

A Study of Green Supply Chain Management: Analysis of Gscm Practices in Three Different Companies

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Abstract: The purpose of this paper is to identify and analyze current practices of Green Supply Chain Management in three different companies. In order to better analyze the identified approaches, a state-of-the-art literature review was made. After clarifying business background of each company, their internal and external GSCM were described. The case studies show that nowadays multinational and foreign-funded companies are adopting more “green practices.” Finally, the finding and interpretations are summarized, and the common practices and opportunities are highlighted.

Keywords: Green Supply Chain Management, Sustainability, Green design, Green purchasing, Green operations, Reverse Logistics, Green Practices;

1. Introduction

The most urgent global challenge faced by the enterprises is to manage the growing demand for energy, water and other non-renewable resources against the exponential growth of world population, and also the rise of consumption of products and services due to the improvement of the economics conditions, especially in the third-world countries. This imminent lack of natural resources has a direct impact on the regulations and discussions on sustainability and environmental issues. In response to this pressure, companies increasingly prioritize projects whose actions minimize environmental impacts and modify their supply chains to

incorporate environmentally friendly practices in their production processes. The main reason for implementing green practices is that organization can generate more business opportunities than their competitors if they can address environmental issues successfully [1].

This development of supply chain management models as function of certain particularity, in this case, sustainable development, effectively meets the latest environmental regulations and increases the competitiveness of companies that adopt them, by improving the image among the stakeholders and end customers and also by reducing costs in key processes of the supply chain. Recently, companies that make use of technology and adopt

environmentally friendly features in their product design and delivery of services related to its products has experienced a remarkable growth in their levels of competitiveness [2].

The Green Supply Chain Management (GSCM) redesigns the supply chain, incorporating practices such as materials recycling, remanufacturing, reuse of leftovers and projects oriented to the environment, minimizing the total impact of industrial activity throughout the life cycle of the product [3]. In this paper, GSCM is treated as a combination of components such as Green Design, Green Operation, Green Purchasing and Reverse Logistics, which means that the sustainability and the optimized use of resources are taken into consideration in each one of these processes. This paper has the objective of analyzing the GSCM practices in three different companies. The first is one of the largest multinational retailer company in the world, the second is a great player in the automotive industry and the third, and last company analyzed, is a company in the paper industry. Initially, their business backgrounds are exposed to better understand their roles and the current situation of each one inside their chain, and then, their internal and external practices of GSCM are described, highlighting the best practices and the reasons why they decided to become "green".

This research is justified by the fact that it is notable that companies that adopt these practices can perform key activities at much lower cost, which reduces the final price of their products and increase competitiveness, and a better understanding on how they achieve these benefits is necessary, since it is a new and important topic in the current economic and social world scene.

2. Literature Review

2.1. Supply Chain Management

A supply chain is the network of all entities involved in producing and delivering a finished product to the final consumer [4]. It is a network of facilities and distribution options that performs the functions of procurement of materials, transformations of these materials into intermediate and finished products, and distribution of these finished products to customers [5].

The uncertainty about the future of the markets has led the companies to develop and strength their supply chains to provide them with what they need in terms of goods and services to be successful and survive in a world where the competition is fierce and where it is necessary to be ready to quickly answer to their customers demands, because every

company takes places in one or more supply chains and has a role to play in each of them.

Supply Chain management is the coordination and management of a complex network of activities involved in delivering a finished product to the end-user or customer. It is a vital business function and the process includes sourcing raw materials and parts, manufacturing and assembling products, storage, order entry and tracking, distribution through the various channels and finally delivery to the customer. A company's supply chain structure consists of external suppliers, internal functions of the company, and external distributors, as well as customers (commercial or end-user). Firms may be member of multiple supply chains simultaneously. The management and coordination functions are further complicated by global players spread across geographic boundaries and multiple time zones. The successful management of a supply chain is also influenced by customer expectations of getting new and innovative products and services, globalization movements, in terms of new agreements between the countries or the economic blocks, new information technology developments, which reduces costs and improves productivity, the approval of new government regulations concerning, for example, labour agreements or transport freights, the entrance or exit of new competitors, and the obligations related to a better use of the natural resources, which means take care of the environment.

