# Industrial Wastewater Disposal

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***There are several reasons why a company would choose to modify their current approach to waste water disposal or treatment, says Jacqualine Ingram, Senior Operations Engineer at Farrer (UK). In the UK wastewater disposal and treatment is paid for in one of three ways:***

***•By discharging to the public sewerage system and thereafter paying the regional water authority to deal with the waste***

***•By paying a specialist company to take the waste away and manage it***

***•By treating it to a high enough standard that the Environment Agency allows it to be discharged to a watercourse. Or regional water authority if the waste water is discharged to a sewer.***

***There are several reasons why a company would choose to modify their current approach to waste water disposal or treatment:***

### Longterm Savings

Studies can be carried out to determine the most cost effective method of dealing with a particular wastewater. The results of which may not be how the company deals with that waste at that time.

For example: Water authority tariffs are based on a formula that relates volume of water to the nature and strength of the pollutants. By reducing any one of these elements the bill for treating the waste water can be reduced significantly. This is normally done through capital investment. The reduction in costs need to be balanced against the capital cost, the cost of running treatment equipment, paying for power and chemicals and employing staff to operate it. Calculations on whole life costs need to be carried out to determine an acceptable pay back period.

Treating waste to a very high standard for release to the aquatic environment may be expensive in capital costs, but the overall costs, capital and operating, may be lower than paying a water authority to deal with it. For certain types of low volume, high concentration wastes it may be more cost effective to pay a specialist to collect them together with other similar wastes and treat them together, for example in the way that solvent reclamation companies do. For dilute wastes, concentrating the pollutants into a waste stream and recycling the clean water for production use, may reduce the sewage and water bills enough to pay for the waste treatment process, particularly if this involves simple settling of solids.

### Regulatory Changes

In Scotland, for example, disposal of wastewater is controlled by one of two regulatory bodies, Scottish Water or SEPA. Where the wastewater is discharged to the environment, for example to a soak-away, a river, a lake, the sea, etc, SEPA will issue a Controlled Activities Regulations (CAR) licence or Pollution Prevention and Control Licence. Where the water is discharged to a sewer, Scottish Water will issue a Trade Effluent Discharge Consent. Occasionally the conditions of these licences or consents will be changed as new legislation is passed or as new environmental drivers are introduced.

If SEPA licences are not met, then a fine can be imposed. If Scottish Water discharge consents cannot be met, then the tariff may go up or fines may be imposed. It therefore pays to achieve the correct discharge quality.

The following contaminants are currently under review by both SEPA and Scottish Water in an effort to reduce the quantity of these materials reaching Scotland's rivers and coastal waters. This may require companies to increase the level of treatment so that they do not exceed new limits.

- Biodegradable material in the form of BOD (biological oxygen demand) – lower values in mg/l may be imposed.
- Ammonia – new or lower limits are being imposed.
- All metals but recently concentrating on copper – SEPA are imposing tighter standards on Scottish Water so they are passing on the reductions to Trade Waste producers.
- Phosphate – new limits are being imposed where none existed before.
- Pesticides and other organic chemicals – new or lower limits are being imposed.

Currently, SEPA's biggest campaign is the reduction of overall water use. This is because climate change implies a reduction in fresh water flows in rivers so that abstraction of water will impact more on water environments. Direct abstraction of water for process use will be affected, as well as legislation to reduce the use of treated drinking water.

### Production Changes

Where use of water is an integral part of a manufacturing process, changing the number of production units, the volume of product made or the nature of the production process will impact on the quantity and quality of waste water created. It is important when planning a change to production to ensure that waste water from the new/modified production process will still meet the current consents or a revised permission is in place for the modified waste streams. It is recommended, that prior to carrying out production changes, a review of the current waste disposal approach is carried out and alternatives are considered for both pre and post changes, such as investing in treatment processes in order that trade effluent bills are reduced.

### Recovery of Raw Materials

Some industries lose valuable raw material when they dispose of their waste. In certain circumstances, this raw material can be recovered, either for direct re-use or for sale to another industry sector, for example solvent or metals recovery. It is recommended that, if a company is not already doing this, a study should be carried out to identify whether it is cost effective to invest in recovery methods.

One of the most overlooked raw materials is fresh water, either potable water or water taken from a watercourse or borehole. Recovery and recycling can reduce both clean and waste water bills, reduce abstraction costs and help to meet the new environmental drive to minimise the reduction of river flows.

