Improving Environmental Performance at a Potato Chip Plant in Kazakhstan

Project Title : Environmentally Friendly Potato Chip Production at the ASF Plant in Talgar, Kazakhstan
Leader: Almaty Snack Food Company Talgar Potato Chips Producing Factory (Talgar, Kazakhstan)
Partner: Savory Snacks, LLC (Madison, Wisconsin); Environmental Control Opportunities, LLC (Richmond, Virginia)
Location: Talgar, Kazakhstan
Project Duration: February 2000 - January 2001
EcoLinks Project Investment: Total Project Investment: $61,950; EcoLinks Grant Support: $46,350; Project Team Cost Share Contribution: $15,600.

Best Practice: Transferable Solution

The project is a Best Practice. It demonstrates a transferable, systematic approach to assess and address environmental problems at a potato chip plant in Kazakhstan. Using EMS training and development as a framework, the EcoLinks project team looked at the entire production process at The Almaty Snack Food Company Talgar Potato Chips Producing Factory (ASF) from initial inputs to final product and waste outputs. This approach resulted in improvements that not only lowered the toxicity of waste and pollution, but also reduced waste and pollution. The project also demonstrated that for most small and medium sized producers in the Newly Independent States (NIS), relatively low cost improvements and changes in management practices can bring significant environmental and economic benefits.

Several aspects of this project are transferable to other enterprises in the NIS. The systematic approach to identifying and addressing environmental problems, embodied in the Environmental Management System developed at ASF as a part of this project, is widely transferable to other small-scale food and beverage producers in the NIS. The low-tech water filtration, aeration and partial water recycling system installed at ASF also provides an inexpensive blue print for addressing waste water problems for small-scale food and beverage producers in the NIS.

Project Summary

The Almaty Snack Food Company is the first potato chip plant to be established in Kazakhstan. It started in 1998 and is located in Talgar. ASF is relatively small, employing 40 people and producing about 80 metric tons of chips per year. The potato chip processing plant is located in a former fruit storage warehouse which did not have any on-site wastewater treatment facilities and is not hooked up to city sewage. As a result, during ASF's first year in production, over two metric tons of untreated wastewater from the plant were dumped into a nearby stream. The wastewater has a very high starch content and overloads the stream with biological contamination. Energy and water use levels were about 30% higher per unit of production than comparably sized plants in the United States. Correspondingly, production costs were almost prohibitively high. Plant management decided to look for options to minimize their impact on the surrounding environment and to make more efficient use of resources in order to lower their production costs.

Before project implementation, ASF used small, poor-quality potatoes in chip production. The poor quality of the potatoes used resulted in a high waste-to-output ratio. In addition, ASF does not have access to fresh potatoes for more than half of the year. Long-term potato storage is needed during the off-season months. To compensate for these factors, the raw chips had to be "blanched" in hot water before frying them to reduce their sugar content to prevent browning. The blanching process is the single largest user of energy and water at the plant. It accounts for 75% of the plant's energy consumption and 33% of the plant's water needs. Wastewater generated from the blancher has an extremely high starch content and causes water pollution when released into a nearby stream.

Together with American partners Savory Snacks, LLC and Environmental Control Opportunities (ECO), ASF was awarded an EcoLinks Challenge Grant. The purpose of the EcoLinks Grant was to design and implement an Environmental Management System (EMS) at ASF and to identify and implement measures to make more efficient use of natural resources in the production process. As a result of this EcoLinks funded project, a wastewater filtration and partial water recycling system was installed. Improvements in processing and management practices were implemented, which have significantly reduced water and energy consumption. Follow ing implementation of these practices, ASF's cost of production for 1 kilogram of chips dropped from $3.60 to $1.70.

ASF continues to implement the EMS developed in this project. ASF anticipates seeking official registration during the year 2003-2004. ASF continues to work with local farmers to reduce the need for potato blanching by introducing specific farming techniques and high-starch potato strains.

