



The National Cleaner Production Center - Macedonia

CP Assessment Report

Company: Susara Lars

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Assessment methodology

Cleaner Production (CP) is defined as the continuous application of an integrated preventive environmental strategy to process, products and services to increase the overall efficiency and to reduce risks to humans and environment. A CP project follows a certain methodology and consists of the following elements: data collection, analysis of the collected data, option generation, feasibility analysis, implementation, controlling and continuation. This report follows the UNIDO CP assessment methodology but it is based on one company visit. Therefore the report should be assumed as basic CP assessment report.

Company profile

- Brief history, Ownership, Number of employees

Susara Lars is a private enterprise specialized for production of dehydrated vegetable products.

The facility was constructed in 1993 and for last 15 years become a medium innovative company with clear vision for production expansion. The Susara Lars production facility is located in central-eastern part of Republic of Macedonia, about 6 km southwest of the town of Stip. The facility has no immediate neighbours within a distance of about 100m and is surrounded by farmland of grain and vegetables and prior to this the land was not used for industrial purposes.

The company has 5 permanent workers and about 30 seasonal workers. The production season lasts for approximately 4 months (from July till November), and during this time the factory operates on a 24-hour basis. Current production rates are approximately 15 tonnes/day, thus giving an annual production of 1500-2000 tonnes. The owner of the company plans to increase the capacity of drying vegetables by introducing new drying technologies and new equipment with faster drying times.

- Activities, Main production, Products

Susara Lars is a medium size company which is rapidly developing its business interests in the vegetable processing industry. The owner of the company is young educated person who carried out both, the management and production process activities. Susara Lars is export oriented company with already established successful export relationship with a Dutch company. The current production process involves the dehydration of cabbage (55%), leek (35%), peppers (5%) and beetroot (5%).

Also, there is a positive social impact of the company in the region, by providing permanent and seasonal employment for a number of local people of the Štip area. The company has prepared a study to increase production and decrease energy needs by installing a centrifuge prior to drying, based on solid financial and environmental principles

- Plans for production expansion, investments, new equipment

Susara Lars plans to decrease the energy and water consumption by implementation of several technological improvements in the production process. As a first step the company intends to add a centrifuge to the production line to dewater vegetable materials immediately before the drying stage of the process. This equipment will increase productivity, reduce production costs and energy needs, increase the company's purchases of local primary product and enable greater exports of dehydrated product. The savings in energy consumption by introducing this new equipment are estimated on 25-30%, and the savings in human resources will be expected also.

As a big energy consumer Susara Lars plans to decrease the consumption of LPG, which is currently 1, 1 ton/ per day, getting in consideration continues increase of prices of LPG in the country, by implementation of new technologies for energy production of renewable sources - solar technologies (photovoltaic and solar thermal collectors) and geothermal pumps. The detail feasibility study for introducing these modern technologies from renewables in the company and techno economical analysis for each renewable source has to be made.

The company plans to reduce the water consumption also, by introducing reuse and reduce of water in some production processes. The plans are not elaborated in a proper form yet, so the additional efforts in this direction are planed to be made with a help of relevant national experts or companies.

- Implemented standards, awards, certificates, permissions

Susara Lars reported that they have the following current permits.

- A construction permit
- A fire safety permit
- HACCP certificate
- An inspection certificate for the proper storage and use of propane gas in large quantities.

The company is currently in the process of application for IPPC (Integrated Pollution Prevention and Control system) permit.

Susara Lars has been successfully presented on a several regional and international Fairs for food and agriculture, and receives a special awards and certificates for quality and healthy products. The last one was the International Food and Agriculture Fair in Paris, October 2008, where dehydrated vegetable products of Susara Lars have been presented.