### Waste Reduction Strategies

It is recommended that companies should arrange their production in such as way as to minimise water usage or waste production. Often, there are simple ways of doing both and these can be identified by anyone involved with the manufacturing process. However, the difficult part is to gain support for such an initiative, to take time to review the manufacturing steps and then to encourage staff to implement changes which may seem counter-productive to them, based on previous work patterns or incentives.

A waste minimisation specialist can help a company decide whether it is financially viable to make such changes. They can facilitate workshops to identify potential savings, determine the required changes, set up regular reviews to monitor the effectiveness of the changes and make suggestions to encourage staff uptake of the changes.

Wasted drinking water from leaks in buried pipes, unobserved open valves, wasteful equipment and unexpected night-time operations can be identified by the use of smart metering and investigation surveys. These techniques can save thousands of pounds and require no change to the current manufacturing or operating systems. They can be applied to almost any environment from large warehouses, shops or factories to bus depots, distribution hubs, airports and industrial estates.

## Waste Treatment Strategies

Treatment of waste water ranges from the very simple to very complex, depending on the nature of the waste and where it will discharge to (sewer, watercourse, or tanker away). Some examples of treatment processes include:

- Blending to reduce peak concentrations
- Settlement to remove solids, which are then disposed of separately
- pH correction to remove high or low pH
- removal of metals by pH correction, precipitation and settlement
- removal of BOD by chemical dosing and settlement
- removal of BOD by an-/aerobic biological treatment
- removal of solids by membrane filtration

In many cases, the final solution is a combination of more than one treatment process. The choice of the appropriate processes depends on the type of industry producing the waste, the volume /concentration of the waste and the discharge consent for the waste.

For individual companies it is possible to create a matrix of likely treatment solutions for size (volume /concentration) and discharge consent combinations. Whilst these do not exist for every industry, many consultant designers effectively carry out this exercise when deciding what type of treatment is appropriate. Specialist equipment suppliers, however, will try to sell their equipment or process into as many markets as possible even if it is not the optimal solution. Thus it is important to carry out a feasibility study to review the main options and compare their effectiveness, whole life cost and environmental burden (it is possible to solve one pollution problem through creating another).

## Waste Recycling Strategies

More and more attention is being applied to the recovery and recycling of water. Normally this requires high levels of treatment to return the water to a purity and condition appropriate for use. Common examples of "recycling" of waste water include; Rainwater harvesting – with minimal treatment, this water can be used for non-drinking water/low quality uses. Grey water recycling – this requires chemical treatment and settlement to remove solids, greases and detergents and can be used for non-drinking water/low quality uses. Process water recycling – this may need significant treatment such as solvent removal, metals removal, pH correction, removal of BOD/ COD/greases, etc. It is usually further treated by ion exchange and/or membrane micro-filtration (MF) to give moderately high quality process water. It is not usually turned into drinking water. Boiler feed water/condensate – usually treated with anti-fouling chemicals and MF to allow it to be retuned to the boiler in a semi closed loop. Ultra-pure water for micro electronics – this is a specialist field where the original water is treated to a very high standard with reverse osmosis, ion exchange and other high energy treatments. The used water can then be treated to remove the metal contaminants and recycled to the initial treatment stages.

In the majority of cases, wastewater can be cleaned up and recycled, particularly, if the cost and environmental impact of doing so outweighs the cost and impact of using fresh water instead.

## Management of Wastewater Disposal

Biwater Services Ltd is a group of companies, belonging to Biwater plc, specialising in the management and treatment of clean and waste water. It comprises three companies; Farrer (Consulting) Ltd, Biwater Treatment Ltd and BiProduct Recovery Ltd. Together these three companies can provide a complete waste management solution.

Farrer's extensive capabilities include site surveys to locate all service assets, using GPR (Ground Penetrating Radar) to locate buried infrastructure and Global Positioning Systems (GPS) to provide accurate, geo-referenced asset maps. Long-term Asset Management Plans can be drawn up by Farrer based on asset inventories which can then be used to plan maintenance, capital investment programmes, schedules and resources.

Farrer also provide smart metering and water leakage surveys to identify leakage, locate it and fix the problem. Farrer's waste characterization tests use a site chemist to determine a sampling programme, collect samples, arrange or carry out analysis and interpret the results. This can include flow tests or flow and load surveys if required.

Additionally Farrer undertake the contract operation of treatment works representing a cost-effective solution in terms of site strategy, design, maintenance and ongoing management