

THE EVALUATION OF GREEN FOCUSED APPLICATIONS FROM THE POINT OF ENTERPRISES

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—Abstract —

As a result of the increasing population of the globe, the temperature of the blue planet has increased during the period from the industrial revolution to the current day and has brought problems such as Global Warming and Climate Change for humankind to face. While measures regarding Pollution Prevention were seen sufficient in the past years, today the concepts of Life Cycle, comprising all activities in the value chain activities, and Green Activities have become not only necessities, but even more imperatives. The goal of this study is to analyze green production activities, which at first glance seem to be a financial burden on businesses, and to evaluate these activities' outcomes in terms of both the society and the businesses. As the subject area of the study, Çumra Sugar Integrated Plant operating in the Konya province is discussed, and their green-production related activities are examined according to the goal of the study.

Key Words: *Green Economy, Green Production, Social Responsibility*

JEL Classification: M11, M14

1. INTRODUCTION

For many years, the contribution to the world's pollution of such things as harmful gases emitted to the air by businesses, chemical substances released to water, and solid waste have not been considered or have been disregarded. Towards the end of the 1990s, protection of natural resources and the environment became a very important subject in national and international milieus. Environmentally-sensitive businesses in various sectors, when producing or offering products/services or providing post-sales customer services, i.e. at every

stage of the product's life curve, are focusing on creating ecological value besides economic value, and green applications are coming to the fore.

2. GREEN PRODUCTION (CLEANER PRODUCTION)

According to the United Nations Environment Programme, Cleaner Production is defined in the most general sense as “the holistic and continuous application of preventive environment management strategies on the production process, and the produced services and products, and the elimination or reduction of risks associated with these to human health and environmental values.” (Yucel, Ekmekciler, 2008: 325)

There can be various forces encouraging or forcing a business to implement green policies (Neto et al., 2008: 196). Buyukozkan and Erkut (2008) emphasized the importance of four fundamental forces in their study. The most important force pushing institutions to adopt green practices is the governmental force and its accompanying laws. The role of the government in this regard can be the regulator, the facilitator, and the customer. Another factor is the negative financial and legal consequences that the business has incurred or may possibly incur as a result of environmentally-wrong management practices. Although most businesses may still think that switching to an environmentally-sensitive management style is financially expensive, the fact of the matter is that in the long run it pays back to the business in the form of profitability, operational efficiency, and cost minimization.

Kopicki et al. put forth three green approaches to environmental management: reactive, proactive, and value-creating approaches. In companies who adopt the narrowest of the three, the reactive approach, environmentally-sensitive green practices are at a minimal level. Companies begin purchasing products with recyclable components, implementing green labeling, and using filters to reduce the impacts of their production to the environment. Nevertheless, most of these activities are due to regulatory obligations. In the proactive approach, the greenification efforts come from within the company with the motivation to achieve competitive advantage among its rivals via sustainable development. The aim of the proactive approach is preventing environmental problems, instead of trying to find solutions after environmental problems arise. Companies who adopt the most comprehensive approach of value creation integrate green activities into their business strategies, publish environmental decisions, and share these decisions with their supply chain partners (Kopicki et al., 1993: 64-65).

Porter and Van der Linde (1995: 126) argue in their study that business benefit from their greenification efforts in two ways. The first is *process gains*, which provides resource savings (better processing, resource savings from new and recycled of production inputs), increased process returns, reduction in maintenance outages because of more careful monitoring, obtainment of by-products by the reprocessing (recycling) of waste, and cost reduction due to lower energy use. The second benefit is *product gains*, i.e. products with better quality, consistency, and safety. Increased business efficiency is achieved as a result of this. In other words, the greenification initiative allows companies not only to reduce their negative environmental impacts but also to increase their productivity, thus creating a competitive advantage in innovation and processes (Van Hoek,1999: 130). Therefore, making strategic decisions with an environmental approach increases the firm's strength both in stagnant and orderly market conditions, as well as in dynamic and competitive ones (Henriques and Sadorsky, 1996: 385).

The elimination of waste and emissions that have a negative impact on the environment and human health brings an added burden on businesses. This in turn causes the business owner to evade such processes or to take precautions at the minimum level (Cihangir et al.,2006: 4). The cost of cleaner production is more expensive than pollution control work during the initial implementation phase, but over time the cost of cleaner production remains constant. Also, expenditures for cleaner production are typically recovered over a period varying between a few months to a few years. In the long-term perspective, cleaner production reduces these high expenditures to a great degree (Cihangir et al., 2006: 5).

