicates that installing an EMS can be very time consuming for companies and can have a significant workload associated with it. Only 13% of respondents in this study classified the workload as excessive. Workload is definitely a barrier and can be a disincentive to companies putting in an EMS. In this author's opinion based on the fact that the vast majority of respondents to this questionnaire classified the workload associated with installing an EMS as "moderate", companies thinking of putting in an EMS should not let "workload" stop them. It is interesting to note that 15% of companies with uncertified EMS's classified the workload as "excessive" and only 11% of companies with certified systems considered the workload associated with installing an EMS as excessive. One would imagine that there would be a greater workload associated with preparing for certification. It can be viewed in a positive light that 5 (11%) of respondents felt that there was a "low workload" associated with maintaining an EMS and 41 (89%) classified the workload associated with maintaining an EMS as "moderate". No company felt that there was an excessive workload associated with maintaining an EMS. According to the respondents to this

questionnaire, it would appear that the workload associated with installing an EMS is slightly greater than the workload associated with maintaining it. 21% of companies with certified EMS felt that there was a low workload associated with maintaining an EMS. These results indicate that certification does not involve an additional workload.

In the literature, cost is considered to be a major barrier to many companies in setting up and maintaining environmental management systems. Cost is mentioned as being a barrier in section 2.4 of literature review. 43 (93%) respondents bracketed the cost of installing an EMS in the "inexpensive" or "relatively expensive" categories. These results indicate that while cost is undoubtedly a barrier, it is not an insurmountable barrier to pharmaceutical companies and IPC/IPPC licensed food and drink companies in Ireland. Companies were asked to provide an estimate of the installation costs of setting up their EMS. Only 25 of the 46 (54%) companies attempted to answer this question and only seventeen (37%) of the respondents provided actual figures. There are different reasons to why the response rate to this question was poor. One reason may be that few companies ever fully quantify the costs and do not actually know the cost of putting in the system or the information may not be readily available or it is also possible that some companies were not willing to divulge the costs. Companies should carry out a cost benefit analysis of their EMS's. There was a significant variation in the estimates given ranging from €4,000 to €100,000. Eleven of the seventeen (65%) companies that provided estimates for the cost of installing an EMS quoted figures of between €20k and €70k.

18 (39%) respondents considered it "inexpensive" to maintain an EMS with 25 (54%) categorising the cost as "relatively expensive". 3 (7%) perceived it as "highly expensive" to maintain an EMS. Many companies did not provide an estimate of the cost of maintaining an EMS. Companies should know how much it is costing them to maintain their EMS. Companies who have exact figures for the annual cost of maintaining their system will be in a better position to make a judgement whether their EMS is really benefiting them.

Question 8 listed five common difficulties associated with EMS installation. The results indicate that "amount of paperwork/documentation" is considered 46% of respondents to be the greatest difficulty. A further 24% of respondents assigned it a number 2 rating and 22% assigned it a number 3 rating. According to the results, the second most common difficulty experienced by pharmaceutical companies and IPC/IPPC licensed food and drink companies is the "time involved". This would seem to contradict the answers to previous questions regarding workload. If "amount of paperwork/documentation" is peceived to be the greatest difficulty, then this must constitute "workload" for these companies. The "cost involved" and "lack of resources" are not as significant barriers as the amount of paperwork/documentation and the time involved. The results of previous questions indicate that cost is not an insurmountable barrier to companies installing and maintaining EMS's. This further supports this. Lack of technical expertise was not reported as a major barrier.

Question 9 links together the barriers and the benefits associated with EMS's and attempts to ascertain whether the benefits to be gained from having an EMS in place are greater than the costs associated with installing and maintaining it. The results

indicate that, in the opinion of respondents, the benefits outweigh the costs with 80% of respondents stating this to be the case. 90% of respondents with certified EMS's felt that the benefits out weighed the costs compared to 74% of those with uncertified systems. Although this response is encouraging, the answers to other questions regarding costs etc may be contradictory. It is difficult to know how a respondent can say benefits outweigh costs when they can't identify all the benefits, nor all the costs.

4.3 Presentation of questionnaire results-Safety

Question 16 asked companies when they had last updated their safety statement. The results are outlined in Table 6 below.

Table 6: *Showing when companies last updated their safety statement*

When companies last updated their safety statement	Number	Percentage
In the last 6 months	23	43%
In the last year	18	33%
1-2yrs ago	7	13%
>2yrs ago	5	9%
Didn't answer	1	2%
Total	54	100%

Question 17 asked companies whether they had an accident reporting system in place. 53 (98%) of the 54 respondents stated that they had an accident reporting system in place. One company did not answer this question.

Question 18 asked companies how many reported accidents they had in last 3 years. Eleven of the respondents did not answer this question. Of the 43 who replied, 3 companies said they had zero reported accidents in 2002, 2003, and 2004; 23 companies had 3 or less reported accidents in 2002, 2003, and 2004 and 16 companies had more than 10 accidents in any one year.

Question 19 asked companies what their percentage absenteeism levels were in 2004, 2003, and 2002. Only 28 of the respondents provided figures for absenteeism levels for the last 3 years. 3 companies said the figures weren't available, 3 companies said figures were unknown, 1 company said that absenteeism levels weren't monitored while 1 company stated that this information was confidential and 1 company stated that absenteeism levels were measured centrally and 14 companies did not answer this question. Overall absenteeism was low. 16 of the 28 companies who provided figures for absenteeism levels stated that absenteeism did not exceed 5% per annum. One company specified 10% absenteeism in 2002, 2003, and 2004 while another company specified 20% absenteeism in each of the 3 years.

The findings to question 20 (a) are illustrated in Figure 7 below.