Recently, the focus of supply chain managers has turned towards the development of green supply chains, which, according to [6], refers to buyer companies requiring a certain level of environmental responsibility in core practices of their suppliers and vendors. The main point is to bring all the actors who participate in the process to contribute and to improve the sustainability standards of the whole chain.

2.2. Green Supply Chain Management

Increasing social pressure, legislative measures around packaging and end-of-life commodities, potential supply chain risks, and green consumerism have led the field of supply chain management to direct attention towards the impact of supply chain activities on the natural environment and the generation of environmental performance change [7].

Green supply chain Green Supply Chain Management (GSCM) has become an important strategy for companies to achieve profit and market advantages by reducing the environmental risks and improving efficiency, and thus the amount of

natural resources extracted from the Earth that are used in the industrial processes.

The definition and scope of Green Supply Chain Management has ranged from green purchasing to integrated green supply chain flowing from supplier to manufacturers to customer [8]. It is the process of incorporating environmental concerns into business activities [9]. It is the addition of green issues into supply chain management [10]. It can be defined as the alignment and integration of environmental management within supply chain management [11]. In a more integrated perspective [12]), it is said that green supply chain management is integrating environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life. GSCM refers to the alignment of sourcing, manufacturing, distribution, transportation, and remanufacturing/recycling processes with the goal of reducing a company's carbon footprint [13]. It integrates environmental concerns into the inter-organizational practices of supply chain management including reverse logistics [14].

The objectives of Green Supply Chain Management are aimed at a win-win strategy [15]. In this case, suppliers have to follow a well-defined strategy by the leading company and recognize those efforts as a general benefit, but the whole responsibility for the global process goes far beyond involving governments, regulatory agencies, non-profit organizations, in order to achieve a high standard cooperation level to reduce the impacts caused by those agents over the environment.

Adding the "green" component to supply chain management involves addressing the influence and relationships between supply chain management and the natural environment. Motivated by an environmentally-conscious mindset, it can also stem from a competitiveness motive within organizations.

In this paper, Green Supply Chain Management is defined as being the sum of Green Design, plus the effects proposed by the green operations, plus the results from the green purchasing, plus the reverse logistics actions.

Green Supply Chain Management (GSCM) = Green Design + Green Operations + Green Purchasing + Reverse Logistics

2.3. Green Design

The origin of green design studies is related to the search of new production methods to collaborate

with the environment in terms of raw materials usage reduction and carbon emissions, and thus diminishing the pressure of extracting new products from nature. It is sure that if enough attention is given to this phase of creating a new product process, the subsequent production and manufacturing activities will contribute to develop new eco-friendly products.

Traditionally, industrial designers have concerned themselves with improving products by reducing costs, enhancing ease-of-use, by making products beautiful and distinctive in the marketplace [16]. It reduces the adverse environment impact of product by designing a product that requires less energy and emits less emission in manufacturing process and while in use [17].

As the society intends to put the sustainability practices in the top of its priorities, it is inevitable doing so, without thinking about change the production processes, and to develop a new product or redesign an old one, the first step is to conduct the design project for it. It is a challenge to change engineer's mental models, built over years, with no concerns of the impacts of using natural resources without caring about the problems it could cause. Furthermore, the designers face the conflict objectives of combining environment demands, that seek to minimize negative impacts over environment, with cost reductions from the industry, in order to satisfy customers' requirements.

Green design has been used to denote designing products with certain environmental considerations. It is the systematic consideration of design issues associated with environmental safety and health over the full product life cycle during new production and process development [18]. It also can be defined as the product design philosophy that usually treats environmental attributes as a design objective and not as constraints. Green design and practices are synergists with the green supply chain management objectives for reducing, surplus capacity, production lead times and transportation times by ensuring holistic integrations of inventory levels [19]. It searches to minimize the harmful effects on human health as well as on the environment. To achieve these goals, according to [20], companies have to concentrate efforts in:

- Reducing or minimizing the use of non-renewable resources;
- Managing renewable resources to ensure sustainability; and
- Reducing, with the ultimate goal of eliminating, toxic and otherwise harmful emissions to the

environment, including emissions contributing to global warming.

