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Carpenter-Speller, Nichole. *Implementation of a Recycling Program, at Corning Incorporated Diesel Plant*

Abstract

The absence of a recycling program within the Diesel Plant has caused a great quantity of recyclable materials to end up in the garbage. This contributes to not only the facilities waste collection costs but also to the facilities negative impact on the environment. The lack of a recycling program also challenges the facilities ISO 14001 commitment to going above and beyond EPA regulations. The purpose of the study was to develop a plan and a process for the Diesel Plant facility to use as a foundation for a sustainable recycling program. This was accomplished by: 1) administering a readiness survey, 2) conducting a waste assessment and 3) performing a cost-benefit analysis. The research indicates the facilities level of readiness on implementing a new program, the opportunities for improving waste collection and the potential for savings upon implementation of a recycling program. The conclusions of the research determined that the facility was ready to implement a recycling program but organization and guidance would be greatly needed in order for the program to be successful.

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Chapter I: Introduction

Adopted from the National Recycling Coalition, the Environmental Protection Agency also known as EPA defines recycling as “the series of activities by which materials that are no longer useful to the generator, are collected, sorted, processed, and converted into raw materials and used in the production of new products” (Environmental Protection Agency, 1997, p. 15). When considering recycling in any manner whether it is in the household or in the business arena, a waste management system should be considered. The goal of a waste management system is to “provide framework for compliance with waste policy and target achievement, outline characteristics and sufficient capacity for managing waste, control technological measures and outline economy and investment requirements” (Preparing a waste management plan, 2005, p. 6).

The waste management hierarchy, designed by the EPA, also known as the three R’s (reduce, reuse, recycle) demonstrates “the most environmentally preferable options for waste management” (Environmental Protection Agency, 2011, p. 4). The hierarchy consists of three tiers; reducing, reusing and recycling. Reducing focuses on the use of fewer materials. This is the most effective tier of the waste management hierarchy (Environmental Protection Agency, 2011; Eisenberg, 2008). The second best tier within the hierarchy reusing, extends the amount of time new materials go unused and it also prevents old materials from entering the waste stream prematurely (Eisenberg, 2008). The last tier recycling represents the most popular tier, mostly because it is the easiest to accomplish. Recycling is the process where materials are used, remanufactured and used again.

Although recycling is not the most effective tier within the waste management hierarchy it is the most successful and has many benefits. According to the National Recycling Coalition

(n.d.) recycling programs cost less to operate than waste collection services, landfilling and incineration (Environmental Protection Agency, 2008; Natural Resource Defense Council, 2011). Also, recycling helps save families money and helps sustain the overall environment for future generations. These are just a few examples of the benefits associated with recycling programs in the local community. Along with these benefits there are also a number of benefits for recycling in the business industry. According to Greenernow (n.d.) recycling has a multitude of benefits for the business industry including but not limited to; enhancement of company image, an increase in customer loyalty, an increase in employee morale, cost effective and improvement in the overall condition of the environment.

According to the EPA (2008), “our average recycling rate is only 33.2%”. This means that in 2008 Americans generated approximately 250 million tons and recycled only 83 million tons. If the average American generated 4.5 pounds of waste a day then this would mean they only recycled 1.5 pounds of that generated waste. Nearly 12.6% of unused waste is burned in incineration facilities and the remaining 54.2% is deposited in landfills throughout the country” (Arms, 2008, p. 1). Roughly 85% of our total waste can be recycled if we can educate people on the importance of recycling (Arms, 2008). These numbers provide a clear outlook on the possibility for growth in the future. While waste management is important to the business industry it is equally important to consider the development of an Environmental Management System, also referred to as an EMS. An EMS allows business environmental problems to be managed in a systematic way (Department of Environmental Conservation, n.d.). The most popular EMS is the International Organization for Standardization 14001, also referred to as ISO 14001. ISO 14001 provides a structure for businesses to manage, assess and continually improve

the effectiveness and the efficiency of the management of their environmental activities (DEC, n.d.), including recycling.

ISO 14001 is a commitment to go above and beyond the typical environmental standards by conforming with all environmental laws, engaging in continuous improvement throughout all systems, preventing pollution, improving environmental performance, communicating principles to employees, and making the policy public (Swallow, 2001). It contains five major elements that each company wishing certification must adhere to. These elements include:

1. An environmental policy which must be established by management,
2. Planning that establishes the framework of the system,
3. Implementation and operation which assigns employees the responsibility of training, communication, documentation and emergency planning,
4. Checking and corrective actions which ensure the organization is monitoring each operation, and correcting when non conformances arise and
5. A management review process used to assess the overall effectiveness of the program (Swallow, 2001).

Drawing on more than 160 years of material science and process engineering, Corning Incorporated creates and makes keystone components that enable high-technology systems for consumer electronics, mobile emissions control, telecommunications and life science. (Corning Inc., 2011, p. 1).

As a part of the automotive industry Corning is required by automobile manufacturers to be ISO 14001 certified (Swallow, 2001). Corning's certification was obtained in 2002. Recently in July of 2011 Corning's ISO 14001 certification was renewed. While Corning is ISO 14001

certified some facilities do not have a sustained waste management system. This is not the case in every Corning Incorporated facilities, but rings true in a few including their Diesel Plant located in Painted Post, New York. Since 2008 there have been two attempts to implement and sustain a recycling program in the Diesel Plant, however due to lack of finances both projects collapsed prematurely. During the time of both proposals Corning, Inc. was getting hit quite hard with economic recession. By the end of 2009 Corning Inc. was expected to have cut 13% or 3500 jobs (CNN money, 2009). With the jobs being cut in significant numbers this left little room for advancement in other areas, including the implementation of a recycling program. The decline in Corning Inc. profits directly affected the potential implementation of an EMS such as a recycling program.

Statement of the Problem

The absence of a recycling program within the Diesel Plant has caused a great quantity of recyclable materials to end up in the garbage. This not only contributes to the overall cost of waste collection services but it also contributes to the amount of waste deposited in landfills and incinerators, which both have a negative effect on business and the environment.

Purpose of the Study

The purpose of this study was to develop a plan and a process for the Diesel Plant to use as a foundation for a sustainable recycling program.

Goals of the Study

1. Determine the plants readiness to implement and sustain a program.
2. Identify materials that are recyclable.
3. Determine potential cost savings associated with a recycling program.

Assumptions of the Study

1. Upper level management will support idea and agree to buy in on the program.
2. The program will be sustained once it has been implemented.

Definition of Terms

Environmental Management System. Organizational structure, planning activities, responsibilities, practices, procedures, processes, resources, and standards (such as ISO 14000 or BS 7750) employed in formulating an organizations environmental policy and achieving its objectives on both short-term and long-term basis (Business Dictionary, 2011).

Waste Management System. The systematic control of generation, collection, storage, transportation, source separation, processing, treatment, recovery, and disposal of waste (Business Dictionary, 2011).

Limitations of the Study

1. The employee's participation in starting as well as maintaining the program may alter the overall success of the program.
2. Restrictions as to where the program may be implemented may alter the effectiveness of the program.

Chapter II: Literature Review

The purpose of this study was to develop a plan that Corning Diesel could potentially use as a foundation for a sustainable recycling program that helps decrease negative impacts on the environment while increasing the profitability of the company. The company at hand has the potential opportunity to decrease the amount of money spent in waste disposal while increasing the overall value of the company name and the value of the environment. In this chapter, the researcher will present a review of literature that will give an understanding of what recycling is, why recycling is important, the benefits involved in recycling, and costs associated with recycling. Also presented is the importance of business recycling, the concept of sustainability, importance of sustainability in the workplace and the proper way to determine program effectiveness. Through proper implementation and organization it is feasible that a recycling program can be sustained.