Figure 7: *Bar chart displaying respondent's answer to question 20 (a) (whether company has a safety management system in place or not)*
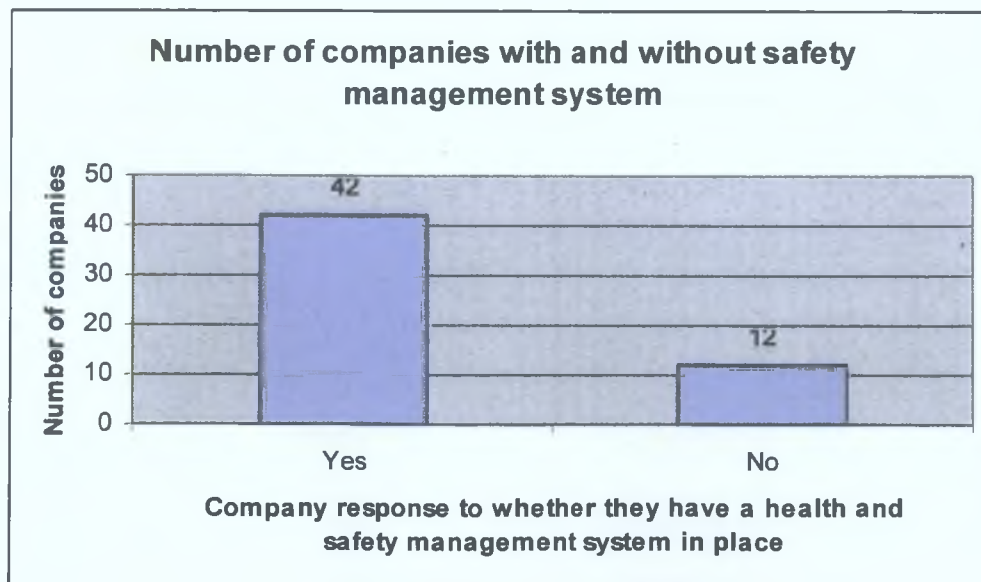
Question 20 (b) asked companies who had a safety management system in place to name that system. Eleven of the respondents did not name their system. The results are presented in Table 7 below.

Table 7: *Displaying names of safety management systems held by questionnaire respondents.*

Name of system	Number of respondents with that system
OHSAS 18001	3
In House System	15
Internal Corporate System	4
FBD Risk Management System	3
ISRS	1
BS8800	1
*Other	4

* 4 companies cited having systems that the author could not categorise, namely "Custom Built Hard Copy", "Emergency Response System", "Global System, and "Enviromanager"

Question 20 (c) asked companies who didn't have a safety management system in place to state the reasons why. Twelve of the fifty-four respondents (22%) did not have a safety management system in place. Of the 12 companies who do not have a safety management system in place 6 of them are currently developing one. One company cited "time and money" as the reason for not putting in a safety management system while another company stated that an "administrative workload increase" put them off installing a safety management system. Another company stated that safety issues were covered in their quality management system while another company stated that they are under construction at the moment and that they will put in a safety management system. One company stated that they only put in their EMS in January 2004 and are waiting to complete a surveillance audit before they install a safety management system. Another company said they had only recently appointed safety

personnel but there was a possibility of putting in a safety management system in the future.

Question 21 asked companies to rank on a scale of 1 to 5, (1 being most beneficial and 5 being least beneficial) the potential benefits of safety management systems to their company. Some companies cited other benefits than the options. One company mentioned "duty of care to all employees" as a potential benefit and assigned it a number 1 rating. Another company listed "employee safety" and assigned it a number 1 rating. Another respondent mentioned "improved regulatory compliance" and assigned it a 4 and "lower risk environment" and assigned it a 5. Another company mentioned "less injuries, healthier workforce" and gave it a number 6. Another respondent outlined, "ingrain a continuous improvement process" and gave this a number 1 rating. Another company specified "no employee injured" as a strong benefit and gave it a number 1 ranking. The results are presented in Table 8 below.

Table 8: *How respondent's rate on a scale of 1 to 5 the potential benefits of safety management systems.*

Potential benefits associated with EMS's	Ranking scale 1-5				
	1	2	3	4	5
Increased cost savings	7	6	13	10	5
Reduced absenteeism	8	4	14	10	5
Reduced insurance premiums	9	4	7	9	12
Improved relations	10	9	10	5	5
Increased staff morale	10	16	6	1	6

Question 22 (a) asked companies whether they had received any safety awards. 45 of the 54 (83%) respondents answered this question. 20 out of the 45 respondents (44.5%) had received safety awards 23 (51%) did not receive safety awards while 2 (4.5%) of respondents didn't know whether they had received safety awards.

Question 22 (b) asked those companies who had received safety awards to name the award. 20 companies stated that they had received safety awards. Of these 20 companies, 13 had received NISO awards, 3 didn't specify, 1 received corporate awards (ROSPA), 1 received merit award from Minister of Labour Affairs, 1 received Most Improved Site, 2003, while 1 received good performance award.

The responses to question 23 (a) are illustrated in Figure 8 below.

Figure 8: *Bar chart showing companies response to whether they felt that their insurance premiums had reduced since the installation of their safety management system*
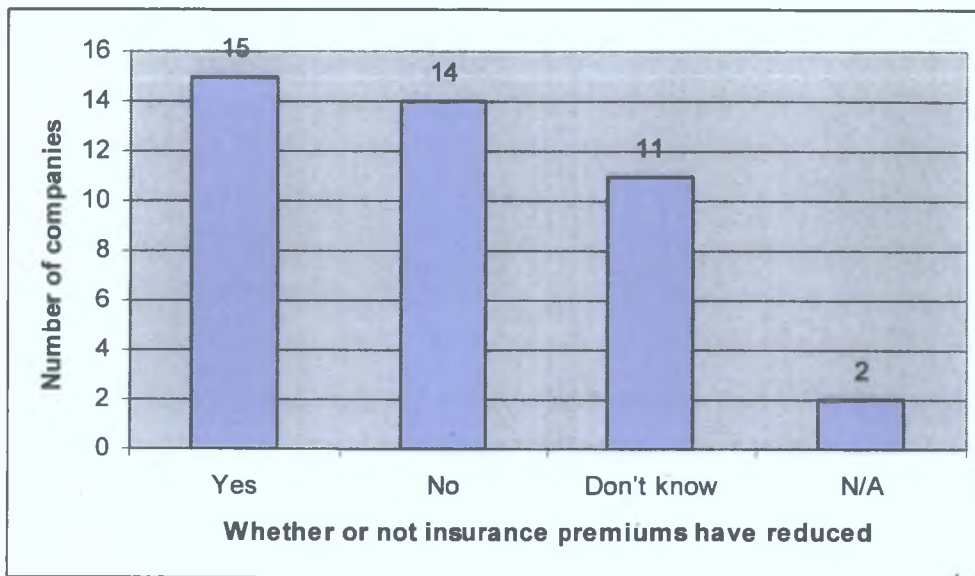
Question 23 (b) asked companies who had experienced a reduction in insurance premiums since the installation of their EMS to quantify what that reduction was. Of the 15 companies who said who said they had experienced a reduction in insurance premiums, 5 (33%) said that it was less than 10%, 4 (27%) stated that there was a 10-25% reduction, 2 (13%) said there was a 25-50% reduction, 1 (27%) said they didn't know while 3 companies (20%) didn't answer this part of the question.