Material Flow Analysis

- Processes, process diagram

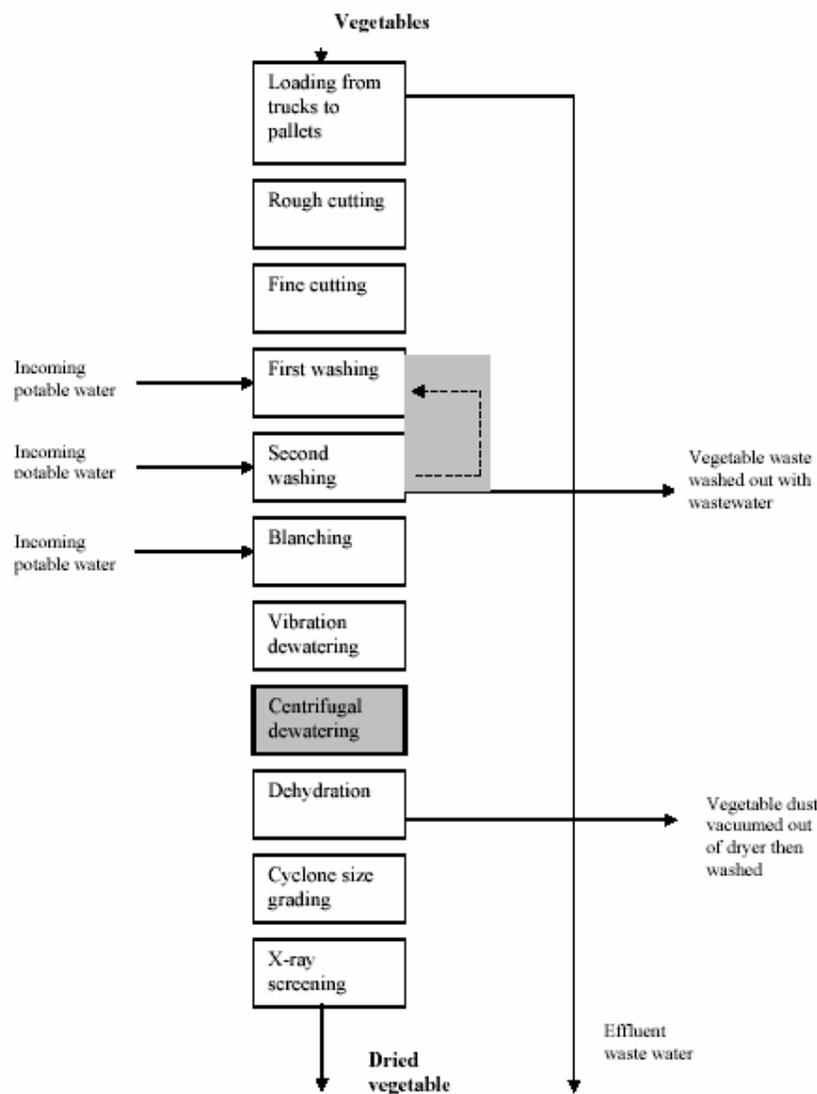


Figure 1: Product processing cycle for dehydrated vegetables in Susara Lars with the planned addition of centrifugal dewatering (grey) and water reuse from secondary to primary washing (grey).

The production process in Susara Lars is not too complex and is quite well organized in the appropriate sized building.

The first step of production process is cleaning of the raw vegetable materials on-site at the farms from excess leaves and stems before being brought to the factory. After being unloaded from trucks into specialized pallets, the vegetables are transferred into a disc cutter which coarsely cuts them into manageable pieces. Via conveyer belt the product is then cut more finely to the shape desired by the customer, moves to primary washing, is then rewashed, blanched, dewatered through mechanical shaking on a vibrator conveyer and then transferred to the dehydrator.

The drying cycle currently lasts 3-4 hours. Following drying, the product again moves via conveyer belts to a cyclone which grades the dried vegetable into different sizes. The product then passes through a metal detector and is finally bagged for transport in food-grade plastic bags.

Hot water for blanching of approximately 65% of product is provided by the gas-fired boiler located outside the main factory building.

The drier is four years old and employs contemporary insulation and energy saving techniques. Presently, hot air from the second half of the drier is ducted back into the drier to recycle heat and save energy needs; however, air from the first chambers of the drier is currently not able to be recycled since it is too humid. The addition of the centrifuge would also provide the possibility recycle heat-laden air from the first stage since a great deal of water would already be removed prior to drying.

- **Materials handling**

The owner claims that there is not a dangerous or toxic raw material in the production process. There is not a special storage area for raw materials because the purchase of vegetables from the suppliers is on daily basis.

