

Background

All industries produce some type of waste product, either from production, maintenance or both. These hazardous and non-hazardous wastes need to be properly stored, treated and discharged to a sewer system or otherwise disposed of. Wastewater treatment is a multi-stage process to renew wastewater before it is discharged to the municipal sewer system. The goal is to reduce or remove organic matter, solids, nutrients, disease-causing organisms and other pollutants from the water in compliance with regulatory limits. Processed wastewater can then be discharged to a municipal sewer for a fraction of the cost of waste hauling.

Filter Innovations Inc. (FII) offers industrial wastewater treatment technologies that allow industries to treat almost any industrial waste stream, including those high in suspended solids, fats, oil and grease, organics and other contaminants. To reduce the environmental impact of effluents from industrial wastewater, *FII* ensures that wastewater is treated using one or more technologies and practices that minimize harmful environmental impacts. *FII* also ensures that the sludge removed during wastewater treatment is recycled or disposed of properly.

Case History: Direct Line Environmental

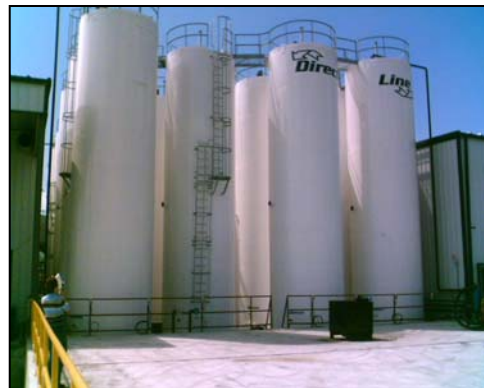
Direct Line Environmental Services Inc. is a fully integrated liquid waste management company that has been involved in the collection and processing of waste in the province of Ontario for over twenty years. *Direct Line's* original Physical and Chemical Waste Treatment Plant totaled approximately 13,000 square feet. To expand the facility's processing capabilities, an adjacent 8.5 acres was acquired, and a 29,000 square foot addition was planned. *Direct Line* industrial and commercial waste management programs include, but are not limited to, the transport and/or treatment/recycling/disposal of wastewater, non-hazardous and hazardous sludge, laundry, acid and alkaline wastes, waste oil and spent fuels, interceptor waste,

used oil filters, parts washer and gun cleaner solvents, spent glycol and paint sludge.

Direct Line's goal is to provide responsible environmental services that meet or exceed the requirements of regulators and industry standards. To that end, *Direct Line* is committed to "quality management" and continuous improvement in all areas. *Direct Line* is both ISO 9001 and ISO 14001 registered.

Treatment of Industrial Wastewater at Direct Line Environmental

Construction of the larger wastewater treatment system was commissioned by *Direct Line* in order to increase the treatment capacity of the old plant. As a result of the expansion, the facility's capacity was increased from 250,000 gallons to 2.5 million gallons. There are now 20 tanks in the tank farm, nine of which are 20 feet in diameter by 40 feet high, and eleven of which are 10 feet in diameter and 40 feet high.



To treat the different types of wastewater that *Direct Line* received, *Filter Innovations Inc.* was asked to design and install a complete wastewater treatment package.

Treatment Stages

In response, *Filter Innovations* has designed a system to separate, modify, remove and destroy undesirable contaminants from the wastewater collected at a variety of industrial sources. Contaminants include, among others, acid, emulsified oil, and coolants.

Wastewater is held in collection tanks for several hours, thereby allowing the particles to settle to the bottom while any grease floats to the top. The solids are then removed from the bottom of the tanks, and the oil and grease skimmed off the top by an oil/water separator.

First, water is pumped from the bottom of the storage tanks into the first stage of the treatment system where a Revoscreen separates debris from the wastewater. Large particles such as sand and gravel are removed at this stage.

The Revoscreen – an internally fed rotary drum incorporating a wedge wire screen – is constructed of stainless steel with a TEFC motor, a shaft-mounted gear drive and an enclosed solids discharge chute. The Revoscreen's slots, which range from 0.010" to 0.100", are oriented perpendicular to the direction of rotation. The feed first enters a non-clog flow diverter where it is evenly distributed along the sidewalls. Liquid flows radially through the openings while the screen rotates and screenings are left on the inside of the drum. Collected debris is then disposed of in a landfill.

Next, oil and grease are removed from the wastewater using a specially designed oil/water separator. Hydraulic oils and most oils that have been degraded to any extent, however, will also have a soluble or emulsified component that will require further treatment.