The responses to question 24 are illustrated in Figure 9 below.

Figure 9: *Pie chart showing how respondents rate the workload associated with installing a safety management system*
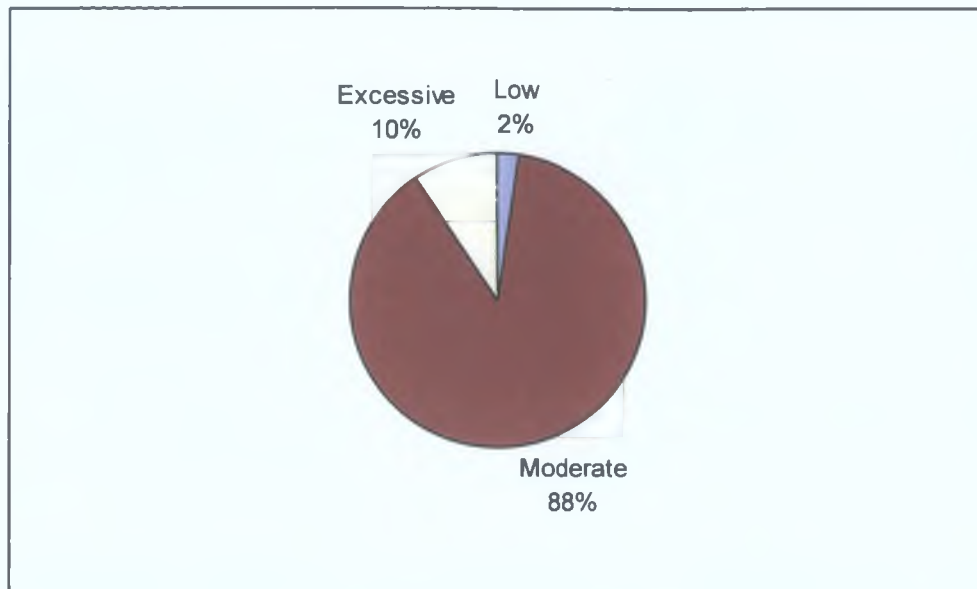
The responses to question 25 are illustrated in Figure 10 below.

Figure 10: *Bar chart showing how respondents rate the workload associated with maintaining a safety management system*
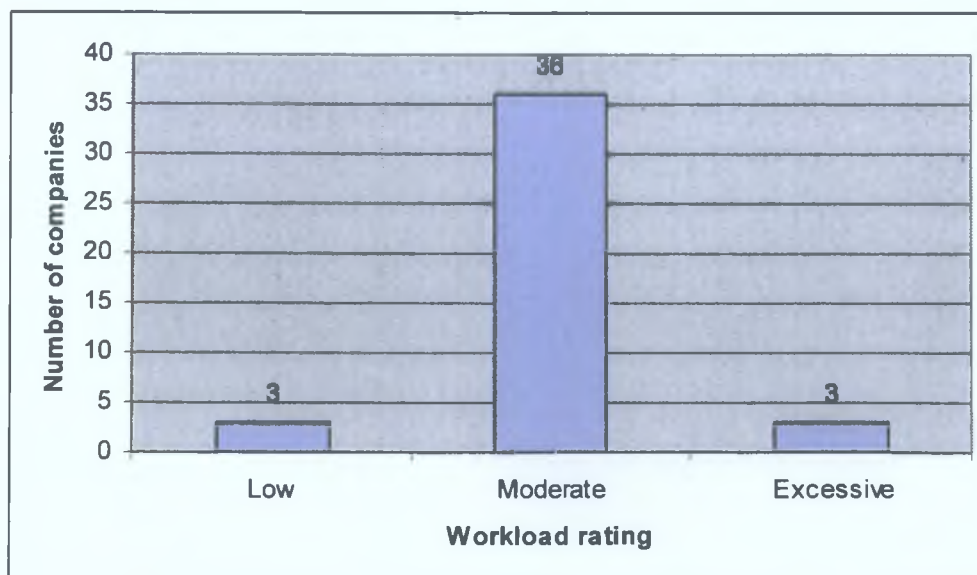
The responses to question 26 are illustrated in Figure 11 below.