What is Recycling?

Before considering the history of recycling, the history of waste disposal should be explored. To the earliest ancestor's waste disposal simply meant dropping trash on the ground and leaving it. This form of disposal never posed much harm due to the main fact that these individuals never settled in one place. It did not pose as an issue until 10,000 B.C when settlers first began to establish permanent settlements (BFI Waste Services, 1998). Even after settlements begun settlers used various forms of waste disposal mainly leaving trash on the streets for animals to consume until health concerns rose. Many of these health concerns stemmed from the dumping of hazardous materials in the streets and waterways.

The rise in health concerns called for an immediate change to the way waste was being disposed of. With well needed change in waste disposal methods the burning trash became

extremely popular. The burning of trash was already being practiced in many areas including Europe (Careless, 1992). In the 1890's incinerators were introduced to the U.S as a tool used to burn garbage. An incinerator is a type of furnace which burns unwanted materials such as garbage. Although incinerators are still used their popularity died out in the 1960's when the concept of using landfills rose. A landfill is a designated area engineered to hold waste (Environmental Research Foundation, 2003). Unlike dumps, landfills are carefully monitored to ensure that harmful substances within trash do not reach soil and waterways used by people. Landfills are still used in the 20th century; however the use of landfills is becoming an issue. Landfills require space that the United States is currently running out of. In the United States there are currently over 2000 landfills in use (Environmental Protection Agency, 2001). According to the EPA this number has significantly decreased since 1995 when there was a reported 3500 landfills in use. The decrease in number stems mainly from the landfills either being full to capacity or being closed due to contamination of the soil and waterways. Landfills were never intended to be a permanent solution for the United States waste disposal issues. In fact, many argue that there is no permanent solution. Others argue that although there may be no solution recycling will definitely be as close to one as possible (Summer, 2011).

Before recycling can be considered as part of the solution it is important to understand exactly what recycling is and where it originated from. Recycling is the concept of "returning materials to their raw material components and using these components again to supplement or replace new materials in the manufacture of a new product" (Careless, 1992, p.11). This is accomplished through a series of steps including separating materials from the waste stream, collecting them in a common place, separating them by category, processing them and lastly reusing them either as a completely new product or part of a new product. The overall goal of

recycling is to eliminate as much as possible out of our waste stream. This can be done by either reducing the amount of waste generated in the beginning or by reusing or recycling everything possible (Careless, 1992). The concept of recycling can be tracked back as far as 3000 B.C. where scrap merchants and scavengers were known to collect what others no longer wanted and either repaired the item for use or turned it into something else. Recycling was even known to be used informally during times of war. Soldiers often kept and reused scraps of metal, tin cans, iron, cooking grease and razor blades because these materials were hard to come by (careless, 1992).

Since then recycling has developed and become so much more than recycling for personal gain. Recycling has grown into a nationwide attempt to salvage the environment. Each state has developed its own set of requirements in regards to recycling. As long as the material can be recycled it should be. The items that are recyclable all depend on whether or not they can be reproduced to serve another function. The most common recyclables include paper of all types of quality ranging from newspaper to corrugated materials also known as cardboard, glass, metals and plastic just to name a few. The above listed items can be found in the recycling bin of almost every United States citizen. These materials can also be found in the recycling bins of most businesses as well.

Recycling is Important

When considering why recycling is important, it is imperative to evaluate the current state of the environment today. If the current situations are understood then it is easier to determine how to minimize the problem. Currently the world faces many environmental issues including but not limited to conservation of resources, conservation of energy, water

conservation and pollution (Griff, n.d.). In each environmental issue recycling has the opportunity to positively transform our environment. All that is needed is active participation

The environmental aspects presented are just one reason as to why recycling is so important. Recycling also help save money and it creates jobs for people (Campos, 2008). By recycling Americans are reducing the amount of waste that is deposited into landfills. Ultimately this saves on the cost of waste removal as well as the need to clear more land for new landfills. According to the National Recycling Coalition (2008) recycling in the United States is a \$236 billion a year industry providing jobs for 1.1 million people nationwide. In the economic state that the economy is currently facing the increase of recycling would only lead to more job opportunities for those who need them.

Recycling helps build and strengthen communities. Charities and community groups often use recycled materials to help raise money for a greater cause (anonymous, 2011). For instance, programs like Salvation Army and Goodwill collect recycled clothing and home goods from people who no longer need them. These charities then turn and resell the merchandise at affordable values. This not only helps those individuals who cannot afford to purchase these items new but it also helps the poor who have no income at all. Once dividends are received from the sold merchandise these charities turn and use the profits to feed and clothe the homeless.

Conservation of resource. All of Earth's resources are finite. It is not possible for fossil fuels or metals to be replenished by nature within our lifespan (Environmental, 2011). Recycling enables the reuse of materials versus using raw or virgin material, which ultimately creates less demand for forestry and mining both which negatively affect the environment. Consider mining, it is a tradition in United States. Mining helps produce materials that are used in everyday

activities. It creates jobs for people in areas where mines are present as well as produces resources that are valuable to other countries. Although it is considered traditional means of living, this tradition also poses a threat for our wildlife (Maximov, 2004). “Mining causes landslides, and pollutes water and soil” (Maximov, 2004, p. 3). Mining pollutes water used recreationally, it pollutes soil that plants and trees need to survive. If recycling is incorporated as an everyday procedure there would be less harm done to the environment because there would be less of a need to mine for these resources. It would eliminate the need for the earth to be torn up and more of our natural resources would be available in the future.

Conservation of energy. When it comes to energy conservation recycling plays an important role in the amount of energy that has the potential to be saved. Energy is used widely on a daily basis in every sector including; industrial, commercial, transportation and residential. “The industrial sector alone uses 30 percent of the nation’s energy” (Project, 2011, p. 46). Every industry uses energy therefore contributing to the nation’s climate change issues. To eliminate the climate change issues energy conservation is important. Energy conservation is the most quantifiable of all issues and this can be attributed to the fact that all material issues can be expressed as energy consumption (Griff, n.d.). For example, if aluminum was recycled it would reduce pollution by 95 percent (earth911, 2011). One recycled can saves enough energy to run a television for three hours. In the United States people throw away enough aluminum to rebuild a commercial air fleet four times every year. Aluminum is not the only material that contributes to energy. Recycled glass saves 50 percent energy versus the use of virgin glass. Recycling one glass container can save enough energy to light a 100-watt bulb for nearly four hours (earth911, 2011). If people recycled paper it would generate 95 percent less air pollution and one ton of paper would save 17 trees and approximately 7,000 gallons of water (earth911, 2011). The

potential for saving energy is evident. With a little more effort put towards recycling the country will be well on its way to reducing the current energy issues.

Water conservation. Recycling goods such as aluminum, paper, and plastic does not directly affect water conservation. In fact, water conservation has its own form of recycling referred to as water recycling (Filter, 2007). It is also referred to as water reclamation or water reuse. This recycling process is used to recycle water for immediate use as well as pipe water back into fresh water sources such as rivers, from which drinking water is drawn from (Filter, 2007). The process consists of three steps including primary treatment, secondary treatment and tertiary treatment. Primary treatment is the removal of sediment and other solid contaminants. Secondary treatment consists of biological oxidation and disinfection (Filter, 2007). Although materials such as aluminum, paper and plastic do not directly affect water conservation they do play a large role in pollution, which can be directly connected to both water conservation and recycling (Pollution, 2011). Water pollution is described as the loss of practical use of water from contamination, and it comes in many forms, either natural or man-made (Pollution, 2011). Factories, refineries, waste treatment facilities, human sewage, oil spills, failing septic tanks, animal waste and household chemicals are all common contributors to water pollution (Pollution, 2011). If companies recycled unused materials rather than disposing of them in the trash this would help decrease the possibility of waste entering the waste streams (Filter, 2007). Ultimately this would decrease the amount of water needing to be treated for waste and help conserve water.