Project Activities

The main objective of this project was to improve environmental performance of the ASF Talgar Potato Chips Producing Factory. Specifically, the plant management wanted to 1) reduce water consumption and address wastewater problems; 2) improve

the input-to- product output ratio; 3) introduce ISO 14000 standards; and 4) develop and implement an Environmental Management System.

The project activities were as follows:

1. Conducted initial environmental assessment of plant facilities and management processes

Action: ECO focused their assessment on: 1) the source and cost of the water supply, 2) general information on topography and soil, 3) cleaning practices for the fryer and use of chemical cleaners, 4) local options for sampling and analyzing wastewater, 5) amounts of water used at each stage in the process, 6) evaluation of wastewater from the plant on surrounding surface waters, and 7) review of legal regulatory requirements at the plant. Savory Snacks looked at the production process itself, from the quality of input potatoes and their processing (specifically the blanching, peeling, and frying stages) to the ratio of inputs to the product produced, and the corresponding waste streams.

Product(s): Assessment of facilities and management processes.

2. Conducted initial introductory training for staff on EMS and ISO standards

Action: The training involved an overview of the ISO 14001 Standard, explaining each clause of the Standard with examples of implementation. During the training, information for a gap analysis at ASF was also gathered.

Product(s): 1) Trained staff on EMS and ISO Standards 2) Information for gap analysis.

3. Conducted a wastewater assessment

Action: Samples of wastewater outputs at all stages in the production process were taken and tested on site for pH levels, conductivity, turbidity, dissolved oxygen, temperature and salinity. Samples were brought to the United States for laboratory analysis and tested for total solids, total suspended solids, and total dissolved solids. Wastewater samples showed that ASF's biggest problem is the low level of oxygen (due to biological overloading) in its water discharge, which threatens the integrity of the stream into which the wastewater flows.

Product(s): Results of wastewater analysis.

4. Developed recommendations to address wastewater problems

Action: ECO provided recommendations to address ASF's wastewater problems based on an environmental analysis and the results of lab samples. Specifically, ECO recommended introducing a water filtration and partial recycling system at various processing points. The system recommended by ECO begins with the installation of a settling tank where starch can be settled out from process waters and reused locally. After the starch is removed, the water passes through a sand filtration system combined with a mild disinfectant. Following sand filtration, the water can be reused

at least twice in the process washing basins. A trickling filter was constructed for the final wastewater output. Crushed stone is used to aerate the wastewater to increase the oxygen level of the wastewater. Due to financial constraints, more expensive methods involving a commercial aerator or a circulating pump were not considered feasible.

Product(s): Recommendations for addressing wastewater problems 2) Wastewater monitoring system.

5. Devebped recommendations to improve the input-to-product output ratios

Action: Savory Snacks developed recommendations for improving input-to-product output ratios. The recommendations focused on introducing an optimal potato variety (a larger, high starch, low-sugar potato), implementing optimal storage methods (appropriate temperature control and the use of dormancy enhancers) and processing techniques to reduce the need for a blancher to improve input-to-output ratios. Savory Snacks also trained ASF staff to use a hydrometer to test the dry content of potato varieties (optimal potatoes for chipping have a high dry matter content).

Product(s): 1) Recommendations for improving input-to-product output ratios 2) Staff trained to use a hydrometer to test the dry content of potato varieties.

6. Collaborated with local farmers to optimize potato varieties and size

Action: ASF began working with local farmers in Talgar to optimize potato varieties and to harvest larger potatoes (thereby reducing the peel/potato ratio) according to Savory Snack recommendations.

Product(s): 1) Optimum potato strain 2) Appropriate growing techniques.

7. Conducted field investigations of pollution prevention methods at other sites in the US

Action: Four employees from ASF trave led to the United States to learn about pollution prevention methods at US chips-producing facilities and to attend SnaxPo 2000, an annual exhibition sponsored by the Snack Food Association of America. The group visited the Poore Brother, Inc. potato chip plant in Arizona and toured the plant's wastewater facility. They also visited the Good Chips, Herr Foods and Martin's Chips plant sites. This trip was arranged by Savory Snacks, LLC.

