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Regional Activity Centre for Cleaner Production

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No. 9 Pollution prevention case studies

Cleaner production in a sugar mill thanks to the adoption of good practices and to process changes

Company	Sucrerie Nationale de Betterave - SUNABEL (Machraa Bel Ksiri - Morocco).
Industrial sector	Agro-industry. Sugar mill branch.
Environmental considerations	The activity of beet sugar mills is seasonal (the beet campaign goes from June to August). The sugar mills are large consumers of water (80,000 m^3/day). Water is used for the washing and for the transportation of the beet, for the cooling, for the diffusion during the extraction of the sugar and for the washing of the floors, tanks and machines. The washing and transportation waters represent 50% of the pollution in organic matter and 90% of the pollution in suspended matter. As for the solid waste, around 200,000 tonnes a year of waste are deposited in the vicinity of the factories. The quantity of fuel used by the sugar mills for the production of energy represents over 120,000 tonnes of carbon dioxide a year emitted into the atmosphere.
Background	SUNABEL sugar mill, belonging to the Gharb and Loukkos beet group, was built in 1968. At that time, the builder did not take into account either the economic aspect of water consumption or the wastewater quality aspect. It was only from 1980 that the company became very sensitive to the problem of the environment and more particularly to the problem of saving water. Indeed, during this period, Morocco underwent a long cycle of drought, which resulted in a reduction in the availability of water and in a generalised increase in the production costs. Faced with this problem, SUNABEL, after carrying out an environmental audit, undertook a certain number of actions whose main objective was saving water and the prevention of and fight against pollution.
Summary of actions	The following modifications were made: – The installation of a sugar-beet cleaner on the beet unloading circuit. This has made it possible, on the one hand, to eliminate a good part of the earth and of the waste which accompanies the beet and, on the other, to reduce the quantity of earth sent to the decanter and to the sludge ponds. – The fitting-out of the radicle station with the aim of separating the hydraulic transportation water from any organic matter, which could affect its quality. – The recycling of the beet transportation waters at the level of the washer, the stone remover and the washing of the radicles. This has allowed a reduction in the overflow of the decanter. – The addition of a third water decanting basin feeding a factory and its treatment with lime and aluminium sulphate to improve its quality and allow it to be recycled.

– The recovery of the hot water overflow and the cooling of this water by pulverising above the first industrial water basin.
– The recycling of part of the cooling waters at gas washer level, at CO_2 pumps liquid ring level and at the small cooling tower level. After use, these waters are again recycled at the level of the water treatment basin feeding the treatment factory where they undergo a correction of the pH and of the temperature.
– The collection, in a pit, of all the cooling waters. The water recovered in this way in this pit having a temperature greater than 40°C and a flow rate of 200 m^3/h is recycled at cool water tub level after passing through a cooling tower.
– The installation of a plate exchanger to heat up the press waters starting from the hot water. This has made it possible to recover the calories available from the hot water, to reduce the consumption of steam and to recover all the cooled hot water at the exchanger outlet and to recycle it at hot water collection tub level.
– The planning of the cleaning-out of the two sludge ponds, making it possible to ensure the autonomy of the stocking of the muddy waters throughout the sugar-producing campaign.

Balances

Production capacity (tonnes of beet)	Water consumed before reduction	Water consumed after reduction	Water consumption savings	Investment	Payback period
3,000 t/day	460 m^3/h	200 m^3/h	60%	USD204,000	26 months

Conclusions

Process modifications carried out by SUNABEL, in order to reduce water consumption and to improve the wastewater quality, have also enabled the company to reduce production costs and to improve environmental impacts generated by its activity.

NOTE: This case study seeks only to illustrate a pollution prevention example and should not be taken as a general recommendation.

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