Pollution. Air pollution is named as the main contributor to the world's environmental issues (environmental, 2011). Air pollution comes in the form of emissions of chemical gases or particulates that prove harmful to humans. The daily activities of people are one of the main

contributing factors of the current pollution issue (Pollution, 2011). The most common sources of air pollution include power plants, factories, automobiles, the burning of fossil fuels and other materials in oil refineries and other forms of transportation as well as incinerators. Recycling products helps solve the issues associated with pollution (Pollution, 2011). By recycling versus using virgin materials, there is a reduction in the pollution that results from manufacturing new products (Environmental, 2011). Along with the reduction in manufacturing, if materials are recycled the amount of wasted materials being burned in incinerators or buried in landfills would be reduced.

The current environmental issues are real, and although it is not possible to eliminate them completely it is possible to reduce them and better the environment for the future. Recycling may just be exactly what is needed to help better the environment. Recycling is on the rise according to EPA (2009), each year the recycling rate has increased and is only expected to increase more. The rise in recycling is a benefit in both the home and the workplace.

After the researcher has determined the need of the program as well as the company's readiness to implement one the next step an organization should consider is conducting a waste assessment or audit. A waste assessment provides the organization with an inventory of materials that are being disposed of (Gaddoniex & Riley, 2009). This is important because the waste assessment helps identify which materials are recyclable and which materials are not. It also helps the organization understand where the trash originated from (Gaddoniex & Riley, 2009). The waste assessment establishes data by collecting background information on a facility and its current purchasing, waste generation, and management practices. It also identifies potential waste reduction options (Environmental Protection Agency, n.d.). "Waste assessments also help an organization identify the current costs being incurred with treatment, storage,

handling and disposal of wastes, including quantifying associated labor, energy, water and lost raw material costs where possible” (Environmental Protection Agency, 2006, p.1). This information is important for an organization to consider when implementing a program because it will help identify how much is currently being spent on waste disposal. It will also help identify the potential for savings in the future. Looking at what is currently being spent will also give the organization an idea of how much money is available to assist in implementing a new program.

While recycling is on the rise it is only effective if there is active participation. Active participation is the key indicator determining whether or not your organization is ready to implement a program. To determine readiness of an organization a readiness assessment survey can be administered (Sustano, 2008). A readiness assessment survey helps to determine if a company is ready to implement a new program like a recycling program. The questions addressed will provide insight from an employees’ perspective in regards to how important recycling is and whether or not it is needed in the organization. The survey will also assess whether or not the employees believe that implementing a recycling program fit with the goals of the company. From the employee responses the researcher will be able to determine if the organization is in need of a program as well as whether or not they are ready to implement a program. The researcher will also be able to determine if the employees are aware and in line with company goals. The readiness assessment survey will also give the researcher an idea of how successful the employees will be in adapting to change.

Reducing Waste and Recycling in the Workplace

The start of recycling in the business industries can be connected to the passing of the Resource Conservation Recovery Act (RCRA) of 1976. Although this act did not mandate every

business to incorporate recycling programs it did spark the beginning of the revolution. At the time the RCRA Act was passed it mandated that all paper be recycled all federal agencies (Gasbarre, n.d.). This act also mandated the recycling of hazardous materials and required that federal agencies purchased recycled goods for use whenever practicable and feasible. These mandates made by the EPA were strictly enforced in all federal agencies but where yet to be enforced on the general industry. Recycling in the business industry began to emerge only within the past ten years.

The term “Going Green” is becoming extremely popular in every arena including the business arena. Currently our population rate is expanding considerably. Population is estimated to reach 9 billion by the year 2050 (Going Green Initiative, 2010). The choices and behaviors of people today have a domino effect deeply affecting the state of the environment for future generations. The Going Green Initiative is considered the beginning stage of the way the environment should be treated.

For businesses Going Green means realizing the importance of protecting the environment and recognizing the potential for making and saving money all at the same time. This is extremely important to businesses in every market. Customers are demanding that businesses develop greener products. As we look, currently businesses are the support system of the economic system (Hawken, 1999). They are the only mechanism powerful enough to produce changes necessary to reduce global, environmental, and social degradation (Hawken, 1999). Without the support of customers the success of the business is minimal and the overall state of our economy will prove to be poor.

“Business is not only a driving force that can restore our ecosystems and tackle tough societal issues it is also a force that can add to the success of the overall organization”

(Gaddoniex & Riley, 2009, p. 5). Back in 1994 a CEO of a carpet company was inspired to transform his organization from one that stole natural resources to one that restored natural resources. With this inspiration the organizations sales increase dramatically by 200 million sales. This increase was present even though the amount of materials extracted from the earth was not more than the previous year (Riley & Gaddoniex, 2009). This goes to show how recycling positively impacted a business.

As businesses are beginning to realize the importance of recycling they are also realizing the amount of change necessary in order for a program to be successful in the workplace. It is important that while building a program in a business you understand and respect how the employees will react to the change. The best way to eliminate resistance to change is to incorporate the employees in the process of building the program. It is also important to keep the program flexible and simple (Wisconsin Department of Natural Resources, 1992). Involving the employees in the initial phase of the planning of a program will show that the company values the input of its employees. When employees feel included there is less of a chance for resistance. Keeping the program flexible and simple is also important. An employee will need for the program to be simple in order to actively participate. If the program is inconvenient in any way this will deter the employee from participating. Keeping it simple could simply mean keeping recycling bins in close proximity to workers. Flexibility is important in case there are changes to your program. If the program expands the company needs to have the ability to make changes to the program in regard to the expansion.

Costs Associated with Implementing and Sustaining a Recycling Program

In every business venture there is a cost that presents itself, especially when implementing new programs. This holds true when implementing a recycling program as well.

The cost of a program all depends on the market area and level of involvement (Department of Conservation Division of Recycling, 2007). Depending upon where the company is located the cost of recycling may vary. Like in any business prices vary from state-to-state and from city-to-city. The cost also depends on how involved the organization intends to be. Businesses that are more involved cost more to start. These businesses usually take more to maintain. This can be mainly attributed to the fact that they require more materials to be purchased to help promote and sustain the program.

Prior to implementing a program it is important to have procedures set in place and a budget determined (Department of Conservation Division of Recycling, 2007). The procedures are the guidelines on which a person or company intends on following to get everything up and running. The procedures serve as an organizational tool that will assist in implementing a new program. The procedures for implementing a recycling program include a series of steps. The first step in implementing a recycling program would be to put together a recycling team. The team should consist of a variety of members ranging from top management to custodial staff. It is important that when building this team the individuals chosen for the team all agree with the goals. Once a recycling team has been determined the next step would be to select a recycling vendor. Once the vendor has been identified the next step would be to identify the type of program the company will use. This will be done alongside a representative from the vendor by completing a waste assessment. Once the waste assessment is conducted the next step would be to determine which type of program is needed based upon the results of the waste assessment.