Figure 11: *Bar chart showing how companies rate the expense associated with installing a safety management system*
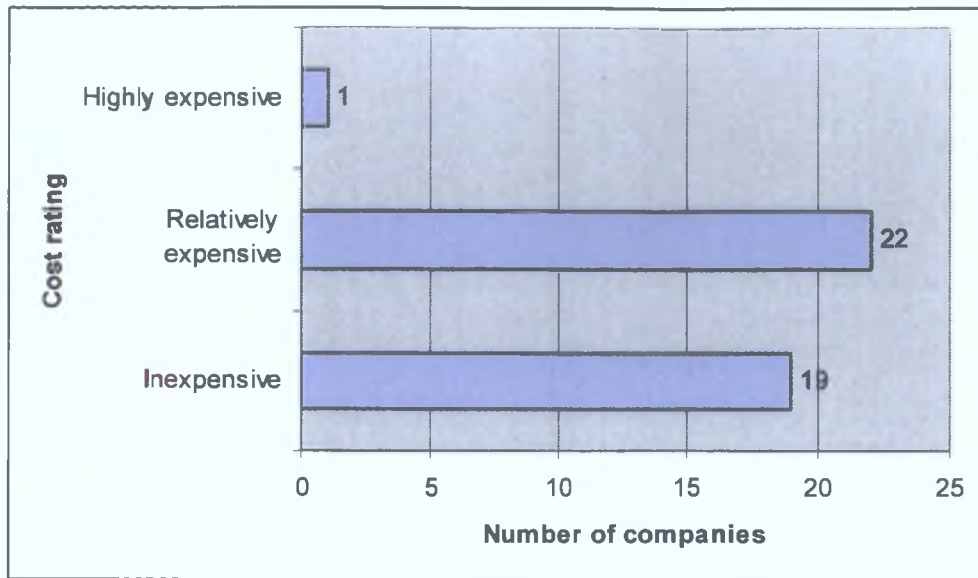
The responses to question 27 are illustrated in Figure 12 below.

Figure 12: *Bar chart showing how respondents rate the expense associated with maintaining a safety management system*
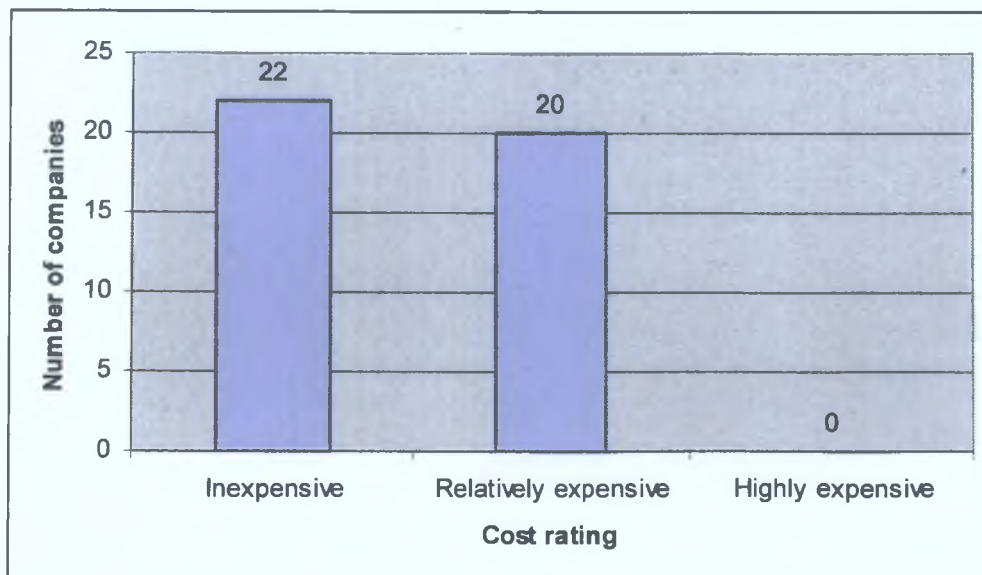
4.3.1 Discussion of safety results

This section consists of a discussion of the benefits and the difficulties associated with safety management in the pharmaceutical and the IPC/IPPC licensed food and drink companies in Ireland.

The safety statement is a very important document in any workplace. Section 12 of the 1989 Health and Safety and Welfare at Work Act requires every employer to have a safety statement. Where a company has updated their safety statement within the last year, this is indicative that there is a proactive approach towards health and safety within the organisation. Regarding the 13% of respondents who updated their safety statement 1-2 years ago and the 9% of respondents who updated their safety statement greater than 2 years ago, it may be suggested that they look towards updating their safety statement again. A better question might have been to ask how often companies updated their safety statement providing a more meaningful result.

42 (78%) of the respondents have a safety management system in place with 12 (22%) not having a safety management system in place (Figure 9). The vast majority of the respondents have an in house system with only 3 companies being certified to OHSAS 18001. Perhaps due to the fact that quality management systems such as ISO 9001 and environmental management systems such as ISO 14001 are around much longer than safety management systems and many of the respondents may have both ISO 9001 and ISO 14001 in place they may not have had time to consider putting in 18001. OHSAS 18001 is not an internationally recognised standard yet.

All of the companies surveyed said they had an accident reporting system in place. Question 18 asked companies to say how many reported accidents they had in 2002, 2003, and 2004. There is a considerable variation in the number of accidents within companies. Many companies have very low numbers of reported accidents with 4 companies stating they had no reported accidents in 2002, 2003, and 2004. This could suggest that there is a very positive safety culture within these companies and that work systems are carefully chosen and monitored ensuring that the safest one is chosen each time. The zero accident rate may also be due to the fact that the hazards are few and easy to control. However food and drink manufacturing facilities and pharmaceutical manufacturing operations tend to have a lot of hazards associated with them such as slips trips and falls which may be due to poor housekeeping, use of toxic and harmful chemicals, manual handling hazards, forklift driving to name a few so this is hardly likely to be the case. It could be a case that employees are not reporting accidents because they do not want to draw attention to themselves. A significant number of companies have specified that they had very low accident rates in many cases less than 5 in any one year. One company has had very high levels of reported accidents having had 400 in 2002, 337 in 2003 and 421 in 2004. This company stated that these figures include incidents and near misses. This company has greater than 250 employees. What is slightly concerning with respect to this company is while there was a marked improvement in safety performance in relation to accidents from 2002 to 2003 which showed a decrease of 63 accidents from 400 to 337, the increase of 84 accidents from 337 to 421 from 2003 to 2004 is particularly worrying. The safety department in this company may need to take a detailed examination of their hazard identification and risk assessment process to ensure that proper controls are put in place to minimise accidents occurring.

