National Development Plan 2007 - 2013

Cleaner Greener Production Programme

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

CGPP2004/20

Reduction in milk solids in waste to effluent treatment plant

Wexford Creamery,
Rocklands, Wexford

Wexford Creamery was established in 1963 and is located on the outskirts of Wexford Town on the estuary of the river Slaney. It is part of the Dairy Crest PLC - largest manufacturers of cheese and liquid milk products in the UK and employs 7500 people. Wexford milk producers have a 20% interest in the company and play a key role in its success by providing premium raw milk for cheese and liquid milk products.

Cheddar cheese (14000 tonnes), Whey concentrate (5000 tonnes) and Liquid milk products (2 million gallons equivalent) are produced at the Wexford site. 97% of the cheese manufactured at Wexford is exported to the UK and sold in all the major supermarket multiples. Whey concentrate is contracted to a neighbouring dairy processor for conversion to added value products and the liquid milk products are sold on the Irish market. It has recently been awarded 3 Gold Medals for Vintage, Extramature and Mature cheeses at the World Cheese Show in London. The plant has an experienced management and workforce of up to 100 people and processes milk from 400 milk suppliers in Co. Wexford.

Wexford Creamery is accredited to ISO14001, BRC (higher standard), Quality mark, Hygiene mark and its laboratory has a Camden Laboratory Accredited System. It has recently applied for an IPPC licence.

At a Glance

A major part of wastewater produced at Wexford Creamery is derived from the cleaning and sanitising of dairy equipment in milk intake and processing areas of the creamery. The main objective of this project is to reduce waste i.e. to minimise the COD and suspended solids content of wastewater prior to treatment in the effluent plant before release to the Slaney estuary. It was thought that this could be done by clarification or filtration thus saving energy usage in effluent treatment and also reducing sludge volumes for land spread which would benefit the environment and the company financially. The involvement and training of staff in the nature of waste, how to measure it and how to prevent it was an integral part of the project and has to be the major driving force behind a study of this nature.

At the outset it was intended to use state of the art technology-ultra filtration or clarification to capture some of the suspended solid material in the waste water. However research showed that this was only partly feasible with a long term payback. We investigated methods of reducing water, and energy usage and product and raw material losses to waste by looking at plant systems and operations. The project emphasis on reuse of condensate as a substitute for water in certain key peripheral areas proved successful. The introduction of chlorine dioxide treatment as a biocidal agent for evaporative condensate which was previously a waste, meant that it is now used in cooling tower water makeup, milk tanker cleaning and as a diluent for chemicals in wastewater treatment as well as it's already established use in evaporator cleaning (CIP). Much effort was expended in establishing the suitability of condensate for these functions by testing and monitoring.

This project also gave an impetus to facilitate the continuous reuse of white whey (a salt-laden by-product of cheese manufacture), in whey evaporation rather than despatching it off site as a waste. The company has now moved into the area of energy monitoring and we should see savings of 5-7% in the first year.

The involvement of staff in plant/process efficiency studies has heightened awareness levels regarding minimising waste. Members of the production, maintenance and laboratory departments were involved in monitoring and assessing the efficiencies of cleaning and CIP programmes in the different areas of the cheese/whey/liquid milk processing. The greater awareness levels achieved combined with a staff training programme on waste loss management and the importance of process efficiency at Wexford Creamery, has resulted in a reduction in water/product losses as well as energy savings in steam and electricity usage.

Aim of this Project

The aim of the project was to reduce waste, to increase awareness of waste and to recycle and reuse where possible. The primary objective was to recover suspended solids from the wastewater mainly produced in removing plant and product residues by plant cleaning and by accidental losses. The aim here was an innovative one, involving an investment in clarification or membrane filtration systems and is not used elsewhere in the food and drinks industry. Other objectives included energy usage reduction, staff training to increase awareness of waste and its concomitant cost, to reduce water consumption mainly by substitution, where possible with condensate /distillate from the evaporation plant and by good housekeeping. Water costs 1.20 euro/1000litre to the company, the provision of water evaporate from whey processing on the site to replace water purchased from the local authority would be environmentally and economically acceptable to Wexford Creamery. The other advantage of using condensate is to reduce the hydraulic loading on the effluent treatment plant thereby saving energy and treatment costs.

Project Description

White whey is a particular stream of whey derived from cheese manufacture. It originates in the salting conveyor and cheddar blockformer areas of cheese manufacture. It tends to be of poorer quality than the vast bulk of the standard whey because of its longer residence time in the plant. However it is rich in butterfat and total solids content and it is a valuable addition to the whey stream for evaporation after separation. After much experimentation on the effects of pasteurisation of white whey it was concluded that it's quality was brought to an acceptable level without pasteurisation for addition to the general whey stream. This was done by reducing its dwell time in a holding tank and by the immediate addition to the general whey stream. It therefore makes a contribution to the whey cream and whey concentrate volumes instead of being discarded as a waste product for land spread. Therefore a saving was achieved in the reduction of transport costs of removing this to the land bank and an increase in yield of whey cream and whey concentrate.