There are some chlorine derivatives used in combination with UV light to sanitize the process water in the pretreatment phases. These materials are currently not stored properly and needs to be removed to a safe area, which is only available to properly trained staff. There is an occasional use of detergents and domestic cleaning products, but they are bought in small quantities and used immediately.

There are some problems with storage and safety surrounding of the propane gas tank. There are no smoking or naked flame signs in the surrounding, the fence surrounding the tank is not well maintained and there is no roof to protect the tank from open weather conditions.

The company use oils and fats in the production process in a small quantities and the owner purchase only the special high quality fats for food industry. Therefore, some special storage area for these materials is not determined.

The quality control of the final products is carried out on a very high level, first by automatic testing, then by visual testing, and finally by testing with metal detector. All this procedures are necessary for export of sustainable high quality final dried vegetables in European market.

- **Raw and waste materials, management of waste materials**

Food processing industry, i.e. the company for drying vegetable products belongs to those types of industries with low level environmental impact. However, some activities for raw and waste materials management have to be settled.

Very little waste originates from this production facility. There is no use of salt, acids or other chemical inputs in their process. Vegetable washing produces some solid waste (soil, vegetable pieces, etc.). Large pieces of organic waste are screened out and collected by a company

which manages hunting reserves for wild game animals. These vegetable wastes are collected three times per week then used as animal fodder.

The only packaging is large plastic bags which are sent with the product for export.

Water leaving the production line goes through three settlement ponds and two screenings before being absorbed into the ground (there is also a bypass gate for this system). There is not implemented reuse process of waste water, and some activities are going to be carried out in this direction.

- Water in the technology processes, waste water treatment/management

Susara Lars is relatively a big consumer of clean drinking water used in technological process. The plant relies on water provided from ground wells pumped by the company's on-site pumping station.

There is a pretreatment facility in the company yard, where some halogenated components in combination with UV light are used to sanitize the water used in the production process. This water is regularly tested by the Republic Department of Health Protection.

The biggest quantities of water are used in the process of washing the vegetables and some for blanching and cleaning of floors and equipment. The dryer is cleaned about once per week to remove vegetable dust by first using dry techniques and then high pressure washing.

The water consumption in the high season is estimated on 10 l/s. Since water is pumped from own ground wells it was non-metered, and there was a little concern given to its expenditure in the past. The new legislation for waters is more strictly defined for usage of ground well waters and more attention has to be paid to this issue.

There is not implemented any measures for reuse of waste water, but some activities are going to be carried out in this direction. The wastewater treatment system at this site includes screens and three sedimentation tanks. There are some concerns about the adequacy of the existing sedimentation tanks that have discharged to the soil for more than 20 years.

Energy Management

The energy management as one of the main issues in the company has to be considered. Susara Lars is a big energy consumer, and the energy consumption has to be expressed not in absolute values, but per unit of product. The energy costs in total product prices participated with 50%, which is enormously high value for this kind of industries. One of the electricity costs are around 1000 Euros/ month in the peak working season and 100 Euros/ month in the off-season.

Main process with high consumption of electricity is drying process. Other major sources include the water pump, lighting. The water pump only operates for about 2 hrs / day during the working season, so this is not largest component of the electricity costs.

Propane gas forms the largest proportion of energy use in the production facility. In peak season gas use is around 1 t/ day - 1, 1 t/day, with propane being used for the drying unit, the boiler to produce hot water for blanching and the two 2-tonne forklifts (there is an additional forklift which operates on diesel).

There are two compressed air systems with the capacity of 350 l/min, used in the production process as electrical energy consumers. Drier is a modern piece of equipment employing reducing techniques to maximize heat use by piping spent, heated air back into the drying chamber. In addition it has insulation to conserve heat.

Company intends to add a centrifuge to the production line to dewater vegetable materials immediately before the drying stage of the process. This equipment will reduce production costs

and energy needs. The savings in energy consumption by introducing this new equipment are estimated on 25-30%.

Environmental Performance of the Company

Drying food production belongs to the food processing industries with relatively small environmental impact. The insight visit of the company performs the picture for well organized production process in quite large building, with separate segments for different production processes. The company takes care for clean and save working area in the whole facility, although some improvements could be made in the company's yard.

Susara Lars has already implemented some of the standards for environmental protection and pollution prevention. Also, the good hygienic habits and continues training for the employees working in the food industry, is performed.