3. CLEANER PRODUCTION and RENEWABLE ENERGY

The rapid growth of the world economy has also led to very large increases in energy demand. Nevertheless, the scarcity of reserves of fossil fuels such as petroleum, coal, and natural gas and their harm on the environment have brought about an inclination towards renewable (alternative) energy resources. In this respect the diversity domestic renewable energy sources has gradually increased. The International Energy Agency (IEA), of which Turkey is a member, held a ministerial meeting on 16/5/2001 with the topic "energy for sustainable development", where it was agreed on the diversification of energy at the national and collective levels and the increased share of renewable energy by the year 2020 based on a consensus of forecasts of harsh climatic conditions, explosion of

demand due to the economic development and population growth in developing countries, 60% increase in energy needs, increase in energy prices, and increasing emission levels (Duygu, 2004:1).

The term “renewable energy” refers to naturally found and continually existing energy resources such as water, sun, wind, geothermal activity, and biofuels. In recent years, besides nuclear energy, renewable energy resources which are often described as “new” and “clean” energy resources have become a hotly debated topic. Recycling of animal and vegetal food waste is important for the prevention of environmental pollution and the development of energy resources (Narin, 2008: 2). Energy from biofuels, which is at the forefront of renewable resources, is derived from agricultural crops. These are sunflower, rape, soybean, safflower, cotton, potato, wheat, rye, corn, sugar beets, sugar cane, etc. The reason for the rapid expansion of bio-ethanol, a type of biofuel, is its continually increasing economic value while having no negative impact on the environment. Also, the main reasons for bio-ethanol production’s coming into question can be listed as follows: its contribution to the reduction of the environmental damage (global warming) caused by fossil fuels, its improvement of agricultural development, the extremely safe nature of its energy product, the complete and adequate use of energy resources, and the reduction of foreign dependence regarding energy (providing foreign exchange savings). Previous studies have shown that bio-ethanol can be successfully used in petroleum-derived fuel engines without need for additives and that the use of bio-ethanol-blended fuels in engines significantly reduces the emissions of harmful hydrocarbon gases and CO₂.

4. AN EXEMPLARY BUSINESS: CUMRA INTEGRATED SUGAR PLANT

In the sugar beet paradise Turkey, Cumra Integrated Sugar Plant was established by Konya Sugar Industry and Trade Inc. in Cumra, Konya, where some of the highest quality sugar beets grow because of the area’s climatic suitability, and began operation on September 24, 2004. The facility has a total area of approximately 2,600,000 m² and a capacity of 16,500 tons/day. Cumra Integrated Sugar Plant houses the following factories and units: Sugar Manufacturing Plant, Liquid Sugar Manufacturing Plant, Bee Feed Syrup Manufacturing Plant, Hard Candy Manufacturing Plant, Fondant Sugar Manufacturing Plant, Chocolate Manufacturing Plant, Confectionary Products Manufacturing Plant, Cube Sugar Production Plant, Packaged Sugar Production Plant, Candy Sugar Manufacturing Plant, Bio-ethanol Production Plant, Pulp Steam-Drying Plant, Cumra Feed

Manufacturing Plant, Agricultural R&D Facility, Seedling Production Center, and Greenhouses.

With a total capital cost of \$340 million, Cumra Integrated Sugar Plant annually produces 280,000 tons of crystal sugar, 10,000 tons of cube sugar, 140,000 tons of liquid sugar, 2,000 tons of chocolate, 2,160 tons of hard candy, 84 million liters of bio-ethanol, 70,000 tons of molasses, and 360,000 tons of mixed feed. The Cumra Sugar Factory, being the source of the produced sugar and also especially because it is the center of the integrated energy structure of all the facilities, plays the role of a balancing factor. The Sugar Factory's characteristics can be summarized as follows; it is the only plant in Turkey that can dry-process sugar beets into 2,500 tons/day of sugar, it is the only factory having a state-of-the-art fluidized-bed boiler which minimizes energy costs, it is the only plant in Turkey to produce liquid sugar from sugar beets, regarding environmental values, it is the sector's most environmentalist factory by being the only one of its kind that produces 4.5 million saplings per year, it is also the first and only factory that has 2 vertical sugar silos with a capacity of 80,000 tons and an automated moisture and temperature control system allowing prolonged preservation of the product's quality.