Product(s): Information on US pollution prevention methods.

8. Conducted specific training on ISO 14001 Standard Clauses

Action: ECO continued the training for ASF employees on the ISO 14001 Standard Clauses: Environmental Aspects/Impacts Analysis; Objectives, Target, and Environmental Management Programs; and Environme ntal Procedures. The training involved a review of the environmental aspects and impacts of the ASF plant and its operations. ECO worked with staff to develop environmental objectives and targets.

Upper management developed a schedule to complete EMS documentation with employees.

Product(s): 1) Trained ASF staff in ISO 14001 Standard Clauses 2) A plan for achieving ISO 14000 standard certification 3) Schedule for completing EMS documentation.

9. Prepared required documentation to acquire an Environmental Passport

Action: Documentation for obtaining an Environmental Passport was prepared. An Environmental Passport is similar to a permit, and is required for all industrial producers in Kazakhstan. Environmental passports are issued by the Regional Department of the Ministry of Ecology. Required documentation was prepared and included a description of all the inputs, the production processes and facilities, the environmental impacts, and the local climatic and hydrological conditions. Based on this application, ASF was granted an Environmental Passport in December 2000. The passport outlines allowable wastewater and pollution concentration limits for ASF production facilities.

Product(s): 1) Documentation for obtaining an Environmental Passport 2) An Environmental Passport from the regional department of the Ministry of Ecology.

10. Installed technological improvements for improving water and energy efficiency

Action: Equipment modifications and installations were made to improve water and energy efficiency. The wastewater filtration, treatment and partial recycling system recommended by ECO was installed at the ASF plant. ASF modified the blancher, equipping it with additional conveyers, to improve the water consumption-to-chip production ratio.

Product(s): 1) Installation of a filtration, treatment and partial recycling system 2) Modified blancher with additional conveyors.

11. Developed core ISO 14001 Environmental Procedures

Action: ECO, in cooperation with the ASF plant management, developed core ISO 14001 Environmental Procedures. This is a core document required by the ISO 14001 Standard, and is necessary for an effectively functioning EMS. ASF and ECO worked together to develop an Environmental Management System Manual. ECO recommended that ASF implement the EMS for two to three years before attempting to receive official registration. Prior to this, ASF may opt for self-declaration.

Product(s): 1) An Environmental Management System at ASF 2) An EMS manual for ASF that designates the environmental policy of the company.

Project Benefits

This project built the capacity for ASF to develop and implement an EMS according to ISO Series Standards. Through this EMS, several environmental and economic benefits are generated from reducing wastewater and energy consumption and reducing production costs. The project benefits are outlined below.

Capacity Building Benefits

The EMS training conducted as part of this project built the capacity of ASF employees to implement environmental practices according to ISO guidelines. The trainings specifically enhanced the management and record keeping skills of ASF employees allowing them to make environmental improvements.

Environmental Benefits

As a result of this project, wastewater volume was reduced by nearly 100%. In addition, final wastewater output reaching the stream is less polluted, containing less starch and more oxygen. As a result of improved management and processing procedures, it was possible to completely phase out the blancher from September to January, saving 75 % of total energy and 33% water use during these months.

Energy needs were decreased by over 30% annually.

Economic Benefits

The implementation of improved management practices and processing efficiencies reduced production costs of 1 kilogram of chips from $3.60 from to $1.70.

Lessons Learned

- Like most small to medium size producers in the NIS, ASF production profits have not reached the level where the purchase of state-of-the-art environmental controls and technologies can be justified. Project recommendations were successfully implemented because the American partners presented low-cost solutions that could be implemented using local materials and require minimal maintenance.

- Due to financial constraints, achieving ISO 14001 certification is probably not realistic for most small-scale producers in the NIS. Even without certification, however, the Standard (specifically EMS sections) can be a very useful tool in implementing a systematic approach to assessing and addressing environmental problems.

- Most small and medium sized producers in the NIS can implement relatively low cost improvements and changes in management practices that may bring significant results not only with regards to improving the environment, but also in regards to the company's bottom line.

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