Reduced absenteeism is a benefit of safety management quoted in section 2.14.2 of the literature review. In general, absenteeism levels were low. For many of the companies, absenteeism levels were less than 5% in any one year. The low absenteeism may be due to a positive working environment and safety culture and high morale within the company. Because this study involved looking at only 54 respondents and many of these failed to specify levels of reported accidents and absenteeism levels, the results do not necessarily indicate that those with safety management systems are performing any better in relation to reduced absenteeism and reduced accidents than those who haven't. Also 10 out of the 12 companies who do not have a safety management system in place specified that they were in the process of developing one or that there was a good level of safety culture on site or that their safety aspects were addressed in their quality management system. This may indicate that the safety culture in these companies is just as good as in those with safety management systems. Future studies over a bigger population could yield more fruitful and interesting results.

The results to question 21 indicate that the respondents identified "increased staff morale" and "improved relations with regulators" as the two most popular benefits of safety management systems with 26 of the respondents assigning "increased staff morale" a number 1 or a number 2 rating and 19 of the respondents assigning "improved relations with regulators" a number 1 or a number 2 rating. "Reduced absenteeism would be the third most popular benefit according to the respondents of the questionnaire. "Increased cost savings" and "reduced insurance premiums" are less beneficial in relation to safety management systems with 15 respondents assigning "increased cost savings" either a number 4 or a number 5 rating and 21

respondents assigning "reduced insurance premiums" either a number 4 or a number 5 rating. These results indicate that the feel good factor associated with "increased staff morale" and "improved relations with regulators" are more relevant to safety management systems than real financial benefits such as "increased cost savings" and "reduced insurance premiums". The emphasis on management of safety in the workplace and particularly safety management systems is a relatively new phenomenon. Therefore the respondents may not have taken the time to thoroughly examine the cost benefits of such systems.

20 companies have received safety awards. Safety awards are the fruits of hard labour and are indicative of a positive safety culture and good safety performance within the organisation. Safety awards lead to a positive public image and to increased morale within the workforce. They are also a good indicator of the effectiveness of the safety management system.

36% of the 42 respondents with safety management systems in place have specified that their insurance premiums have reduced since the installation of their safety management system. The fact that 11 (26%) have stated that they didn't know whether their insurance premiums had reduced or not suggests that these companies need to take a more detailed look at costs. Companies should know whether their insurance premiums are reducing. Companies who have a good level of safety performance should highlight this to their insurance companies and should make sure that they get a good deal and that they get reduced insurance premiums each year. 6 of the respondents experienced a reduction of > 10%. There is no reason why companies should not be able to achieve such a reduction.

The majority of respondents considered there to be a "moderate workload" with both installing and maintaining a safety management system. It appears from the results that there is a slightly greater perceived workload involved in installing a safety management system than maintaining it. This mirrors the results obtained for EMS's. The results indicate that cost does not appear to be a major barrier in installing and maintaining safety management systems. 45% of respondents considered it "inexpensive" to install a safety management system and 52% considered it inexpensive to maintain a safety management system. The results also indicate that workload is a greater barrier than cost in installing and maintaining safety management systems.

SECTION 5-CONCLUSIONS/RECOMMENDATIONS

This dissertation examined the barriers and the benefits of environmental management systems and health and safety management systems in the pharmaceutical sector and the IPC/IPPC licensed food and drink companies in Ireland. The main conclusions can be summarised as follows.

- EMS's are very useful in assisting legislative compliance.

- Cost and workload are not insurmountable barriers for companies installing and maintaining EMS's and HSMS's. Cost would appear to be a greater barrier in installing and maintaining EMS's than HSMS's. Both cost and workload are greater barriers in installing EMS's and HSMS's than maintaining them.

- The benefits associated with an EMS outweigh the costs and time spent on environmental affairs does not interfere with production/competitiveness.

- The research has highlighted areas for improvement and aspects which companies need to address in order to gain the maximum benefits from their EMS. These areas include a more in depth and comprehensive examination and analysis of their manufacturing/operating costs, waste disposal/collection costs and insurance premiums. It is slightly worrying that these perceived benefits of EMS's are not being realised or perhaps not recognised by a high proportion of companies in the pharmaceutical and IPC/IPPC licensed food and drink sector in Ireland. Companies may need to review their system on a bi-annual basis with particular emphasis on whether the system is delivering the cost benefits it should be. Waste disposal/collection costs delivered the greatest cost savings. Many of the respondents did not know whether they

were experiencing reduced costs which suggest that they should carry out a cost benefit analysis on a yearly basis.

- With respect to the safety aspect of the questionnaire, it is encouraging that across the board there were reasonably low levels of reported accidents and reasonably low levels of absenteeism. Reduced absenteeism and reduced accidents/injuries are indicative of a positive safety culture and a strong, healthy and proactive approach towards safety within the organisation. Insurance companies would appear to favour companies with a better safety record than environmental record with 36% of respondents with safety management systems having experienced reduced insurance premiums. The vast majority of respondents felt there was a "moderate workload" associated with both installing and maintaining a safety management system.

- The fact that 12 of the respondents had received environmental awards and 20 of the respondents had received safety awards suggests that there is a positive attitude by these companies towards EHS management.

Recommendations for future study could include a more detailed examination of the two sectors. More meaningful results may be gained by arranging face-to face interviews with all of the companies over a longer time period. Questionnaires may not always deliver the most meaningful of results. An analysis of the turnover of the companies may be useful in determining how realistic the cost savings achieved were.

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Cortoonmore,

Ballaghaderreen,

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Dear Sir/Madam

I am currently doing my Masters in Environmental Health and Safety management at Sligo Institute of Technology. As part fulfillment of the course, I am doing a research thesis on "An examination of the benefits and difficulties associated with maintaining a good environmental and health and safety standard with particular reference to the pharmaceutical and IPPC licensed food and drink companies in Ireland".

I am enclosing a questionnaire which will take approximately 15 minutes to complete. I am grateful for your time and co-operation in filling out this questionnaire. If you would like a copy of the results, please let me know when you are returning the questionnaire.

I enclose an addressed envelope for your convenience. If you require further clarification on any issue, please do not hesitate to contact me at the above phone number or e mail.

Yours Sincerely,

John Carty.

