

Look Before You Leak: Increasing Profits Through Wastewater Minimisation

The drive towards environmentally sound food processing systems in developing countries offers opportunities for higher profitability through effective wastewater control.

By Philippe Neuville & Dean Sigler

AS MECHANISED food processing becomes a bigger force in feeding the growing Asian population, economic and environmental concerns are helping producers become aware of, and ready to create and benefit from, answers to these issues.

The United Nations Environment Programme, in its "UNEP Global Environment Outlook 2000," notes that increasing competition may force private industries to use cheap, ineffective means to protect the environment. The report states, "If manufacturers have to cut corners to keep their competitive edge, the environment may suffer. But where lowering tariffs results in cheaper imports of cleaner technologies and pollution abatement equipment, environmental benefits could follow."

Growing populations, the movement of food processing factories to urban neighbourhoods, and increasing scarcity of potable water makes the reuse of water necessary, and measures to minimize wastewater desirable. The UNEP report continues, "Despite increased interest in cleaner technology, West Asian countries have yet to benefit significantly from the experience of the industrialised nations."

Wastewater savings result in green gains

This concern is being rectified. Industrial Design and Construction (IDC), headquartered in Portland, Oregon, USA, and a subsidiary of CH2M HILL, specialises in process industries. IDC is currently working in Singapore, Taiwan, and China on large projects in wastewater systems. These systems are



An example of one source of needless waste of water, chemicals and energy in a food processing plant. The overflow resulted from an inefficient Programmable Logic Control (PLC) system controlling a Reverse Osmosis Cleaning-In-Place process.

often linked to other projects that reduce the amount of wastewater produced in the industry processes.

Philippe Neuville of IDC's Food and Consumer Products Division is a dairy process engineer, and dedicated to reducing waste and protecting the environment. He has found that the two

seemingly mutually exclusive goals go together in beneficial ways for the environment and the processor's economic gain.

Some of the new interest in saving wastewater, for instance, is driven by the advent of new technologies that allow food processors to achieve greater savings through wastewater minimisation with lower up-front costs than one might expect. Processors are also placing increasing value on new strategies that can improve the overall sustainable development of "Green Manufacturing" processes they can integrate into their operations.

Philippe has found that the dairy industry is particularly interested in using dynamic new technologies to recover revenue value from by-products such as whey by converting those wastes into desirable food additives. These types of activities are occurring throughout the food industry in general.

Two of his recent projects illustrate the ways in which responsible environmental care can be executed to ensure sustainable levels of water usage and a profitable outcome for the operator.

Plugging profit leaks

A dairy in the northwest US that

produces cheese and whey powder wanted to expand from producing 6 million gallons of milk per day to 9 million. The local waste stream authority would not approve the expansion unless there was no growth in the waste stream regardless of the process expansion.

IDC was called in to analyse the situation and recommend a solution. Philippe performed an exhaustive survey of all leaks, losses, operational conditions and cycles, CIP (Clean In Place) cycles, cleaning procedures, controls and product and waste stream valving. From this survey, Philippe developed a detailed list of opportunities to reduce water and waste streams and enable the operators to expand the plant.

Not only was there reduced waste, but also significant reductions in chemical, BOD, milk, and water usage – down 150,000 gallons per day. Philippe was credited with successful implementation of his recommendations, and was considered a part of the plant's engineering and management team.

A dairy in the Middle East, with a daily production of 2-3/4 million litres per day, wanted to make sure their operations were as environmentally responsible as they could be. Philippe was part of a CH2M HILL/IDC team that included Brian Natrass, a leader of the Natural Step, a leading sustainable development consulting firm, and Skip Fresn, a CH2M HILL sustainable development expert. Brian helped train his fellow IDC and CH2M HILL team members in sustainable design practices.

Philippe focused on the dairy's production processes. Skip analysed its sites and facilities. Together they completed a study that recommended environmentally sound strategies for energy and water use, transportation, siting, prod-

uct packaging, and other opportunities for "green" improvements. There's every indication that the dairy is happy with the improved processes and approaches, and Philippe looks forward to working there in the near future.

In the meantime, he is working with a snack food manufacturer to reduce solid and water wastes from deep frying processes. In another instance, Philippe is working with a shrimp processor to reduce water use from 300,000 gallons per day to 15,000!

In each case, the reduction of wastes in the process and normal waste streams was tied to improved productivity and better profits. This profit is a nice reward for the up-front costs of developing and implementing these environmentally sound practices. Philippe's techniques in both cases included exhaustive surveys of all leaks, improvements of cleaning cycles, and



An example of water being wasted at an evaporator system due to defective controls, causing clean water to be diverted to the drain instead of the water recycling system.

optimisation of facility control systems. This often requires expertise in more than just the actual production of food-stuffs.