For doing so, companies have to go further. It means to centralize their efforts in some actions: a) reduce consumption of natural resources used for keeping processes on. This minimizes damages with the extraction of raw materials from the earth; b) it is also desirable that managers seek for the reduction of energy consumption, by eliminating unnecessary losses, optimize energy consumption, and by finding out new, non pollution and economically viable substitutes energies sources.

The application of these measures might not be enough to achieve a reasonable standard of sustainability. In this situation, managers should act to redesign the entire product to make it greener, by reviewing the types of materials selected to be used in the manufacturing process. The use of other recourses such as recycled and recovered materials should be an interesting choice to replace the initial proposal. An especial attention should be placed over the assemblies and sub-assemblies used in the product project, since it influences the tasks of disassembling and segregates the modules and components used at the product end of life, and facilitates the project of the reverse flows to give them a right destination.

Those goals have to be detailed and applied in terms of specific objectives, that have to be clearly defined and pursued by all the organizations levels, taking into account that the main green design purpose is to pursue the most cost-effective fashion, to be perceived as a company's competitive advantage.

2.4. Green Operations

Due to the growing interests among researchers and industry managers, motivated by the perceptions and understanding that green operations may become a powerful resource for achieving competitive advantage, the green operations offer an opportunity to controlling and preventing damages caused by pollution originated from different stages of producing, distributing and disposing goods as they are moved in the supply chain.

Green operations relate to all aspects to product manufacture / remanufacture, usage, handling, logistics and waste management once the design stage has been finalized. It involves all the operational aspects related to reverse logistics and network design (collection, inspection/sorting; pre-processing; network design), green manufacturing and remanufacturing (reduce; recycle; production planning and scheduling; inventory management;

remanufacturing: re-use, product and material recovery) and waste management (source reduction; pollution prevention; disposal [12]. Green operations extend environmental protection into a management system through the introduction of green notions to the supply chain [21]. It also emphasizes the reduction of pollution by stimulating the development of closed-loop supply chains and the recycling of used materials as a matter of improving financial performance by reducing its costs and expenses.

The scope of the green operations spans from product development to management of the entire product life cycle involving such environmental practices as eco-design, clean production, recycling, and reuse with a focus on minimizing the expenses associated with manufacturing, distribution, use and disposal of products [22]. Its main purpose is to enhance the ability of an enterprise to address stakeholder environmental concerns throughout the entire product life cycle to ensure that the sustainability fundamental principles are followed by all the participants in the supply chain.

Green Operations is a very important area within GSCM. It encompasses techniques for minimum energy and resource consumption for a flow system in order to reduce the use of materials. It helps a company on achieving maximum energy efficiency, selecting energy sources, addressing security of supply, and preparing for potential regulatory changes, such as introduction of a carbon tax, and the adoption of green operations initiatives can lead to better organizational performance and enhanced environmental performance [23].

Green operational management refers to a close cooperation between upstream and downstream manufacturers in the supply chain management (SCM) by adopting "green" as prerequisite to reduce environment damage [24]. It emphasizes the idea that every company has to participate, which means that it has to give a contribution to minimize the problems caused by the effects of extracting and using more resources than the earth is capable of reposing.

2.5. Green Purchasing

Traditional purchase theories emphasize on (1) the quality of products, (2) delivery, and (3) price, but neglect the greenness of products, suppliers, and logistics systems in supporting corporate performances [25], but nowadays, companies have to adapt themselves to attend the new standards and strict legal regulations, otherwise they are not able to develop new products and markets, especially in countries that have passed strong laws to protect

their environment and it is clear that a new behavior is demanded to cope with these legislations.