After determining which type of program will be used the next step is to determine the budget for implementing the program. The budget allows a person or company to visually see what they have to work with financially. A cost that a business may consider whether or not

they need to employ a person to handle the maintenance of the program (Department of Conservation Division of Recycling, 2007). If so then a salary would need to be determined. Also a company may consider whether or not any special licensing or fees are required prior to starting the program. Charges associated with equipment would need to be determined, whether the equipment is being rented or purchased. At any rate when implementing a program a person or a company should be prepared for all initial operations funding (Department of Conservation Division of Recycling, 2007). Upon determining the budget the next step would be begin implementing the program. Implementation includes communicating with the employees of the company the intent of incorporating a new program. Implementation also involves purchasing the materials needed to build a program. In this case this would mean purchasing the recycling bins as well as the necessary signage needed to identify the proper recycling steps.

Once a program has been implemented the upkeep of the program is fairly simple. From the financial standpoint recycling fees are normally accrued on a monthly basis. Monthly expenses would include labor charges for hauling, taxes and fees implemented by local, state and federal government, equipment and capital fees associated with renting recycling equipment and any interest, and overhead fees which would include items such as utilities, insurance and other applicable fees (Department of Conservation Division of Recycling, 2007). Payment of these fees along with the support of employees should keep the program up and running smoothly.

With the program up and running the cost savings of the program can be assessed. One way to determine the cost savings is to perform a cost benefit analysis (CBA). Cost benefit analysis' estimate and total the monetary value of the benefits and costs to a project while determining the overall effectiveness (Watkins, n.d.). With a CBA an organization can track the initial spending before a project was implemented and track the savings after it was

implemented. In the case of implementing a recycling program the organization should consider the benefits that will come from implementing the program. One of the major benefits the company will experience is a decrease in the amount of money paid out for waste disposal. Recycling will reduce the amount of trash deposited daily which will ultimately decrease the number of times the waste disposal company empties the trash. Another benefit of having a recycling program is effectively meeting the ISO 14001 standard requirements. By meeting the requirements of the standard the organization will not only be able to retain their certification but there is also a potential to gain more business from customers searching for businesses with this certification. Ultimately the organization should use a CBA to determine if the amount of money being spent implementing a program will positively affect the business in the long run.

Benefits of Recycling

Recycling benefits include both environmental as well as economic aspects. Environmentally recycling diverts tons of materials away from incinerators and landfills, which only pose as temporary fixes for the current waste issues (NRC, n.d). By recycling resources this eliminates the need to mine or log, therefore expanding the life cycle on raw materials. Along with expanding the life cycle of these raw materials energy and water are also salvaged when recycling manufactured materials. Recycling also reduces greenhouse gas emissions (GHGs) (Whataregreenhousegases, 2004). GHGs are gases that trap heat in the atmosphere causing change in many things including climate, sea levels and land use patterns, all of which affect human daily living (Whataregreenhousegases, 2004). From an economic standpoint recycling creates millions of jobs which help boost the overall economic position. According to the National Recycling Coalition (2011) well run programs cost less to operate than waste collection,

landfilling, and incineration all together. The more people that incorporate recycling into their daily routine the cheaper recycling becomes.

For businesses the benefits of recycling are very similar to the benefits within a household. Recycling is beyond just the positive impacts on the environment and the economy. Recycling materials enhances stakeholder value. Stakeholder value goes beyond impact on society and the planet. Stakeholder values take into consideration a broader base of parties that business effects (Gadonniex & Riley, 2009). Improving stakeholder relationships has a direct impact on the bottom line. A better relationship with stakeholders means a better relationship with customers. This enables businesses to better understand the needs and wants of customers. Along with increasing stakeholder value recycling also increases company image (Business, n.d.). Increasing the company's image is another way to attract customers. Customers are now seeking to do business with company's who are showing interest in the conservation of the environment. With customers looking for more environmentally friendly businesses implementing a recycling program will increase customer loyalty (Business, n.d.).

Importance of Sustaining a Program

Once a program has been developed the next thing to do is to make sure it stays up and running. Webster's dictionary defines sustainability as "capable of being sustained" (n.d.). In the business industry sustainability means balancing the cyclic system of ecology, economy and society (Gadonniex & Riley, 2009). According to Gadonniex and Riley (2009) applying a cyclic system to business helps to ensure a continuous supply of resources. A recycling program is a perfect example of a cyclic system that has the potential to continuously supply resources if sustained.

Sustainability is important in every environmental aspect. In order to sustain the program it is important to educate the employees. The employees will be the determining factor on how successful the program will be. If the employees are in line with what is expected of the program then it should run smoothly. Also monitoring the program will help ensure that it is sustained. By monitoring the program the company can identify what is working well for the program and what isn't. Monitoring the program ensures that the program stays effective and up to date. It will also give insight on changes that should be implemented in the program.

It is one thing to be able to implement programs such as recycling but it is another to be able to keep them up and running. A sustained program allows an organizations management team to visibly see the cost savings. Without a sustained program businesses will be unable to see the benefits of implementing a program as well as the savings acquired after the implementation. Over time businesses have succeeded on using the earth's natural resources, but as resources begin to deplete businesses must recognize now more than ever the importance of recycling and sustainability. Without recycling the earth's natural resources are sure to run out and in the end businesses that need these resources will lose profitability. Businesses are beginning to realize this as well as realizing that protecting the environment makes good business sense (Environmental Protection Agency, 2011).

Chapter III: Methodology

The purpose of this study was to develop a plan that Corning Diesel could potentially use as a foundation for a sustainable recycling program that helps decrease negative impacts on the environment while increasing the profitability of the company. In order to assess the plants readiness to implement a recycling program a couple of tools will be used. The tools used will help illustrate the plant need and readiness while keeping the following goals in mind to determine plant readiness to implement a program, identify recyclable materials, and assess financial benefit of a recycling program. The methods and procedures used during this study are explained under the headings subject selection and description, instrumentation, data collection procedures, limitations and summary.

Subject Selection and Description

The subjects chosen for this study were employees of the Corning Incorporated Diesel Plant. Each department team leader or department supervisor was delegated to participate as a recycle team member. If the delegated individual was unable to participate a second individual was chosen by the team leader to represent the department. The focus of the study lay heavily on the readiness of the plant to implement a recycling program. To determine the readiness of the plant a survey was developed by the researcher and then critiqued by the recycling team members. Once the survey was successfully put together it was then sent out to all of the Diesel Plant salaried employees via email. Before conducting any surveys the researcher will clearly notify the subjects of the study as well and explain all necessary participation needed from subjects. If any questions arise the researcher will strongly advise subjects to ask prior, during or after the study.

Instrumentation

A review of literature provided the fundamental steps a business should take when implementing a recycling program. From those steps the researcher was able to determine which tools would best fit the course of the study. The specific tools used in the study included a readiness assessment survey, a waste assessment and a cost benefit analysis report.

The readiness assessment survey was used to determine the plants readiness to implement a recycling program. The survey was created with the use of some materials from on point consulting services as well as other questions which were developed by the researcher. The assessment was developed through the program Qualtrics. Once the survey was the completed the researcher worked alongside the recycling team members to ensure that it was appropriate and would meet the needs of determining readiness. The survey was distributed to all of the Diesel Plant full time salaried employees via email. These plant employees were encouraged but no required to participate. The surveys purpose is to evaluate the importance of recycling to the facilities employees as well as determine whether the employees within the facility would positively accept the implementation of a new program. The participation from employees will affect the overall effectiveness of the program. Participation is detrimental to the programs' success. If the employees do not recycle the recyclable materials then there will be no need for collection services and the recyclable materials will end up in the trash and eventually the landfill. A copy of the survey can be found in Appendix A.