There are very few emissions as result of the process. The area where emissions occur is appropriately ventilated. Waste water emission is currently under regular supervising of the legal environmental institutions, but some improvements in this direction could be done in the future on the regional level.

The company hires relevant persons/companies to conduct environmental assessment for different purposes. The application for IPPC permit for adjustment with operational plan is going to be prepared by environmental consultant company.

Waste materials handling

There are no obvious physical impacts resulting from the drying operations at Susara Lars. Further expansion of operations to include vegetable products in jars will require a reassessment of the facility since it may result in the introduction of chemical inputs and related hazardous waste outputs. The effect of discharging wastewater into surface soil is unknown since the water treatment system has not been serviced for many years and may have leakage points. However, water that is discharged at present has a low potential for environmental harm since it is basically clean water with trace amounts of vegetable matter.

Current Operating Practices

- Good operating practices

The operators are provided with gloves, hats and special working suits, to keep the final products of any kind of pollution. All operator job functions are well defined, even for the season workers. Management is permanently on site, supervising the process and employees. Company have some specific goals for energy savings, water savings and waste minimization, especially directed in waste water decreasing. They are also trying to minimize every waste and they are aware of direct loss of materials. Improvement toward good operating practices is expected after the new equipment will be installed.

- Good housekeeping

Susara Lars is company in expansion, going to become a medium size company, so the maintenance of a clean, orderly work environment is implemented as much as possible. The work environment is almost clean. Spillage is moved occasionally. The floors are cleaned by brooms and water under pressure. The walkways are free of containers. The employee interest in good housekeeping is stimulated.

The owner of the company and director in the same is committed towards implementation good housekeeping measures as a daily practice in the company. He has a clear vision that by low cost or no/cost measures a big achievements could be done in energy and material (water) savings, for example: better insulation of the dryer which is enabling in the same moment a heat recovery in some part, return/reuse of rinsing and cooling water already implemented in some steps of production process, filtration of organic waste and sewage from the vegetables during processing, etc

- Partnership with other stakeholders

The raw materials, fresh vegetables are supplied by the neighboring farm lends in the Stip area. Organic solid waste is brought back to the farm lends. The recyclable waste is occasionally taken away by third parties. The owner of the company is well educated in business management, so he performs the basic principles of good relationships with suppliers and other stakeholders in everyday practice.

Identification of CP Opportunities

- Technology processes improvement

Susara Lars actively participated during the CP assessment. Some of the recommendations and discussion during the site visit identify the cleaner production measures and the possibility for implementation in some processing units.

During the cleaner production assessment at the end of the high season for drying vegetables, some activities recommended to the general manager of the company identify no cost and low cost opportunities to reduce water usage and wastewater pollution. There are several opportunities that are recommended to further improve production standards, efficiency and environmental sustainability; however, the company has already made a concerted effort to better itself in these areas. In particular, the addition of a centrifugal dewatering step will increase production and environmental efficiency.

- Water

As a big water consumer, the company needs to have special concern for water savings, by reducing usage of clean water and reducing the emissions of waste water as a pre-emptive step before Macedonian water regulation comes into force. Therefore, several measures as well know CP opportunities, could be undertaken:

1. There is a possibility to reuse water from the second stage washing by allowing this relatively clean water to be returned into the first washing stage. This would save water and reduce wastewater outputs.
2. The water savings in a cleaning process by substituting high pressure floor cleaning with dry cleanup techniques.

: 3. Install water meters on all main water supply distribution lines; monitor water use and record water consumption; use a closed system for cleaning operations; use low-volume/high-pressure washers for cleaning, and optimize the work of compressed air system.

4. Staff education and training in water efficiency will form an important step in water saving.

- Waste and emissions minimization

It is recommended that the company implement a broad environmental management program such as Integrated Pollution Prevention and Control system (IPPC). The new legislation for waste management and waste water treatment is prepared in accordance to EU legislative, so the necessity of implementation the law in practice is a near future. Application for IPPC permit will enable the company to introduce some measures designed to prevent or, where is not practicable, to reduce emissions in the air, water and land from the industrial activities, including measures concerning waste, in order to achieve a high level of protection of the environment taken as a whole.