Green purchasing process, or Environmentally Preferable Purchasing (EPP) plays an increasingly significant role in today's supply chain management [26]. It is a practice aimed at ensuring that purchased products or materials meet environmental objectives of the organization such as waste reduction, hazardous materials elimination, recycling, remanufacturing and material reuse [27]. Green purchasing refers to the following supply chain management aspects [28]:

- Preferring the purchase of materials and items that are recyclable;
- Consideration of the environment and liability issues associated with the use and discharge of hazardous materials lying anywhere in the supplier's supply chain; and
- Developing the suppliers by the use of environmentally safe materials, processes and practices, and also enabling them to be socially and environmentally responsive.

Green purchasing is an environmentally conscious purchasing practice that reduces sources of waste and promotes the recycling and reclamation of purchased materials [29]. It involves identifying, selecting and purchasing products with significantly less adverse environmental impacts than competing products. Further, it involves considering the costs and environmental characteristics and performance of a product in all stages of its life-cycle. It should target and give greatest preference to those suppliers that are environmental leaders from a cumulative and full life-cycle perspective. It does not simply lead to environmental benefits, but also helps purchasers reduce full life-cycle costs and thus save money [30]. It considers that green purchasing behavior is the consumption of products that are benevolent and beneficial to the environmental, recyclable, and conservable, or sensitive and responsive to ecological concerns. Besides the traditional buyer-supplier relationship, buyers and suppliers can cooperate in developing new materials and products to meet buyer needs, including environmental and green products [31].

Environment Protection Agency, a former United States Agency that deals with environmental issues has established a Executive Order (EO) 13101, entitled Greening the Government through Waste Prevention in which it stated five guiding principles to provide broad guidance for applying environmentally preferable purchasing in the Federal government setting. The application of these principles is subject to some factors, such as: the type and complexity of the product or service

being purchased; whether or not the product or service is commercially-available; the type of procurement method used; the time frame for the requirement; and the dollar amount of the requirement [32].

The guidance principles are:

Guiding Principle 1: Environment + Price + Performance = Environmentally Preferable Purchasing.

Environmental considerations should become part of normal purchasing practice, consistent with such traditional factors as product safety, price, performance, and availability.

Guiding Principle 2: Pollution Prevention

Consideration of environmental preferability should begin early in the acquisition process and be rooted in the ethic of pollution prevention, which strives to eliminate or reduce, up-front, potential risks to human health and the environment.

Guiding Principle 3: Life Cycle Perspective/Multiple Attributes

A product or service's environmental preferability is a function of multiple attributes from a life cycle perspective.

Guiding Principle 4: Comparison of Environmental Impacts

Determining environmental preferability might involve comparing environmental impacts. In comparing environmental impacts, Federal agencies should consider: the reversibility and geographic scale of the environmental impacts, the degree of difference among competing products or services, and the overriding importance of protecting human health.

Guiding Principle 5: Environmental Performance Information

Comprehensive, accurate, and meaningful information about the environmental performance of products or services is necessary in order to determine environmental preferability.

It is significant that due to high specialization quality standards searched and the global competition faced by the companies in the global markets, the purchasing process involves a large number of international suppliers that demands a coordinated action to control and manage the flow from products and services bought.

It is significant that due to high specialization quality standards required, and the global competition faced by the companies in the international markets, the purchasing process has evolved to a complex procedure involving a large number of suppliers who demands a well-interconnected action to control and manage the flow of products, and services bought worldwide.

To cope with this change, managers have outsourced some activities to concentrate themselves in the strategic function of selecting and managing suppliers for achieving the best successful results within the chain.

2.6. Reverse Logistics

In a world where population has been growing quickly and steadily and consumers' economics conditions have also been improving over the last years, it is sure that manufactures, society and governmental authorities have to find out proper alternatives destinations for products and materials after they have been used and reach end-of-life, otherwise they are going to be dumped or incinerated causing considerable problems to nature and human beings.

In the past, manufactures did not feel responsible for giving a right destination to waste generated by their production lines and their final products once they reach the end-of-use, but as the governments pressed by society demands, started to passing laws and formal orientations to organize and guide the final destination process to all kinds of waste, managers were forced to review the actions towards a constructing a better scenario to mitigate the damages that were caused.