The waste assessment tool was used to determine the amounts of disposed waste as well as the types of recyclable materials present in the waste. The waste assessment also helped identify the recycling needs of the facility. A waste audit was conducted by a waste auditor from the preferred recycling vendor. In order for the waste to be assessed the facility cleaning crew

was required to set aside a week's worth of trash to be analyzed. A copy of the waste assessment template can be found in Appendix B. The auditor then entered the facility and performed a walk-through of the facility. During this walk-through the auditor observed different functions and activities performed by employees. The auditor also talked with employees and managers about waste producing, activities and equipment. From this audit the auditor will be able to determine the need of a recycling program, specifically how many offices are present in the building, how much of each material should be recycled and lastly how many recycling bins will be needed throughout the facility.

Lastly, a cost-benefit analysis (CBA) was performed to determine the financial benefit of implementing the program. Businesses use cost benefit analysis report to identify if there is an actual savings compared to the amount of money that was initially invested in a project. The format of a CBA varies from company to company and can be retrieved from offline or made by the company. From the CBA the researcher will be able to determine whether or not the program implemented provided a financial savings to the Diesel plan. A sample CBA has been provided in Appendix C.

Data Collection Procedures

A voluntary 24 question survey was administered to a random selection of individuals from all over the plant. The purpose of the survey was to determine the potential participation level of the employees upon implementing the recycling program. The survey will include questions regarding the type of business, recycling status of the facility, items that could be recycled, costs of a program, outside recycling (in home), the overall need of a program at this facility.

Completing the waste assessment is the best way to get a comprehensive picture of your waste. To obtain a comprehensive picture a company would collect the waste over the course of a business week and examine it. In order to do this a member of the cleaning crew collected a set amount of waste and put it aside in a separate location for it to be analyzed at a later date. The next step of the assessment was to measure the waste that was set aside. The auditor also recorded the number of days over which waste was collected. This provided an idea of how fast the company was disposing of the recyclable materials. The auditor next opened the bag of waste and took photographs. The photographs assisted in the next step which was to log all recyclable materials found in the trash. Lastly the auditor estimated the composition by volume for each material present. This helped the auditor analyze exactly how much of each material the plant should expect to recycle.

Data analysis. The analyzed data in the survey will demonstrate the readiness of such a program to be implemented. Not only will it present the opinions of the employees but it will also demonstrate to the management staff the commitment level of the employees. To analyze this data the researcher will use descriptive statistics to ensure that questions asked will provide an overall consensus of the employee intentions and opinions. From the survey the researcher will be able to make an inference as to whether or not the program will be successful.

Through the review of the analyzed data within the waste assessment the researcher will be able to determine where the best location is to implement the program. The researcher will also be able to determine which recycled materials are the highest in quantity. The waste assessment will provide necessary data needed for communicating the need of a program to the management staff. To analyze this data the researcher will use descriptive statistics to determine

whether or not amount of each recyclable material present is disposed of in large enough quantities to be recycled.

The data analyzed from the cost benefit analysis will present to the management the potential cost savings of implementing the program. From this the researcher will be able to present the amount of money spent in waste removal from the previous year versus the amount of money spent on waste removal from the current year. To demonstrate the savings the researcher will use descriptive statistics, specifically a histogram to illustrate the amount of savings each month.

Limitations

The limitations of this study include:

1. The employee's willingness to participate in the study may alter results.
2. The employee's truthfulness while participating in the study may alter results.
3. The analyzed data is specific to the Diesel plant location

Chapter IV: Results

The purpose of this study was to develop a plan and a process for the Diesel Plant to use as a foundation for a sustainable recycling program. The goals of the study where to:

1. Determine the readiness to implement and sustain a program.
2. Identify materials that are recyclable.
3. Determine potential cost savings associated with a recycling program.

The methodology used consisted of the administration of a readiness survey which was distributed to all salaried employees, a waste assessment which was conducted by the researcher and a recycling representative and lastly a cost benefit analysis.

Data Collected

Goal one. The first goal of this study was to determine the readiness of the plant to implement and sustain a recycling program. This was accomplished through the administration of a readiness survey. The survey included questions that the researcher believed would help determine whether or not the plant was ready based upon the responses received. The researcher analyzed the responses based upon the amount of individuals who took the survey as well as how they responded to each question. The responses received from the survey can be found in Appendix A.

Discussion – Goal 1. Out of a total of 80 salaried employees who received the survey 25 individuals responded. Based on the 25 responses the researcher was able to determine that the plant appears ready to implement a recycling program. To determine readiness the researcher considered the responses of each individual for each question. For instance, question 2 in the survey questions the importance of recycling to the respondent. From the responses given for this question the researcher can make an inference that if recycling is important to the respondent

then they would be more likely to actively participate in a program if it was implemented. If the respondent replied that it was not important then the researcher can make the opposite determination. The amount of individuals who responded “yes” versus the amount that responded “no” to each question will help the researcher determine whether or not the plant is ready to implement a program. Question 6 in the survey was broken down into 10 sub questions. These questions allowed each respondent to indicate their level of agreement on how well the plan to implement a program was presented to the facility as well as how receptive they thought the facility would be to the program. The sub questions asked in question 6 provided the researcher with an idea of what areas may need to be addressed upon implementation if readiness was determined. The responses ranged for each question from strongly agree to strongly disagree. Questions 11 and 12 questioned the employee’s level of involvement with the ISO 14001 process. Question 11 specifically asks whether or not the employee was aware that ISO 14001 suggests recycling. The responses received from these two questions assisted the researcher in determining how involved the employees from each area were in the audit process. It also provided insight on how well audit findings were communicated to others within the plant. From the responses of these two questions the researcher was able to determine that the ISO 14001 process is not familiar with everyone throughout the plant. Not only are they not aware of the components but they are also not being involved in the facilities findings upon completion of an audit. This indicates that if the facility decides to incorporate a program they will need proper training on the ISO 14001 process. Questions 13 and 14 questions the employees’ willingness to participate in a recycling program as well as participate as part of the recycling team if a program is implemented. The responses received from these two questions allowed the researcher to determine whether or not there would be active participation. It also

provided insight on the level of commitment for the individuals that were polled. From the level of commitment the researcher was able to make an inference on whether or not the program would be successful at this facility. The last question in the survey asked the respondents to identify issues that would be related to implementing a recycling program within their facility. This question allowed the researcher to identify areas in which the facility may need help on in order for the program to be successful.

From the results of the study it was determined that the plant appeared to be ready to implement a recycling program however the maintenance of the program was a concern with each respondent. With maintenance being a large concern it is important that the proper guidance was set in place before the implementation of the recycling program.

Goal two. The second goal of the study was to identify recyclable materials. This was accomplished by performing a waste assessment. Presented in Appendix B is the waste assessment which provides the breakdown of all recyclable materials deposited in the trash.

Discussion- Goal 2. The waste assessment identified that the materials disposed of in greatest quantity included: scrap office paper, aluminum cans, plastics (bottles, utensils, plate covers), magazines, books, cardboard, Styrofoam and glass. The waste assessment form also identified the amount of money spent each month on waste collection services which included the disposal of all the above mentioned items. The total amount spent on waste collection services totaled approximately \$252,000 per year. The waste assessment identified that there were approximately 250 office areas which would call for 250 individualized bins, 8 conference rooms which called for 16 medium sized bins (two in each conference room), 2 cafeterias which called for 4 medium bins (two in each cafeteria), 5 break rooms on the floor which called for 10 medium bins (two in each break room), and 8 miscellaneous medium bins for common areas

such as the restrooms, locker rooms and hallways. Provided in the table below are approximate waste disposal costs based upon a \$130 pull fee, \$40 per ton dumping fee and \$40 per ton tipping fee. The total per year is based solely on at least one ton of waste pulled each day with two pulls per day for all six waste disposal bins.