The use of evaporative condensate as an alternative to well water is viewed as a priority by the company both from an environmental and economic perspective. 200,000 litres of secondary condensate is used for cleaning the

7-stage Niro evaporator after each daily production run. It is highly effective for this purpose as it has negligible hardness compared to well water. Primary distillate (also from the evaporator) is sold to neighbouring manufacturing plant as boiler feed water.

In recent times, chlorine dioxide treatment of the condensate has been introduced in order to improve its bacteriological quality. This has been very successful and the treated condensate is now also used for chemical make-up in the effluent treatment plant; it is also used to feed the cooling towers on site, which lose water on evaporation, and to clean milk tankers. Further uses for surplus condensate are being investigated with a view to reducing dependency on hard water further.

Energy monitoring – The introduction of an energy monitoring system to monitor energy, steam and water usage on site has been introduced, in order to bring about savings in these target areas. According to an independent survey carried out by the E.S.B electricity savings of 5-10% can be achieved with the aid of monitoring. Year to date savings on electricity are 4% through good housekeeping and the company is satisfied that a further saving of 7% can be achieved in all areas. Expected savings of 7% are also anticipitated on water consumption.

Staff were trained by site personnel regarding nature and sources of waste on site. A programme of training entitled Waste Loss Management and Process Efficiency Studies at Wexford Creamery was undertaken by Mr. Jim Kelly, Teagasc, Moorepark. The attendance included production operatives, maintenance staff, laboratory technicians, administration staff and management staff. The presentation outline included definition of waste and practical ways of reducing it particularly in cheese and whey concentrate production; implementing loss measuring techniques; using COD to calculate milk losses and to assess the process efficiency performances in the Wexford factory highlighted in the Teagasc Industry Technical study of the cheese industry during 2003/04. Explanation was given on flow measurement and analysis, the types of sampling and their effectiveness and the conversion of COD in effluent to product loss.

Achievements

The economic benefits will become more apparent in the longer term and will act as a catalyst for ongoing emphasis on reducing waste.

The reduction in the waste removal costs of sludge derived from white whey which is now processed has resulted in savings of ca. €26000/annum (2000tonne @ €13/tonne).

Reductions in water, steam and electricity usage have significance in containing service costs.

Observations

The benefits of the project have not yet been fully realised but most definitely will become apparent in the longer term when the energy monitoring programme is rolled out. The greater awareness and understanding of staff in relation to product and process losses will also provide more savings in the longer term but has already reduced water usage by 5%. Intangible benefits include a more motivated staff and environs with greater emphasis on hygiene and housekeeping resulting in a site that is more visually attractive and appealing to visitors which includes many major retail cheese buyers and quality auditors.

Lessons

Investigate more fully the relevant technology, its effectiveness and it's cost ahead of advancing the project. This would lead to a more focused approach in pursuing objectives and targets. The involvement of relevant staff in the process has been of great benefit in increasing awareness of the impact good housekeeping has on reducing product/raw material/water losses in the effluent stream and its concomitant reduction in treatment costs at the effluent plant. The creation of an energy-monitoring programme has increased awareness of energy consumption and will lead to savings in the longer term.

More Information

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Cleaner Greener Production Programme

The Cleaner Greener Production Programme (CGPP) of the EPA was funded under the National Development Plan 2000 – 2006. The CGPP was launched in 2001 as a grant scheme to Irish organisations to implement cleaner greener practices while achieving significant cost savings.

Cleaner Greener Production is the application of integrated preventive environmental strategies to processes, products and services to increase overall efficiency and reduce risks to humans and the environment.

- Production processes: conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes
- Products: reducing negative impacts along the life cycle of a product, from raw materials extraction to its ultimate disposal.
- Services: incorporating environmental concerns into designing and delivering services.

The programme aims are focussed on avoiding and preventing adverse environmental impact rather than treating or cleaning up afterwards. This approach brings better economic and environmental efficiency.

Under Phase 2 of CGPP, 22 organisations were funded from a variety of sectors (e.g. chemicals, food, metals, electronics, service). The total achievements from the projects for the participating organisations included annual reductions of 250,000 tonnes in input/output streams (water/waste water), 660 MWh energy reduction and €1.6m cost savings.

The programme will continue to be funded by the EPA in the NDP 2007-2013.

This case study report is one of the reports available from the companies that participated in the second phase of the Cleaner Greener Production Programme. A summary of all the projects and CD containing all the reports are also available.

More information on the programme is available from the EPA:

Ms. Lisa Sheils or Dr Brian Donlon,
Environmental Protection Agency,
Richview, Clonskeagh Rd., Dublin 14, Ireland.
www.epa.ie/researchandeducation/research/

Programme Managers...

The Clean Technology Centre (CTC) at Cork Institute of Technology was appointed to manage the programme. Established in 1991, the CTC is now nationally and internationally regarded as a centre of excellence in cleaner production, environmental management and eco-innovation across a range of industrial sectors.

CTC CLEAN TECHNOLOGY CENTRE

cork institute of technology
Institiúid Teicneolaíochta Chorcaí