Since then, reverse logistics practices have received increased attention and has been seen as a strategic issue to face the challenges of reducing pressures over earth's environment, and also an instrument to give a safe and economic destination to every product that been used and needs to be given a proper final destination.

The need to finding proper destination to products that have reached end of life status, or need to be returned to manufacturers for any reason varying from a damaged packing to a function that does not proper function has led enterprises to develop their reverse logistics networks. Reverse logistics is the process of planning, implementing, and controlling the efficient and cost effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal [33]. It is the sector of logistics dealing with product flows (unsold items or returns) from their final destination to the initial producer, or to a facility dedicated to their treatment [34]. It is the process of planning, implementing and controlling the efficient, low-cost flow of obsolete materials from the point of consumption to the point of origin, with the goal of recovering value or providing an appropriate destination [35]. Generally reverse logistics involves activities of

collection, transportation, reprocessing, value addition and final disposal of products. These products are moved backwards from the end user and processes include information flows associated with tracking and transaction processes [36].

Reverse logistics closes the loop of a typical forward supply chain and includes reuse, remanufacturing, and/or recycling of materials into new materials or other products with value in the marketplace. The objective is to eliminate or minimize waste (energy, emissions, chemical/hazardous, solid wastes). It is referred as all the activities associated with a product/service after a point of sale, the ultimate goal to optimize or make more efficient aftermarket activity, thus saving money and environmental resources. Reverse logistics networks have some generic characteristics related to the coordination requirement of two markets, supply uncertainty, returns disposition decisions, postponement and speculation [37].

Reverse logistics deals with five basic questions:

- What alternatives are available to recover products, product parts, and materials?
- Who should perform the various recovery activities?
- How should the various activities be performed?
- Is it possible to integrate the activities that are typical for reverse logistics with the classical production and distribution systems?
- What are the costs and benefits of reverse logistics, both from an economical as well as environmental point of view?

3. Case Study

3.1. Company A

3.1.1 Business Background

This case study is based on American multinational retail corporation founded in 1962. It runs discount department stores and warehouse stores. The company is the largest retail store in the world and the biggest private employer. It has 8500 stores in 15 countries.

Company A has undergone many growth stages since its founder decided to be the best retailer in the world. His initial strategy was to target low-income families in rural areas by offering significantly lower cost. In the other hands, his successor used different strategies to succeed: he truly realized that the use of technology in distribution and supply chain logistics could allow the company to cut costs and lower prices for end users, it also transformed the company from just a

retailer into a retail distributor. The early identification of technology boosting supply chain operation was the cutting edge to create a competitive advantage. Emphasizing visibility through the sharing of information with suppliers, its managers reframed the company strategy in terms of how to be low-cost operator and low-cost leader by focusing on logistics and distribution.

3.1.2. Green Supply Chain Management

The newly strategy of making strategy processes more economically friendly was adopted by a CEO who took control of Company A in 2000. At this time, the company has already been considering a global company which must consider this environmental friend transformation on its bottom line. It was realized that being a good steward of the environment and being profitable are not mutually exclusive. The first step to move toward sustainability was integrate Corporate Social Responsibility (CSR) into company's business model. This CRS policy would function as built-in self-regulating mechanism where company could monitor and ensure its adherence to laws, ethical standards and international norms. It was the first policy adopted by the company to embrace responsibility for the impact of its activities on the environment, consumers, employees, communities, stakeholders and all other members of the public sphere. This defensively rather than cooperatively, proactively approach was followed until the beginning of 20th century. In another initiative, Company A launched a campaign to convince its suppliers to provide environmentally safe products in recyclable or biodegradable packaging. It was a response to letters from customers about environmental concerns. However, the same customers were skeptics in the review of it. They believed the campaign was designed to generated benefits for the company at the expense of its suppliers. Then the company began promoting the environmental friendly products with green-colored tags what named the program as "Green Tag Program". After noticed that the program was promoting but not measuring or monitoring improvements, the managers decided to discontinue it by the early 1990s, then the environmental issues slipped off of the company's list of strategic priorities. Only in 2005 a new sustainable strategy was created, this one was deeply embedded in Company's operations and supply chain management, setting ambitious goals. The current CEO declared: "We recognized early that we had to look at the entire value chain. If we had focused on just our own operations, we would have limited

ourselves to 10 percent of our effect on the environment and eliminated 90 percent of the opportunity that's out there" [38]. That means that Company in this new program implemented sustainability through distribution systems, created metrics for analysis and monitored corporate and global suppliers through the collection and analysis of substantial data. The new program was also presented for all employees by the President's company and goals were stated. The main ones were:

- 1) Be supplied 100 percent by renewable energy in the near future;
- 2) Create zero waste;
- 3) Sell products that sustain Company's resources and the environment.

In the beginning, these goals seemed inconceivable, but Company A just took a while to begin to make good on its promises. It is doubtless that this sustainability strategy looks to be off to a promising start, though the company was complacent and pressed-on carefully in order to make these networks sustainable and able to expand without interruption.

The point in this strategy was: while the company was building value added networks of government agencies, non profits, employees and suppliers to "green" its supply chain, it was also using network approach to lower overall carbon and environmental footprint in order to increase profitability. The senior director declared: "It's not philanthropy. From this improved environmental and social outcomes derive economic benefits".

To convince the suppliers and distributors to adhere to the program, in return for participating in these value-added networks, participants would receive information about Company's operation, and provide guidance and support from the company nonprofit partners. It was a shift from generating additional value through price-based interactions, relationships with nonprofits, suppliers, and other stakeholders. The company gained a system perspective which helped retailers to find ways to address environmental issues.

3.2. Company B

3.2.1 Business Background

The second company is a joint venture automotive industry producer of auto constant velocity shafts (CVS), industrial shaft, universal joint drive shaft and other automotive components. It was founded in 1988 and is located in Shanghai, China. The company buy raw and supplemental materials, including different types of steel, mainly

from the domestic suppliers. Oil and grease are imported from Germany. The other purchased product parts are different types of besides-star wheel, dust caps, different types of clamps, mostly bought at Shangai industries. The main customers are major car makers as Volkswagen, Honda, Nissan, Chery and BMW. These customers have already applied GSCM techniques in their design, manufacturing, parts supply, sales services process, manufacturing and material management processes. This fact has a great influence in the development of Company B green supply chain management program.

3.2.2. Green Supply Chain Management

Company B has carried out some internally proactive environmental management activities. In 2001, the company obtained ISO14001 certification and set up a division in responsible of environmental management in the next year. The company also joined a “35% Energy Plan” launched by its holding company. This plan had the main goal of saving by 35% of the energy output in a five-year timeframe. The energy saving activities included managerial measures, structure modification and technological upgrading detailed in 48 proposals, which 43 have been completed for achieving the goals set. The program also helped the company to earn more subsidies from the governments since energy saving and pollution reduction are current focus of environmental policy in China.

The managerial measure approach focused on the establishment of energy saving institution and plans, training and education. It was done establishing an energy management team with qualification certificate for energy management and regular training for the members. The energy savings and emission reduction were checked every month and presented in general meetings.

In the structural modification field, adjustments were made in equipments, products and energy structure. Hot forging equipments were replaced by precision forging equipments, during a market recession the production was rationalized and energy structure was modified with the adoption of phased-out of coal-boiler to replace phase-in of oil-fired boiler. They also used technology upgrades through special projects. For example, the fans were operating using water temperature, the air-cooling control was improved, the residual heat of air compressor was reused.

The program achieves a decline rate of energy use by 28,9% in its fourth year, which allow us to suppose that in the end of the fifth year the initial target of 35% will be achieved.

The second GSCM practice implemented by Company B was a request from one of its potential customers, General Motors. The customer was designing its own Green Supply Chain project which involved the adherence of suppliers. The main company gives the support information, technology and management to its suppliers which applies the activities for itself. It results in direct cost savings and indirect stable supply chain relationship for Company B. It included action as water balance of plants by searching water saving potentials, energy audit and use saponification instead of spraying. Every action had its implementation details, economical and environmental performance addressed to General Motors GSCM team.