ENVIRONMENTAL MANAGEMENT SYSTEMS & HEALTH AND SAFETY MANAGEMENT SYSTEMS QUESTIONNAIRE

1 Number of employees

< 50 ☐   50-250 ☐   >250 ☐

| Section A |
| This section of the questionnaire deals with environmental management |

2 Does your company feel that time and effort spent on environmental affairs interferes with production/competitiveness?

Yes ☐   No ☐   Don't know ☐

3 (a) Does your company have an Environmental Management System (EMS) in place?

Yes ☐   No ☐   Don't know ☐

(b) If yes, is it

Certified to ISO 14001 ☐   Certified to EMAS ☐   Uncertified ☐

(c) If no, please state reasons why your company decided not to put in an EMS
(If your answer to Question 3(a) is No, please proceed to Question 16 after completing Question 3(c).)

_____
_____
_____
_____

4 How does your company rate the workload involved in obtaining an EMS?

Low workload ☐   Moderate workload ☐   Excessive workload ☐

5 How does your company rate the workload involved in maintaining an EMS?

Low workload ☐   Moderate workload ☐   Excessive workload ☐

6 (a) How does your company, rate the costs associated with installing an EMS?

Inexpensive ☐   Relatively expensive ☐   Highly expensive ☐

(b) Can you give an estimate of the installation costs?

_____

7 (a) How does your company, rate the costs associated with maintaining an EMS?

Inexpensive ☐   Relatively expensive ☐   Highly expensive ☐

(b) Can you give an estimate of the annual cost of maintaining an EMS?

_____

8   What did you feel were the main difficulties associated with putting together your EMS? (Please rank 1-5) with 1 being "most difficult" and 5 being "least difficult"

Difficulties involved in EMS installation	Ranking (1-5)
Cost involved	
Time involved	
Lack of technical expertise	
Amount of paperwork/documentation	
Lack of resources	
Other (Please specify)	

9   Does your company feel that the benefits of your EMS outweigh the costs?
Yes ☐   No ☐   Don't know ☐

10   (a) Are your company's insurance premiums lower since the installation of the EMS?
Yes ☐   No ☐   Don't know ☐

   (b) If yes, how much of a reduction has there been
   <10% ☐   10-25% ☐   25-50% ☐   >50% ☐

11   (a) Has your company received any environmental awards?
Yes ☐   No ☐   Don't know ☐

   (b) If yes please state name of award
_____

12   (a) Have your manufacturing/operating costs been reduced since installing your EMS?
Yes ☐   No ☐   Don't know ☐

   (b) If yes how much of a cost reduction has there been?
   <€5000 ☐   €5000-20000 ☐   €20000-50000 ☐   >€50000 ☐

13   (a) Has your waste collection/disposal costs reduced since the installation of your EMS?
Yes ☐   No ☐   Don't know ☐

   (b) If yes, please give an estimate of the annual cost savings
_____

14 Do you feel that the EMS has helped you to comply with legislation?
Yes ☐   No ☐   Don't know ☐

15 Have you had less environmental complaints since the installation of your EMS?
Yes ☐   No ☐   Don't know ☐

┌───┐
│   **Section B**   │
│ **This section of the questionnaire deals with health and safety management** │
└───┘

16 When did your company last update your safety statement?
In the last 6 months ☐   In the last year ☐   1-2yrs ago ☐   >2yrs ago ☐

17 Have you an accident reporting system in place?
Yes ☐   No ☐   Don't know ☐

18 How many reported accidents have you had in the last 3 years?
_____ in   2004
_____ in   2003
_____ in 2002

19 What are your % absenteeism levels in the last 3 years?
_____ in 2004
_____ in 2003
_____ in 2002

20 (a) Has your company a safety management system in place?
        Yes   ☐   No   ☐   Don't know ☐

    (b) If yes, please state name of system
_____

    (c) If no, please state reasons why
(If your answer to Question 20(a) is No, please fill in 20 c and return the questionnaire, thank you)

_____
_____
_____
_____

21 The following is a list of potential benefits for health and safety management systems. Please rank 1 to 5 how applicable these benefits are to your company. Please note that 1= "most beneficial" and 5= "least beneficial"

Potential benefits of safety management systems	Ranking (1 to 5)
Increased cost savings	
Reduced absenteeism	
Reduced insurance premiums	
Improved relations with regulators	
Increased staff morale	
Others (please specify)	

22 (a) Have you received any safety awards?

Yes ☐   No ☐   Don't know ☐

(b) If yes, please state name of award

_____

23 (a) Have your insurance premiums reduced since installing your safety management system?

Yes ☐   No ☐   Don't know ☐

(b) If yes, how much of a reduction has there been?

< 10% ☐   10-25% ☐   25%-50% ☐   >50% ☐

24 How does your company rate the workload involved in installing your safety management system?

Low workload ☐   Moderate workload ☐   Excessive workload ☐

25 How does your company rate the workload in maintaining your safety management system?

Low workload ☐   Moderate workload ☐   Excessive workload ☐

26 How does your company rate the costs associated with installing your safety management system?

Inexpensive ☐   Relatively expensive ☐   Highly expensive ☐

27 How does your company rate the costs associated with maintaining your safety management system?

Inexpensive ☐   Relatively expensive ☐   Highly expensive ☐

Thank you for taking the time to complete this questionnaire.