Goal three. The third goal was to determine the potential for savings if a recycling program was implemented. This was accomplished through the use of a Cost-Benefit Analysis (CBA). The data collected from the waste assessment was used in the cost benefit analysis to help determine the potential for cost savings once a recycling program was implemented. The CBA found in Appendix C provides the breakdown of the costs and illustrates the potential for savings once a program has been implemented.

Discussion-Goal 3. The potential for cost savings was determined by breaking down the cost of waste disposal by producing the cost of the plants current waste fees each month and year for a total of 6 waste bins. The total waste fees each month for all six bins equaled approximately \$15,120 which meant the total each year equaled approximately \$181,440. These costs included the \$130 pull fee, the \$40 per ton disposal fee and the \$40 per ton tipping fee. These costs are without the presence of a recycling program and are based on only 1 ton of waste removed from the property each haul. The CBA also outlined what the initial start-up cost of a recycling program would be. The start-up cost included the pricing for purchasing the recycling bins. The total amount the plant paid for start-up cost equaled \$3758.40. The total included 252 individualized containers, 36 medium containers and 36 medium container lids. The next piece the CBA identified was the on-going cost of a recycling program. Unlike the waste removal services there is no charge for disposing of the materials and there is also no tipping fee. The only charge was the pull fee which was also \$130. The monthly recycling fees totaled \$9,360

and the yearly fees totaled \$112,320. The CBA provided the plant with a potential cost savings of approximately \$5,760 a month in waste removal fees and a yearly savings of approximately \$69,120. These amounts are based the company recycling at least one ton of materials each pick up. With these potential savings the company would see a return on initial investment within a year's time.

Chapter V: Summary, Conclusions and Recommendations

Summary

The ISO 14001 certification presents various pre-requisites a facility must adhere to in order to receive certification. Along with those pre-requisites it also provides suggestions for going above and beyond. Although Corning Incorporated is ISO 14001 certified it lacked the presence of a recycling program which was identified in their ISO 14001 recertification audit as an opportunity for improvement.

Restatement of the Problem

The absence of a recycling program within the Diesel Plant Facility has caused a great quantity of recyclable materials to end up in the garbage. This not only contributes to the overall cost of waste collection services but it also contributes to the amount of waste deposited in landfills and incinerators, which both have a negative effect on business and the environment.

Due to the identified problem the purpose of this study was to develop a plan and a process that the Diesel Plant Facility could use as a foundation for a sustainable recycling program. In order to achieve this purpose, three goals were identified:

1. Determine the plants readiness to implement and sustain a program.
2. Identify materials that are recyclable.
3. Determine potential cost savings associated with a recycling program.

Methods and Procedures

The methodology used to collect data consisted of distributing a readiness survey to all salaried employees, conducting a waste assessment on the entire facility, and lastly performing a cost benefit analysis. The readiness survey to all salaried employees was to assist the researcher in identifying whether or not the facility was ready to incorporate a recycling program. The

survey was administered via email and each full time salaried employee was provided a link that allowed a secure, confidential connection to the survey.

A waste assessment was performed to identify recyclable materials that were being disposed of in the trash. This was performed by walking the entire facility and recording the number of trash bins in each area and then identifying the materials that were placed inside each of these bins. This assisted with determining which material should be recycled as well as how many recycling bins would be needed throughout the facility.

Lastly, a cost benefit analysis was used to determine the potential cost savings associated with implementing a recycling program. This was performed by identifying the current waste charges of the facility and using the waste assessment results to determine the difference of cost once a recycling program had been initiated. The cost benefit analysis also determined the initial start-up cost of a program as well as when the facility should expect a return on investment.

Major Findings

There were several major findings that resulted from each component of the research. The following findings were found in relation to the readiness survey:

- Only 25 out of 80 employees who received the survey responded to the survey.
- 10 out of 25 of those employees had not participated in the ISO 14001 audit.
- Due to the lack of participation in the ISO 14001 audit many of the employees were not even aware of the components associated with an audit.
- 12 out of the 25 employees were not aware of the audit findings.
- Not only were the employees not aware of the audit findings but the opportunities for improvements were not shared.

- Majority of the respondents stated that they did not agree that all the obstacles related to implementing a program had been identified.

The following findings were found upon conducting a waste assessment of the facility:

- The facility spent approximately \$181,000 dollars a year on waste collection services.
- Many recyclable materials were being deposited in the trash, including: scrap office paper, aluminum, plastic, magazines, books, Styrofoam, cardboard and glass.

The cost benefit analysis produced the following findings:

- The initial start-up cost of a recycling program would run approximately \$3,758 dollars.
- The facility would expect a return on investment within one month's time.
- The cost of a fully developed and fully implemented recycling program would cost approximately \$112,000 dollars a year.
- The facility would have the potential to save approximately \$69,000 dollars a year in waste collection services.

Conclusion

The above findings provided much needed insight that assisted the researcher in determining whether or not a recycling program would be beneficial for the Diesel Plant Facility. When determining the readiness of the facility the researcher referred back the major findings. Areas of concern within the readiness survey first stemmed from the number of employees who actually responded to the survey. With only 25 out of 80 full time employees responding to the survey the researcher was able to conclude that there was a lack of active participation

throughout the facility which may hinder the implementation of a new program. Another area of concern came from question 6.3, the researcher determined that because employees did not feel that all obstacles had been identified prior to implementation then there was no way to properly correct them. The researcher was also able to determine from the responses received on questions 10,11 and 12 that there was a lack of communication throughout the facility as many of the respondents were not aware of the ISO 14001 audit components, findings, nor were they aware of the opportunities for improvement. This suggested that the facility had not been properly trained on the ISO 14001 process. This may result as an issue when identifying why the implementation of a recycling program is important.

From the waste assessment audit the researcher was able to determine that there is a large quantity of materials that need to be recycled. The facility has a great opportunity for reducing waste collection costs while increasing the overall impact on the environment with the implementation of a recycling program.

The cost benefit analysis allowed the researcher to provide top management with the relevant figures associated with implementing a recycling program. From this analysis top management is able to visibly see where the facility is currently with waste collection costs and where they could potentially be upon implementing a program. It also provides them a detailed summary of what it would cost to implement the program from beginning to end.

Overall the researcher concluded that the facility was ready to implement a recycling program however; there is a need for guidance upon implementation. The guidance provided will assist in working on the issues that were identified as concerns to the researcher. Once the issues have been managed properly the facility can begin to reap the benefits of the incorporated program. Not only will the benefits be monetary but environmentally beneficial as well.

Recommendations

Based on the conclusions of this study the researcher provided the following recommendations to the facility:

- Consider communicating the importance of actively participating in all facility related activities. By doing so this would help enhance the overall culture of the facility making implementation of new programs an easy transition for all.
- Consider the process of the ISO 14001 certification audit and properly communicate to all employees the components associated with the audit. By doing so this would ensure that all employees are aware of audit components and expectations prior to the audit resulting in minimal non-conformances and/or opportunities for improvement.
- Consider communicating all audit findings to the entire facility upon completion of an audit. By doing so could provide employees a helpful training session on ISO requirements and what is and what is not accepted.
- Consider the implementation of a recycling program. By doing so the facility can expect to reduce financial costs of the current waste collections services while increasing positive impact on the environment.
- Consider any and all issues related to implementing a recycling program. By doing so this will provide the facility the opportunity to mitigate and correct any issues prior to implementing a program.
- Upon implementing a recycling program consider building a recycling team. By doing so the facility can be assured that the most dedicated individuals will assist the program with being successful.