Because the nature of the drying process does not involve any chemical inputs, the system is relatively clean and free of hazardous waste production. However, the two main waste streams exiting the factory are washing waters containing small amounts of vegetable material and combustion gases from the propane-fired dryer and boiler.

There waste water facility has to be reconstructed or rebuilt, which is relatively expensive investment for Macedonian companies in general, but there must be some efforts to solve the problem with industrial waste waters going directly in the rivers. The regional authorities have to prepare a feasibility study for WWTP which is going to serve the industrial facilities in a wider industrial region, so the estimated cost for building the plant will be decreased.

- Energy saving and energy efficiency measures

The installation of the centrifuge before drying of vegetable product will improve the production process, decrease the gas consumption, increase the energy efficiency and improve the humanization of the work. There is a plan to recycle air from the first stage of the drying unit after the installation of the centrifuge.

The other possible energy efficiency measures could be performed by continues monitoring of the working process, regular maintenance of machines, water pumps and forklifts, maintenance and optimization of the work of compressed air systems, ect.

It is recommendable for such type of companies located at the southeast part of Republic of Macedonia, with lot of sunny days per year, to get in consideration possibility of installing photovoltaic solar systems. The PV system could be used for producing electricity as additional source of energy, to reduce the energy consumption and to improve the image of the company by usage of green energy and introduce of environmental friendly measures.

The other possibility in energy savings and energy efficiency could be installation of a geothermal heat pump that will provide some reduction in energy consumption by injecting naturally preheated water into the boiler vats used for vegetable blanching.

There are some general CP methods that can be recommended to help conserve electricity at the facility including: implementation of good housekeeping measures such as turning off equipment and lights when not in use; use of fluorescent lights and/or lower wattage lamps; use of more efficient equipment when replacing old equipment (such as motors and heating units); installation of computerized controllers to better regulate motor output; installation of timers and

thermostats to control heating and cooling; preventative maintenance of operational processes and pipes so as to improve efficiency and minimize losses.

Concluding Remarks and Recommendations

Susara Lars is a successful story for SM enterprises in Republic of Macedonia, which is rapidly developing its business interests in the vegetable processing industry. It becomes a medium innovative company with clear vision for production expansion. The owner of the company is well educated person who carried out both, the management and technical coordination of production process. Susara Lars is export oriented company with already established successful export relationship with a Dutch company.

Susara Lars actively participated during the CP assessment. Some of the recommendations and discussion during the site visit identify the cleaner production measures and the possibility for implementation in some processing units.

During the cleaner production assessment at the end of the high season for drying vegetables, some activities recommended to the general manager of the company identify no cost and low cost opportunities to reduce water usage and wastewater pollution. There are several opportunities that are recommended to further improve production standards, efficiency and environmental sustainability; however, the company has already made a concerted effort to better itself in these areas. In particular, the addition of a centrifugal dewatering step will increase production and environmental efficiency.

The goals and the aims of the cleaner production have been explained by the national experts (NE) from the National Cleaner Production Center (NCPC) during the CP assessment process in Susara Lars. The general manager and the owner of the company participated in all the phases of the company assessment. The general manager is well educated businessmen and he has already some knowledge about the cleaner production principals. During the visit he showed big interest to learn more and to cooperate. An example of his awareness of the CP principals is fact that he is going to introduce some activities arising from the CP options as a tool to achieve material and energy savings. The feasibility study for certain CP activities have to be prepared in the short term period. A detailed CP analysis, with comprehensive materials flow, energy management and environmental performance analysis was recommended. Also further cooperation with the NCPC was recommended.

Getting in consideration that CP assessment in the company was carried out in a certain specific conditions during the high season of drying production process there was no possibility for more persons to be trained during the site visit. However, the company management is aware that training is needed also for the rest of the employees, so the company will organize some training courses in the winter period. Also, the company hires outside persons/consultants to conduct environmental assessment for different purposes.

Skopje, 14.11.2008

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Annex
Photo documentation



Fig. 1 Primary washing tank



Fig. 2. Cyclone size sorter of products



Fig. 3. Washing tanks and rotating booms



Fig. 4. Rough cutting and washing



Fig. 5 Blanching process



Fig. 6. Centrifugal dewatering and dehydration



Fig. 7. Visual and X-ray inspection of the products



Fig. 8. Packaging department