The pharmaceutical companies as downloaded off the IDA website to whom questionnaires were sent are as follows

1. Abbott Ireland (Ballytivnan Co. Sligo)

2. Allergan Pharmaceuticals Ltd (Westport, Co. Mayo.)

3. Alltech Biotechnologies (Dunboyne, Co. Meath)

4. Altana Pharma Ltd (Little Island, Cork, Co. Cork)

5. Alza Ireland Ltd (Cashel, Co. Tipperary)

6. Amersham Healthcare (Carrigtohill, Co. Cork.)

7. Arkopharma Laboratories (Co. Waterford)

8. Athlone Pharmaceuticals Ltd (Co. Roscommon)

9. Aventis Pharma Ltd (Co. Waterford).

10. Bio Pin GmbH (Co. Waterford)

11. Boc Gases Ireland (Little Island, Co. Cork)

12. Cambrex Cork Ltd (Little Island, Co. Cork)

13. Cambridge Diagnostics Ltd (Co. Galway)

14. Cara Partners (Little Island, Co. Cork)

15. Cascade Biochem Ltd (Little Island, Co. Cork)

16. Centocor Biologics (Ireland) Ltd (Ringaskiddy, Co. Cork.)

17. Clonmel Healthcare Ltd (Co Tipperary)

18. Elan Pharma Ltd (Co. Westmeath)

19. Eli Lilly SA (Co. Cork)

20. FMC International AG (little Island, Co. Cork)

21. Forest Laboratories Ireland Ltd (Co. Dublin)

22. Fort Dodge Laboratories Ireland Limited (Co. Sligo)

23. Fournier (Carrigtohill, Co. Cork)

24. Fujisawa Ireland Ltd (Co. Kerry)

25. Genemedix Plc (Co. Offaly)

26. Genzyme (Co. Waterford)

27. Gerard Laboratories (Co. Dublin)

28. Glaxosmithkline (Cork) Ltd (Co. Cork)

29. Glaxosmithkline (Dungarvan) Ltd (Co. Waterford)

30. Glaxosmithkline Oral Care (Co. Waterford)

31. Helsinn Birex Pharmaceuticals (Co. Dublin)

32. Helsinn Chemicals Ireland Ltd (Co. Dublin)

33. Henkel Loctite (Ireland) Ltd (Co. Dublin)

34. Honeywell (Co. Wicklow)

35. ICI Dulux Paints Ireland Ltd (Co. Dublin)

36. Innothera Ireland Ltd (Co. Kildare)

37. Ipsen Manufacturing Ireland Limited (Co. Kildare)

38. IVAX Pharmaceuticals Ireland (Co. Waterford)

39. Janssen Pharmaceutical Limited (Little Island, Co. Cork)

40. Johnson Diversey (Ireland) Ltd (Co Dublin)

41. Kellogg Company (Co. Dublin)

42. Klinge Pharma GmbH (Co. Kerry)

43. Leo Pharma (Co. Dublin)

44. McKessen Information Solutions Irl. Ltd (Co. Cork)

45. Merck Sharp & Dohme (Co. Tipperary)

46. Niche Generics Ltd (Co. Dublin)

47. Niche Generics Ltd (Co. Tipperary)

48. Norbrook Manufacturing Ltd (Co. Monaghan)

49. Novartis Ringaskiddy Ltd (Co. Cork)

50. Olympus Ireland (Co. Clare)

51. Omega Technica Ltd (Co. Dublin)

52. Organon (Ireland) Ltd (Co. Dublin)

53. Pepsi Cola (Little Island, Co. Cork)

54. Pfizer (Cork) Ltd (Inchera, Co. Cork)

55. Pfizer Drug Product Plant (Loughbeg, Co. Cork)

56. Pfizer Ireland Pharma (Dun Laoghaire, Co. Dublin)

57. Pfizer Ireland Pharma API Plant (Loughbeg, Co. Cork)

58. Pfizer (Ringaskiddy, Co. Cork)

59. Pfizer (Little Island, Co. Cork)

60. Ranbaxy Ireland Ltd (Co. Tipperary)

61. Recordati Ireland Ltd (Co. Cork)

62. Roche Ireland Ltd (Co. Clare)

63. Rottapharm Limited (Co. Dublin)

64. Rowa Pharmaceuticals Ltd (Co. Cork)

65. Schering-Plough (Avondale) (Co. Wicklow)

66. Schering-Plough (Bray) (Co. Wicklow)

67. Schering-Plough (Brinny) (Co. Cork)

68. Schutz (Co. Mayo)

69. Servier (Ireland) Industries Laboratories (Co. Wicklow)

70. Stiefel Laboratories (Ireland) Ltd (Co. Sligo)

71. Swords Laboratories (Co. Dublin)

72. Taconic International Ltd (Co. Westmeath)

73. Takeda Ireland Ltd (Co. Wicklow)

74. Taro Pharmaceutical (Co Tipperary)

75. Tosharo Products Ltd (Co. Dublin)

76. Tyco Healthcare (Co. Dublin)

77. Virgin Drinks (Co Monaghan)

78. Wexport Ltd (Co. Cork)

79. Wyeth Biopharma (Co. Dublin)

80. Wyeth Medica (Co. Kildare)

81. Yamanouchi Ireland Company Ltd (Co. Dublin)

The IPC/IPPC licensed food and drink companies as downloaded off the EPA website
are as follows