- Consider re-evaluating the program once it has been implemented. This will assist in minimizing the cost of a program if it is not effective.
- Consider re-training employees when necessary. This will assist in ensuring that the program runs efficiently and effectively.
- Consider a single stream recycling program. This will help eliminate the need for numerous recycling bins in each area and will also assist in training the employees on the proper way to recycle. With the materials all being recycled into one bin there creates less confusion.
- Consider properly identifying which materials are and which materials are not recyclable based upon your recycling vendor. By doing so the facility can expect fewer complications with the recycling vendor and each employee will be well aware of the recycling process.

Recommendations for further study

The scope of this study was considerably narrowed to provide the facility an idea of the possible benefits of implementing a recycling program. The following should be considered for further investigation to determine the successfulness of the program:

- Consider researching and finding a successful recycling program within the company and determine any issues that arose upon implementation. By understanding past issues in another facility this facility will be able to correct potential issues before they arise.
- Consider conducting a full in-depth waste assessment which provides information in regards to the amount in weight that will be recycled. This will assist the facility in

understanding their overall positive impact on the environment once a program has been implemented.

- Consider running a pilot prior to fully implementing the program plant wide. This will provide the management with an idea of whether or not the program will be successful. This will also assist the facility in identifying any issues that were not identified previously.
- Consider incorporating recycling training into the New Employee Orientation training. This will ensure that each employee is trained properly prior to starting work.

References

- Arms, M. (2008, April 30). *What is recycling-7 benefits of recycling* [web log message]
Retrieved from
<http://www.pacebutler.com/blog/what-is-recycling-7-reasons-why-we-should/>
- Berman, F. (1996). *Trash to cash*. Delray Beach: St. Lucie Press.
- Business benefits of recycling*. (n.d.). Retrieved from
<http://www.greenernow.co.uk/recycling-benefits>
- Careless, J. (1992). *Taking out the trash*. Washington, DC: Island Press.
- Corning incorporated. (2011). Retrieved from <http://www.corning.com/index.aspx>
- Cost benefit analysis template*. (2011, June 23). Retrieved from
<http://www.analysis-template.com/cost-benefit-analysis-template.html>
- Department of Health and Environmental Control, Office of Solid Waste Reduction and Recycling. (2008). *Economic benefits of recycling* (OR-0591). Retrieved from
http://www.scdeh.gov/environment/wm/recycle/pubs/economic_benefits_of_recycling.pdf
- Earth911. (2011). *Earth911*. Retrieved from Energy costs and Conservation:
<http://earth911.com/reduce/energy-costs-and-conservation-facts/>
- Eisenberg, S. (2008, February). *The 3 r's still rule*. This Green Life, Retrieved from
<http://www.nrdc.org/thisgreenlife/0802.asp>
- Environmental benefits of recycling*. (2011). Retrieved from
<http://www.all-recycling-facts.com/benefits-of-recycling.html>
- Environmental waste management. (2011). Business dictionary. Retrieved June 24, 2011, from
<http://www.businessdictionary.com/definition/environmental-waste-management.html>

Filter, W. (2007). *Water Filter*. Retrieved from Water Conservation:

<http://www.waterfiltering.com/conservation/water-conservation.html>

Gaddoniex, H., & Riley, T. (2009). *Greening your business*. Indianapolis: Penguin Group.

Griff, A. (n. d.). *Is recycling good for the environment?* Retrieved from

<http://www.griffex.com/Griff-gpec-and-tables.pdf>

Harrison, E. B. (1993). *Going green*. Homewood, IL: Business One Erwin.

Hawken, P. (1999). *Natural capitalism: Creating the next industrial revolution*. Little, Brown and Co.

Maximov, M. (2004). *Man and nature*. Retrieved from

<http://library.thinquest.org/05aug/00461/global.htm>

New York State Department of Environmental Conservation, Pollution Prevention Unit (n. d.)

Understanding and implementing. Retrieved from

http://www.dec.ny.gov/docs/permits_ej_operations_pdf/p2emstep1.pdf

Non-hazardous waste management hierarchy. (2011, June). Retrieved from

<http://www.epa.gov/wastes/nonhaz/municipal/wte/nonhaz.htm>

Pepitone, J. (2009, January 27). *More than 11,500 job cuts announced Tuesday*.

CNN Money: America's Money Crisis, pp. Issue 1

Pillsbury, H. U.S. Department Environmental Protection Agency. (1997).

Setting the standard for recycling measurement EPA.

Pollution. (2011). Green Student U. Retrieved July 6, 2011 from

<http://www.greenstudentu.com/encyclopedia/pollution>

Preparing a waste management plan: A methodological guidance notes. (2003, May).

Retrieved from

[http:// ec.europa.eu/environment/waste/plans.pdf.wasteguide_final.pdf](http://ec.europa.eu/environment/waste/plans.pdf.wasteguide_final.pdf)

Project, T. n. (2011). *www.need.org*. Retrieved from Intermediate Energy Infobook:

<http://www.need.org/needpdf/Intermediate%20Energy%20Infobook.pdf>

Proposal to provide project management. (2007, May 30). Retrieved from

http://www.newpointgroup.com/files/DOC_DORIIS_Proposal_-_5-30-07.pdf

Recycling benefit: The many reasons why. (2011). Retrieved from

<http://www.recycling-revolution.com/recycling-benefits.html>

Smith, D. (1993). *Business and the Environment*. New York, NY: St. Martin's Press, Inc.

Solid waste management. (2011). Business dictionary. Retrieved June 24, 2011, from

<http://www.businessdictionary.com/definition/solid-waste-management.html>

U.S. Environmental Protection Agency, Solid Waste and Emergency Response. (2010).

Municipal solid waste generation, recycling, and disposal in the United States: fact and figures for 2009. (EPA-530-F-010-012). Washington, DC

Waste assessment approaches. (2011, July 28). Retrieved from

<http://www.epa.gov/osw/partnerships/wastewise/approach.htm>

Water pollution control. (2007). Retrieved from

<http://waterfiltering.com/conservation/water-pollution-control.html>

What are greenhouse gases? (2004, April 2). Retrieved from

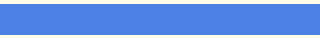

<http://www.eia.gov/oiaf/1605/ggcebro/chapter1.html>

What's the problem? (2010). Retrieved from

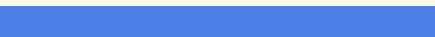

<http://www.gogreeninitiative.org/content/whygogreen>

Appendix A: Recycling Survey



1. Select the one that best applies to you

#	Answer		Response	%
1	Male		17	68%
2	Female		8	32%
	Total		25	100%

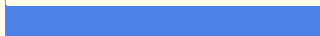





2. Is recycling important to you?

#	Answer		Response	%
1	Yes		23	92%
2	No		2	8%
	Total		25	100%




3. Do you recycle at home?

#	Answer		Response	%
1	Yes		21	84%
2	No		4	16%
	Total		25	100%

4. Which best describes the area in which you work?

#	Answer		Response	%
1	Office area		17	68%
2	Cafeteria		0	0%
3	Batching		1	4%
4	Forming		1	4%
5	Firing		1	4%
6	Finishing		3	12%
7	Maintenance		2	8%
8	Click to write Choice 8		0	0%
	Total		25	100%