A 100 GPM oil/water separator draws oil particles out of the water phase using oleophilic media. As additional droplets collect, they coalesce with the previously collected droplets and rise to the surface of the separator. On the surface, an adjustable

product skimmer collects the oil and transfers it to the oil outlet coupling.

Following solids and oil separation, the wastewater will be transferred to the chemical treatment system where the pH is adjusted and additional organics, inorganics and particulates are removed.

The chemical treatment process utilizes a four-compartment system to treat the incoming wastewater. The pH adjustment is done automatically using either acids or bases.



After the pH adjustment is complete, coagulation and flocculation are performed using alum and polymers. The water overflows to the slant plate clarifier and is then pumped into a clean tank. If further polishing is required, the water is pumped into the organoclay and activated carbon vessels.

Two bag filters in series are used for filtration of sediments down to 1 micron. The particulate filters effectively remove any dirt and particulates which would prematurely plug the media contactor vessels. Each bag filter housing consists of a pressure vessel, the micron-rated disposable filter bags and a restrainer basket to support the filter bag.

The disposable filter bag is triple-layered, will hold approximately 5 pounds of dry solids and has a filter rating of approximately 1 micron. Since filtered contaminants are trapped within the bag, rapid access to the filter bag ensures a quick and easy clean-up of the vessel. The bag filters are followed by a clay treatment system that removes traces of oil. Oil/grease-absorbing media is contained in a large contactor vessel and absorbs oil and grease through a partitioning phenomenon. The unique characteristics of the media result in a

slight swelling of the bed as it removes the hydrocarbon from the contaminated liquid.

Following the oil absorbing unit, two carbon contactor vessels will remove the organics. The primary carbon absorption unit removes all low molecular weight organics, and the secondary carbon absorption unit polishes any contaminants that may flow from the first unit. *Filter Innovations* uses virgin activated carbon made from the finest grades of bituminous coal. It is ideal for many liquid phase applications including the removal of organics from water streams and the



purification of potable water.

When the primary carbon vessel becomes saturated, it is replaced by the secondary carbon vessel and a new replacement unit is used as the polishing unit. Sludge from the clarifier is sent to a filter press for sludge thickening.

All filter elements are supported in a fabricated mild steel filter press framework. The feed head is located at one end of the filter, while the cross head containing the hydraulic closure is located at the other end. The moving head (tail plate), together with the feed head, will enclose the filter elements by hydraulic force provided by a power pack. Extensive use of a box design and heavy gauge plate ensure a rugged and robust framework that is well-suited to the rigorous duties encountered during the filtration process. Three automatic valves are added on three pump stations and all the pumps are controlled by a PLC control system.

Once all of the particulates, oil and grease, organics and chemicals are removed, the treated water will be discharged to the sanitary sewer system. Sludge will be sent to a hazardous or non-hazardous landfill depending on the quality of waste.

Control System

Rather than using relay logic panels (hardwiring and electro/mechanical relays), *Direct Line* utilizes a Programmable Logic Control (PLC). A PLC is a small computer with inputs and outputs that executes a set program stored inside a nonvolatile memory. Field devices such as level switches, pressure switches and flow meters are connected to the system inputs. Motors, solenoid valves and other electric devices are connected to the outputs. The logic to control the system is entered as a program into the PLC. The custom-designed, programmed PLC at *Direct Line* operates at 575 Volts and utilizes a Direct Logic DL 250 controller, a 15" color touchscreen, Westinghouse variable fire gauge drives and square D contractors.

PLC's natural advantage over relay systems is that the logic can be easily modified and more complex logics can be accomplished. The system also has ethernet compatibility and can be monitored and controlled offsite, thus enabling communication from remote distances. A major benefit of using the remote access system with a PLC on site is that all the information about the system can be viewed, pumps can be run remotely to clear alarms and the systems can be restarted, all without a visit by the operator.

About Filter Innovations Inc.

Filter Innovations, a privately held firm, is a leading provider of treatment solutions for process water, wastewater, ground water, and air in Canada, with additional sites in the US and several countries overseas. Headquartered in Toronto, Canada, *FII* has had consistent growth and increased annual sales with systems and equipment supplied for over 1,000 sites and over 500 clients.

For more information, please contact *Filter Innovations* at 416-490-7848 or email us at inquiries@filterinnovations.com