Future GSCM activities are also being planned by Company B. For instance, although the company is not on the list of compulsory cleaner production audit, it still has potential to save energy and reduce emissions by using this approach. It is also possible to reuse the containers of product transportation, they have high angular rigidity and are hard to deform, but a reclaiming system has to be implemented. The byproducts like scraps can be recycled and generated raw material for transmission shaft which is made from steel. Company B, as the final user of various lubricants and parts, intends to require green products from the suppliers, set standards and evaluate environmental behaviors, and even provide technical assistance to them.

3.3. Company C

3.3.1 Business Background

This case study is based on a Chinese paper industry founded in 2002. The main raw materials of this company are waste paper and unbleached softwood, with 70% coming from Europe, the U.S and Japan; and 30% from the Eastern China. This industry also buys supplemental material as chemical additives for papermaking, industrial oxidative starch, polyester wire mesh, blankets and dry nets. The major supplier of wasted paper is an American company, which is also the holding of Company C.

3.3.2. Green Supply Chain Management

Company C has high energy and pollution intensities which make it sensitive to change of environmental policies. The environmental regulations for paper industry in China are becoming much stricter in recent years. In 2006, the company was once pended on a blacklist due to the delay in implementing energy saving plan. As the

top manager highly concerns about the reputation of the company, various environmental efforts have been made since then. From 2003 to 2006, the company passed ISO14001 certification and China Environmental Labeling certification. A Department of Environmental Protection and Resource was established and environmental training at the company, workshops and team levels were addressed. The GSCM practices of the company focus on internally proactive environmental management, including pollution control, energy audit and technological upgrading. In 2007, Company C invested 60 million CNY to reconstruct the wastewater treatment plant by introducing the efficient internal circulation reactor (ICR). It also built up a water reclamation system which can recycle 36.000 tons of water per day and increase the water reuse ratio up to 47%.

In 2009, the company carried out a project collecting and reusing the residual heat from papermaking lines. It developed a heat recovery system to reuse the energy resulting from excessive high temperature of steam discharged from paper drying. By this system, the production line can save 22.172 tce of energy per year. The wastes, which can not be recycled, are burnt by circulating fluidized bed technology for collecting the heat. The residual of the burned wastes are used to make chopping block of forklift.

Besides reinforcing technological upgrading and pollution control of wastewater, exhaust gas and solid wastes, the company also started GSCM external practices such as environmentally preferable procurement and evaluation and selection of suppliers. Researches for developing environment-friendly products, with light cardboard as an example, are being conducted.

4. Conclusions

The three companies are large multinational companies present in or exporting to a large variety of international locations, working as a crucial component inside the supply chain they belong. As it is possible to notice, all three companies started incorporating green practices to their supply chain management. Initially because of the pressure imposed by environmentally concerned customers and governmental regulations, what made the companies concerned about their image and reputation in the global market. That was until they realize the benefits that the implementation of a GSCM would bring, including increases in their productivity and competitiveness, and also major economies on their processes.

Company A, for example, set goals like: use 100% of renewable energy in its processes, work with zero waste and promote sustainable features on its products, decisions that are based on the concepts of green operations and green design, what resulted not only in cost reduction and increase of profitability, but also the creation of a large value added network.

Companies B and C focused on the best utilization of their resources, elimination of waste, reduction of the pollution generated by their processes and an initiative to develop a conscious use of energy. These companies improved their reputation for the eyes of their customers and suppliers by acquiring environmental certification and being part of green supply chain. They are also promoting researches to develop more environmental friendly products and processes.

It is important that companies incorporate the concept of extended responsibility to their supply chain by requiring producers and distributors certain levels of sustainability in their production processes, logistics networks, product design, etc., so that together, they can achieve preestablished environmental goals.

Finally, given the importance that has been given lately to environmental issues related to the planet's future, companies should become familiar with environmental management practices, and as performed in this work, seek to know the best practices already existing, in order to align not only their socialenvironmental responsibility to their reputation in the market, but also to increase competitiveness, always remembering that environment and being profitable are not mutually exclusive.

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