This spill in a dairy products operation resulted from a non-automated High Temperature Short Time cleaning process that produced periodic losses of water and energy due to lack of consistent control regulation.

Filling a gap in public works

The success of these projects was a product of IDC's ability to blend its experience in high-technology enterprises with CH2M HILL's public works experience. The company brought to bear a diversified range of expertise encompassing site selection, civil and structural engineering, electrical, chemical, and mechanical engineering and design, and the design and operation of highly complex automated controls systems. While wastewater minimisation may seem like a fundamental pursuit on its surface, it can evolve into a set of technical challenges that draws upon a wide range of expertise.

An added benefit is that the integrated nature of much of the design work carried out to solve client problems of this kind often leads to new technologies and techniques that can be applied in many other situations.

This knowledge and experience could bring relief to Asian food processors who face dwindling resources and increasingly stringent government demands regarding the use of those resources. Other regions are finding that these challenges can not only be met, but be met with the added benefit of increased profits for

Some Pointers on Minimising Wastewater in East Asian Manufacturing Environments

- Evaluate your plant's process equipment for leaks and other inefficiencies, and make upgrades as needed. Many equipment upgrades related to wastewater minimisation are surprisingly inexpensive to perform, and provide long-term return on investment in the form of reduced operating costs over a manufacturing plant's life cycle.
- Make sure plant personnel are properly trained in wastewater minimisation techniques and the processes that apply those techniques. Ensure that they apply these techniques consistently throughout the operation. Successful reduction of resources is a collective effort in any manufacturing environment.
- Have your plant evaluated for its compatibility with automated processing and packaging systems, since such systems can produce greater efficiencies in water consumption.
- Make an effort to acquaint your plant's decision-makers with the latest advances in wastewater minimisation technology. There are many readily accessible resources

for news on such advances, including documents such as the United Nations Environment Programme quoted in this article. Consulting firms with expertise in wastewater minimisation are another logical source for a review of the latest waste reduction methods available.

- Inefficient instrumentation and controls are sometimes overlooked as a culprit in creating waste in manufacturing operations. Don't wait for a system to malfunction before its efficiency is improved. Be proactive and use preventative planning and maintenance throughout your plant *before* problems arise.
- Your plant may be producing wasted by-products that have the potential to be converted into revenue-generating commodities. In the dairy industry, for example, whey by-products have enjoyed a surge in demand in recent years, while they were once regarded as wastewater. There are industry specialists you can contact to help assess your plant's potential for revenue enhancement through secondary product recovery.



This food product loss and BOD pollution resulted from a bad connection between vats in a whey crystallisation process. Improved training for plant personnel was one remedial approach applied in this case.

industrial owners.

Many countries with endemic water shortages are finding it necessary to apply water conservation and wastewater reduction efforts. Again, this is to meet government edicts, or to make the most efficient use of scarce resources. Their experience and the new technologies that support these efforts may inspire those in Asian markets to emulate their efforts.

As noted in the UNEP report, "In countries with agro-industries, waste

minimisation procedures have been in use for some time. The solid wastes from these industries are converted to animal feed or compost to be re-used as soil conditioners. In the dairy industry, the liquid waste from the manufacture of cheese is being bottled and sold in Iraq and Jordan as a soft drink. On-site recycling of water in these industries is becoming the norm rather than the exception."

The report further notes that government controls often have little effect on waste recovery and recycling, and often discourage such effort. As Philippe has demonstrated on several projects, an up-front effort can lead to a better environment and economy.

Companies such as IDC want to work with food processors to apply new, but proven technology and manufacturing techniques, careful control of product flow, and system-

atic approaches to waste reduction and resource optimisation. Based on IDC's experience, these goals can be achieved while promoting the environmental health of the region and the economic health of the enterprise.

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Philippe Neuville is a senior process engineer with IDC with 30 years of experience in engineering and construction, with an emphasis on food processing plant design, processes, capital budgeting and asset management. He is a specialist in advanced dairy manufacturing technologies, including wastewater minimisation and conversion of waste products into revenue-producing by-products. He often performs reviews of plant designs and operations to improve the ecological neutrality and cost-effectiveness of food processing operations. A technical writer at IDC, Dean Sigler has worked on job sites throughout America and recently, in Singapore, producing technical documentation for food processing facilities and other process industries.