4.1 Green Activities of Cumra Integrated Sugar Plant

4.1.1 Industrial Waste Water Treatment Plant

Cumra Sugar Factory's Industrial Waste Water Treatment Plant is a biological waste water treatment plant consisting of aerobic and anaerobic treatment stages. Established in 2004, the plant has a treatment capacity 3,600 m³ of waste water and the capability to treat water with a degree of contamination requiring up to 10,000 mg/liter of chemical oxygen. A capacity increase became necessary after new plants came online, which was resolved in 2007 by increasing the aerobic unit's capacity from 150 m³/hr to 300 m³/hr.

4.1.2 Pulp Steam Drying Plant

The pulp steam drying facility within Cumra Integrated Sugar Plant has a capacity to produce 200-250 tons/day of 90% dry pulp. Designed to utilize a steam turbine, the plant provides energy cost savings as compared to electric-motor based pulp drying processes used in pulp drying plants in Germany and France. The total cost of the plant including all of units (additional pulp presses, machine equipment,

pipe and plumbing, electrical, automation and construction work) was \$10 million. Considering the energy and product returns from the plant, the investment's payback period is 3 years.

The pulp waste product is reclaimed in 3 ways. Pulp containing 23% dry ingredient is given as bulk feed to sugar beet manufacturers. A 30%-dry ingredient pulp, packaged into 1,200 kg bales so that it can be preserved and used for a long time, is offered to producers. A 90%-dry ingredient pulp is formed into 13x40 mm pellets and offered in 50 kg bags as animal feed to the producers.

In the currently operating sugar factories in our country, the drying of wet pulp is performed via systems involving rotating trommels and fuel-oil furnaces. Such systems are not only costly to operate but also pose problems to the environment. Because of the direct contact between the fuel flames and the pulp in the rotating trommel-furnace, product losses between 5-12% occur and fuel and burn smells permeate the product. On the other hand, in the steam-fluidized bed pulp drying system, instead of direct flames steam at 20 bars and 208 degrees is circulated in a pipe-heater to evaporate the water. The pulp is dried in a completely fluidized environment. The steam condensates after giving its heat to the water and is sent back to the boiler as fresh water. Also, the steam obtained from the pulp in the drier is used in the first stage of the syrup evaporation process, thereby providing *a complete recovery of energy*. In the current system, the auxiliary steam supplied from the pressure reducer to the syrup vaporizer is decreased and this cut-down amount is passed through the steam pulp dryer. This setup allows both the drying of the pulp and the vaporization of the syrup be done with significant energy savings.

4.1.3 Cumra Sugar Greenhouses

In geographical conditions that are unsuitable for greenhouse operations, a large part of the operating costs are due to expenses related to the use of fuel and appropriate heating systems to provide the ideal temperature for the crop to grow in the greenhouse. Continental climatic conditions prevail in the Konya Plain. Winters are harsh, cold, and snowy, whereas summers are hot and dry. Day-night temperatures differentials are high during winter months (<http://www.sekerclub.com>, Accessed: 03.03.2011). Therefore, high heating and cooling costs connected to climatic conditions in the Konya Plain leaves investors with economically unfavorable conditions for greenhouse operations.

Nevertheless, Cumra Sugar Factory established two greenhouses in the Konya Plain with a total area of 6 decares for the purpose of cultivating alternative crops.

The water used at Cumra Integrated sugar Plant for producing sugar from sugar beets reaches a temperature of 55° C and requires to be cooled down in order to be reused in the production process. The factory uses cooling towers to cool down the hot water. The heating of the sugar greenhouses built at the Cumra Sugar Factory is done by using the plant's condensed (over-heated) waste water. While the condensed water provides the necessary heat for the greenhouses, it also subsequently provides cool water required by the sugar factory. In other words, the 55° C water from the sugar factory is routed through the greenhouses, thereby providing savings from energy used for cooling the water as well as allowing zero-cost heating of the greenhouses, which otherwise constitutes a large portion of greenhouse operating costs. The greenhouses currently produce two kinds of F1 cocktail type tomatoes, as well as bananas, which is a first in the conditions of the Konya Plain. Contrary to the widespread use of plant hormones in the Antalya province, home to 65% of the country's greenhouses, fertilization in these greenhouses are done by using bees of the "Bambus Terrestis" kind, and also, burn animal manure is mixed into the soil before planting in order to enrich the soil's organic structure. The manure is also obtained from a calf nursery affiliated with Cumra Sugar Factory. Abiding by good agricultural practices, the greenhouses are free of toxic pesticides and organic farming is carried out within the framework of social responsibility. In this year's investment program of the firm, there is a provision for the establishment of two more greenhouses on a total area of 10 decares. The products obtained from the greenhouses are offered to customers at large chain stores such as Adese and Kipa in Konya central.