1. Monery By-Products (2000) Limited (Crossdoney, Co. Cavan)

2. College Proteins Limited (Nobber Co. Meath)

3. National By Products (Cashel Co. Tipperary)

4. Munster Proteins Limited (Cahir Co. Tipperary)

5. Munster Proteins Ltd t/a Waterford Proteins (Co. Waterford)

6. Dublin Products Ltd (Co Wicklow)

7. Marrow Meats Ltd (Co. Limerick)

8. C&N Oils Ltd (Co. Meath)

9. Premier Proteins (2000) Ltd (Co. Galway)

10. Castlemahon Food Products (Co. Limerick)

11. Slaney Proteins (Co. Wexford)

12. Dawn Country Meats t/a Western Proteins (Co. Mayo)

13. Carton Group Ltd (Co. Cavan)

14. Henry Denny & Sons Ltd (Co. Kerry)

15. Fair Oak Foods (Clonmel) Ltd (Co Tipperary)

16. Kepak Hackettstown (Co. Carlow)

17. Kepak Clonee (Co. Meath)

18. Kepak Athleague (Co. Roscommon)

19. Liffey Meats (Cavan) Ltd (Co. Cavan)

20. Kildare Chilling Company (Co. Kildare)

21. McCarren & Company Ltd (Co. Cavan)

22. Cabglove Ltd (Co. Meath)

23. Charleville Foods (Co. Cork)

24. Galtee Food Products Ltd (Co. Cork)

25. Queally Pig Slaughtering Ltd (Co. Kilkenny)

26. Dawn Meats (Middleton) Ltd (Co. Cork)

27. Irish Country Meats (Sheepmeat) Ltd (Co. Wexford)

28. Dawn Country Meats (Co. Roscommon)

29. Dawn Meats (Exports) Ltd (Co. Kilkenny)

30. Glanbia Fresh Pork Ltd (Co. Offaly)

31. Glanbia Fresh Pork Ltd (Co. Tipperary)

32. Glanbia Fresh Pork Ltd (Co Roscommon)

33. Meadow Meats Ltd (Co Laois)

34. AIBP Ltd t/a AIBP Nenagh (Co. Tipperary)

35. AIBP Ltd t/a AIBP Bandon (Co. Cork)

36. AIBP Ltd t/a AIBP Cahir (Co. Tipperary)

37. AIBP t/a AIBP Dundalk (Co. Louth)

38. Donegal Meat Processors (Co. Donegal)

39. AIBP t/a AIBP Dublin (Co. Dublin)

40. AIBP Ltd t/a AIBP Rathkeale (Co. Limerick)

41. M.J. Bergin & Sons Limited (Co. Kildare)

42. Slaney Foods Limited, Slaney Foods International Limited and Slaney Proteins (Co. Wexford)

43. Ashbourne Meats (Co. Tipperary)

44. AIBP t/a AIBP Waterford (Co. Waterford)

45. Irish Sugar plc (Co. Carlow)

46. Irish Sugar plc (Co. Cork)

47. Diageo Ireland (Co. Dublin)

48. Glanbia Group (Ballyragget) Limited (Co. Kilkenny)

49. Kerry Ingredients (Ireland) Limited (Co. Cork)

50. Kerry Ingredients (Ireland) Limited (Co. Kerry)

51. Carbery Milk Products Ltd (Co. Cork)

52. AHP Manufacturing B.V t/a Wyeth Nutritionals Ireland (Co. Limerick)

53. Dairygold Co operative Society Ltd (Mallow) (Co. Cork)

54. Dairygold Co operative Society Ltd (Mitchelstown) (Co. Cork)

55. Glanbia Ingredients (Virginia) Ltd (Co. Cavan)

56. Bailieboro Foods Limited and Bailie Foods Ireland Limited (Co. Cavan)

57. United Fish Industries Limited (Co. Donegal)

58. Beamish & Crawford plc (Co. Cork)

59. Harp Ireland Limited t/a The Great Northern Brewery (Co. Louth)

60. Macardle Moore & Co. Ltd, t/a Dundalk Packaging (Co. Louth)

61. Irish Distillers Limited (Co. Cork)

62. Bulmers Ltd Annerville (Co. Tipperary)

63. Bulmers Ltd Dowds Lane (Co. Tipperary)

64. Heineken Ireland Ltd (Co. Cork)

65. E Smithwick & Sons Ltd (Co. Kilkenny)

66. Cherrys Breweries Ltd t/a The Waterford Brewery (Co. Waterford)

67. Kepak Cork (Co. Cork)

68. Monaghan Poultry Products (Co. Monaghan)

69. AIBP t/a AIBP Clones (Co. Monaghan)

70. Abbott Ireland (Co. Cavan)

APPENDIX 3

Table 1: *Showing company response to the estimated cost of installing an EMS*

Company number	Response given to the estimated cost of installing an EMS
1	€20k
2	Consultants fees for 6 months, pre-certification audit fees.
3	EMS in place nearly 12 years. Hard to estimate cost now.
4	€30k
5	€4,000
6	€5,000 approximately
7	Internal system. Resourced from full time involvement of a staff member.
8	€30,000 plus time.
9	We have not quantified costs. We are also IPC licensed and therefore we must have an adequate EMS in place & operational.
10	€100k
11	€50k
12	€40,000
13	25,000
14	€60-70k
15	€15,000
16	€30k for ISO 14001
17	Ongoing
18	ISO registration €7,500
19	100,000 pounds
20	Difficult to say
21	No-We installed the EMS in 1996 under BS7750 & in 1997, we were certified to ISO 14001
22	€30,000
23	€20,000
24	For the procedures manual (paperwork) + records no problem. The cost of plant itself 000's
25	We received our IPC licence in 1998. initial costs were expensive approx €20,000

Table 2: *Company response to the estimated annual cost of maintaining an EMS*

Company number	Response given to the estimated annual cost of maintaining an EMS
1	10K
2	3,500
3	100,000
4	Difficult to say
5	Less than 50000
6	20,000
7	20,000
8	5-10,000
9	Full time environmental officer required, cost of chemicals for plant etc
10	20,000
11	200k
12	Mostly related to IPC licence requirements
13	5-10k-this does not include any costs of EMP projects, licensing requirements etc which are built in to the EMS system
14	10k
15	2,500
16	300-400k
17	15k
18	Not possible to extract cost
19	No
20	€4000
21	Half annual salary (average for EHS manager)
22	Unknown
23	€15000 plus time
24	Didn't quantify costs
25	€17000
26	20k
27	20k
28	50,000
29	100-150,000
30	10,000
31	50-60k
32	10,000
33	No but the only large cost is for the disposal of hazardous waste-very expensive to dispose of such waste

Table 3: *Showing estimate of annual cost savings in waste collection/disposal costs since installation of EMS*

Company number	Estimate of annual cost savings experienced by respondents regarding waste collection/disposal costs since installation of EMS.
1	We record achievements/targets in terms of tonnages/yields not always euros
2	Didn't answer
3	Cant provide estimate
4	€15,000
5	€200,000
6	Didn't answer
7	€1,000 a year
8	20-30%
9	€10,000
10	Didn't answer
11	N/A relatively new site
12	25k
13	€10,000
14	€20,000 a year
15	€5,000
16	Slight reduction only
17	€20,000
18	Didn't answer
19	10k
20	€5,000-20,000
21	Didn't say
22	€5000
23	Yes for landfill only. Overall cost has increased