5. Which best describes your position at the company?

#	Answer		Response	%
1	Management		10	40%
2	Engineer		14	56%
3	Front line worker		0	0%
4	Kitchen staff		0	0%
5	Maintenance staff		1	4%
	Total		25	100%

6. Please indicate your level of agreement with each of the following statements:

#	Question	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Responses	Mean
1	The reasons for implementing a recycling program have been made clear	5	14	3	2	0	24	2.08
2	The purpose and objectives of implementing a recycling program have been made clear	5	13	3	3	0	24	2.17
3	Actions to address the obstacles to implementation of the change have been identified	4	4	9	7	0	24	2.79
4	The way people currently think and behave in my department will be compatible to change	8	10	5	1	0	24	1.96
5	People in my department will be receptive to supporting change	7	15	1	0	0	23	1.74
6	Top leadership is committed to the success of change	9	7	7	0	0	23	1.91
7	Previous changes at Corning Incorporated Diesel Plant have been well managed	4	10	8	1	1	24	2.38
8	I understand what my role	7	12	3	1	1	24	2.04

	will be in achieving my departments change goals							
9	I am personally committed to making the change of success	14	10	0	0	0	24	1.42
10	I believe that the proposed change is necessary and worthwhile	16	5	2	1	0	24	1.50

7. Are you familiar with the ISO 14001 certification process?

#	Answer		Response	%
1	Yes		20	80%
2	No		5	20%
	Total		25	100%

8. Have you participated in the ISO 14001 process in any way?

#	Answer		Response	%
1	Yes		15	60%
2	No		10	40%
	Total		25	100%

9. Are you aware that our company is ISO 14001 certified?

#	Answer		Response	%
1	Yes		21	84%
2	No		4	16%
	Total		25	100%

10. Are you aware of the most recent ISO 14001 certification audit results?

#	Answer		Response	%
1	Yes		13	52%
2	No		12	48%
	Total		25	100%

11. Are you aware ISO 14001 suggests the use of a recycling program?

#	Answer		Response	%
1	Yes		11	46%
2	No		13	54%
	Total		24	100%

12. Did you know our company was issued an opportunity for improvement because we currently do not have a recycling program?

#	Answer		Response	%
1	Yes		9	38%
2	No		15	63%
	Total		24	100%

13. If we developed a recycling program would you be willing to participate?

#	Answer		Response	%
1	Yes		24	96%
2	No		1	4%
	Total		25	100%

14. If we developed a recycling program would you be willing to serve as a recycling team member?

#	Answer		Response	%
1	Yes		16	64%
2	No		9	36%
	Total		25	100%

15. If a program was developed what would be issues related to sustaining the program? (Provide details below)

Text Response

Maintaining

Communication. Control/Upkeep. Implementation - The recycling program was not fully implemented in my opinion. There is much room for improvement.

Nowhere in my area to rinse containers to put into recycling container

You put me on your recycling team.

in the past recycled material was just mixed with the garbage so lack confidence in a recycling program

Training and Top Management Support for the program

Having time to dedicate to the program to make sure the plant stays in compliance.

Would need more human resources and money; does the cost outweigh the benefit?

Proper implementation

Availability of resources

Lack of resources to manage program. Not financially beneficial.

Defining whose responsibility it is to pick up the bins and where to place them

Need more receptacles. Example: conference rooms, special events (awards, etc) NEED TO MAKE IT EASIER FOR EMPLOYEES TO BRING CARDBOARD FROM HOME TO RECYCLE AT THE PLANT.

People caring to take the time to recycle and having the recycling bins in a convenient location

Keeping everyone involved

Appendix B: Waste Assessment

Waste Assessment Form									
Conducted by: Nichole Carpenter-Speller and Joseph Fiori						Phone: 607-725-8694		Date: 12/28/11	
I. General Information									
Company Name: Corning Incorporated, Diesel Plant									
Address: 960 Addison Road Painted Post, NY 14871									
Contact Person: Nichole Carpenter-Speller									
Email: carpenterspellen1998@my.uwstout.edu									
Number of Employees: Approx. 500									
Type of Business: Manufacturing									
II. Current Waste Collection Information (NOT INCLUDING RECYCLING OR HAZARDOUS WASTE)									
# of Containers	Container Size in cubic yards (cy)	% Full	Container Fee	Monthly Collection Fee	fee per pull	Disposal Fee per haul	Tipping Fee per haul	# of hauls per day	Total Per Month for all 6 containers
1	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	\$15,120
2	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	
3	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	
4	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	
5	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	
6	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	
								Total per year	\$181,440
III. Target Materials for Waste Reduction									
Type of waste material	Waste-producing activity or location			Current waste reduction activities	Potential waste reduction actions				
Office paper	Office floor area			Secure recycling only	Zero Sort recycling throughout entire plant				
Aluminum	Cafeteria, office area, conference rooms			Cafeteria recycling only	Zero Sort recycling throughout entire plant				
Plastic	Cafeteria, office area, conference rooms			Cafeteria recycling only	Zero Sort Recycling throughout entire plant				
Magazine	Cafeteria, restrooms, Office area, plant break rooms			None	Zero Sort Recycling throughout entire plant				

Books	Cafeteria, office area, plant break rooms	None	Zero Sort Recycling throughout entire plant
Cardboard	Cafeteria, office area, plant floor, plant break rooms	Plant floor recycling only	Zero Sort Recycling throughout entire plant
Styrofoam	Cafeteria, Office area, plant break rooms	None	Zero Sort Recycling throughout entire plant
Glass	Cafeteria, office area, plant floor break rooms	Cafeteria recycling only	Zero Sort Recycling throughout entire plant

Appendix C: Cost-Benefit Analysis

**Waste
Collection
Fees**

# of Containers	Container Size	% Full	Container Fee	Monthly Collection Fee	Fee per pull	Disposal Fee per ton	Tipping Fee per ton	# of hauls per day	Total Per Month for 6 containers
1	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	\$15,120
2	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	\$15,120
3	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	\$15,120
4	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	\$15,120
5	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	\$15,120
6	35 cy	50-75	\$0	\$0	\$130	\$40	\$40	1	\$15,120
								Total per year	\$181,440

**Initial
Cost of
Recycling
Program**

Recycling Materials	Order quantity	Price of each item
Desk side recycling bin	252 containers	\$5.25 each
Medium size bin	36 containers	\$48.70 each
Medium size lid	36 lids	\$18.95 each

Recycling

# of Containers	Container Size	% Full	Container Fee	Monthly Collection Fee	Fee per pull	Disposal Fee per ton	Tipping Fee per ton	# of hauls per day	Total Per Month for 6 containers
1	35 cy	50-75	\$0	\$0	\$130	\$0	\$0	1	\$9,360
2	35 cy	50-75	\$0	\$0	\$130	\$0	\$0	1	\$9,360
3	35 cy	50-75	\$0	\$0	\$130	\$0	\$0	1	\$9,360
4	35 cy	50-75	\$0	\$0	\$130	\$0	\$0	1	\$9,360
5	35 cy	50-75	\$0	\$0	\$130	\$0	\$0	1	\$9,360
6	35 cy	50-75	\$0	\$0	\$130	\$0	\$0	1	\$9,360
									\$112,320

Potential for cost savings= \$69,120 per year