4.1.4 Sapling Production Facility

Within the framework of social responsibility and with the principle of "giving back to nature what you take from nature", Konya Sugar put forth a goal of growing as many saplings as the population of the Konya province and reached this goal in 3 years. In this context, a total of 3,000 km of rural roads connecting 275 villages and towns were afforested on both sides with over 4.5 million saplings. To ensure the continuity of the forestation work, a sapling production center with a capacity of 4.5 million saplings per year was established within Cumra Integrated Sugar Plant. City Forests covering a total of 125 hectares at 4 locations were created to date, and 30 more hectares of these forests will be created every year.

4.1.5 Bio-Ethanol Factory and Bio-Ethanol Production

As the energy sources in use today begin their process of depletion, concerns of diversifying and propagating the country's energy sources and reducing its dependence on energy imports has led the firm to a search for an alternative fuel source, culminating in the establishment in 2007 of a Bio-ethanol Factory to produce ethanol from sugar beets. The factory has a production capacity of 84 million liters/year. The raw material for the bio-ethanol produced by the plant is a sugary, brownish, viscous liquid substance called molasses, a residual product of obtained from sugar beets. Thus, the residual by-product of sugar beets is converted into bio-ethanol, which is used as a source of renewable energy. The bio-fuel technology utilized in the production process is fermentation. The yeast used in the process is re-cycled using more active processes and besides providing energy savings, this allows the yeast to be usable for future fermentation processes. Also, a malodorous, dark-brown colored, nitrogen- and phosphorus-poor but potassium-rich liquid waste substance called schlep, which occurs as a waste product of bio-ethanol production and also in sugar factories that produce alcohol via fermentation, can be used as animal feed and fertilizer. Thus, no post-production residual product is left.

5. CONCLUSION

In this study we examined green production activities, which at first glance seem to be a financial burden on today's businesses, for the case of Cumra Integrated Sugar Plant.

The waste water processed in the Industrial Waste Water Treatment Plant is re-used in the production process, not only preventing the release of waste water to nature but also providing savings in water usage. As a result of the green activities at the Pulp Steam-Drying Plant; energy savings of 90% is achieved as compared the classical system, lesser amounts of air-polluting waste, dust, and odor occur, the product wastage rate is zero, a safer and more secure work environment is provided, and more of the product can be dried with a small investment. The heating system of Cumra Sugar Greenhouses is fed using Cumra Sugar Factory's hot wastewater, thereby not only allowing the greenhouses to be heated without an energy cost burden but also supplying the cold recycled water needed by the Sugar Factory using less energy. Therefore, greenhouse operation, a high-cost investment in the climatic conditions of the Konya Plain, is possible with lower

business costs under this system. In addition, considering the spoilage of products during transportation and handling, the system provides competitive advantage to the firm because of its proximity to the markets in the Konya province as compared to its rival greenhouses. The bio-ethanol plant increases the value-added of the residual products of sugar manufacturing and also provides an alternative energy source, helping this important issue faced by our country. However, despite the tremendous efforts by the private sector to build the infrastructure for biofuel production, the sector has not achieved the desired commercial success. The main reasons for this can be listed as follows: the tax clamp on the sector, fuel distributors apathy to the subject, and most importantly, the lack of any governmentally recognized document of biofuel policy. Today, the biofuel facilities built with very large amounts of investment are in an idle state. In order for the country's biofuel industry to revive, it is necessary to implement a mandatory blending ratio policy or an effective support mechanism. Especially considering the recent social explosions in the geography having a large portion of the world's petroleum reserves and the resulting political crises, it is imperative that such governmental support comes urgently to help reduce the country's foreign energy dependence. The firm produces saplings in its sapling production facility and plants them in the Konya province for a sustainable environment, thus fulfilling a social responsibility by giving to nature what it takes from nature.

In return for its investment in green activities, Cumra Integrated Sugar Plant achieves such strategic competitive advantages as savings in business costs, elimination of product loss, improvement of processes, improvement of the work environment, contribution to sustainability, fulfillment of social responsibility, and thus, preference by consumers.

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