

# Duffin Creek Water Pollution Control Plant Odour Control Program

A disciplined approach makes  
for good neighbours



## Who we are

Duffin Creek Water Pollution Control Plant is on the north shore of Lake Ontario in the City of Pickering. It's operated as a partnership between The Regional Municipality of York

and The Regional Municipality of Durham. The Plant is capable of treating 630 million litres of wastewater each day and serves the booming communities of York Region, the Town of Ajax and

the City of Pickering in Durham Region. Proudly ISO 14001 certified, the Plant operates to ensure the environmentally responsible treatment of wastewater.





# Odour Control is more than a good neighbour policy



**It's an undeniable fact – wastewater smells.**

Wastewater is a catch-all word for water that ends up in the sewer system from our homes, businesses and industries. Sources are toilets, sinks, laundry and rinse water from various industrial and commercial processes.

You may be surprised by the multi-pronged approach we take to treat the wastewater so the community and our neighbours stay friendly. Duffin Creek runs a leading odour control program using world-class technology

that is constantly reviewed and upgraded to ensure it meets the standards set by the Ministry of the Environment, Conservation and Parks.

## You may be wondering ... how is odour measured?

There is a standard testing procedure to measure odours. The strength of a smell or odour is measured in Odour Units (OU). A smell or odour is exposed to an independent panel of judges. The odour is then slowly diluted with odour-free air. Test results are recorded when only half the judges can accurately identify the odour. This is classified as 1 Odour Unit. So, for example, if a substance has to be diluted 15 times with odour free air, this odour has 15 OU. The higher the OU, the stronger the odour.

Interestingly, we humans have amazing olfactory (smell) systems that can detect and remember thousands of smells. People offer varied responses to smells and, as we age, our sense of smell may decline. There are also certain chemical vapours that can trigger your sense of smell. Of course, we all know someone who actually likes the smell of a skunk ... which shows you how individualistic people are.

And finally, while summer is a fun season, the heat intensifies the smell receptors in our noses. Fluctuations in heat and humidity can impact the volatility of gaseous odorants in the air. It's this volatility that allows us to perceive odours to be stronger on hot summer days.



# Choosing the right technology

Odour control technology is carefully selected to tackle the exact source of the air stream. Certain technologies are better than others at removing specific odours. For example, odours from the initial liquid phase of

the treatment process tends to contain more hydrogen sulfide gas ( $H_2S_{(g)}$ ) and needs filters to deal with that odour. The solids management portion of the process contains reduced sulphur organic-based

compounds such as methyl mercaptan and dimethyl disulfides. These are best treated with heat or combustion. In other words, all odours are not created equal – targeting the source is critical.



## Systems integral to pollution prevention

When a wastewater treatment plant is approved by the Ontario Government, it must have an odour prevention plan in place. This is mandated so that nearby communities can breathe clean, fresh air, and pollution prevention. Our state-of-the-art odour control systems operate to remove common wastewater gases, including Volatile Organic Compounds (VOCs), petroleum-based hydrocarbons, mercaptans, nitrogen-based compounds (ammonia) and sulphur compounds (hydrogen sulfide) that exist in wastewater.

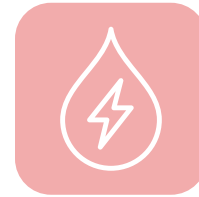
# Multiple sources of odour in wastewater



**Organic compounds**  
(human)



**Mercaptans**  
(methyl mercaptan)  
(additive)



**Petroleum-based hydrocarbons**  
(crude oil)



**Nitrogen-based compounds**  
(cleaning products)



**Hydrogen Sulphide and other sulfur-based compounds**  
(petroleum)

## Odour-causing agents

**Mercaptans** are added to substances such as natural gas to give it a detectable odour resembling garlic or rotten eggs. Volatile Organic Compounds or VOCs are organic compounds that can easily become vapours or gases. VOCs that contain sulphur can give off an unpleasant odour.

**Compounds:** A substance that results from the combination of two or more different chemical elements. Different types of odour-causing compounds are treated at the Duffin Creek Plant.

### Don't forget about algae

Our beautiful Lake Ontario is also home to algae - a naturally occurring organism found across the Great Lakes. These small, microscopic organisms grow near the water's surface and often build up along the shorelines. Algae give off a pungent smell when they decay and die which can sometimes be confused with the wastewater treatment plant. Algae, while not toxic, is often the smelly culprit at the water's edge.





# 1 Incineration (thermal treatment)

**How it works:** Thermal Destruction

**Processes Treated:**

Capture air from dewatering operations and digesters

**Primary Odour Source:**

Hydrogen Sulfide Gas- $H_2S_{(g)}$

Thermal processes destroy foul odours through oxidation. Odours from the dewatering process and sludge holding tanks are ducted into the air blowers of a reactor. The combination of high heat and oxygen leads to the breakdown of odour-causing compounds. What remains is released into the atmosphere with either no smell (water vapour and carbon dioxide) or reduced smell (sulphur dioxide). The waste gas burners and boilers also use thermal treatment to destroy odour produced by the digesters.

## A three-pronged approach

The Plant deploys three main systems to remove odour-causing compounds from the air.

They are incinerators, biofilters and activated carbon units.

Each has a unique job to do and, together, they work to ensure compliance. Issued by the MECP, the Environmental Compliance Certificate involves a rigorous process of testing, reporting and monitoring.

**Airflow:** Proper ventilation is key to the odour control process at the Plant. Air movement through the different odour control mechanisms helps prevent the buildup of harmful gases and also minimizes corrosion of pipes and equipment.

**Stack Ventilation:** The vertical stacks pumping out 'smoke' from the top is not smoke at all; in fact, they are vapours. Odours leaving the Plant are diffused or dispersed into the atmosphere through a tall chimney or stack. Diffusion works by using pressure differences with the stack to pull in outside air.





## Biofiltration

**How it works:** Biological

**Processes Treated:**

Headworks and Pumping Stations

**Primary Odour Source:**

Hydrogen Sulfide Gas-H<sub>2</sub>S<sub>(g)</sub>

Biofiltration technology uses bacteria to break down odours. Odorous air is first pumped into a humidification system to raise the moisture content and temperature. Then the air is moved to the biofilter cells and is evenly spread over the media bed where bacteria breaks down the odour-causing compounds. The treated air is then exhausted into a discharge stack.

**What is Filtration Media?** Think of media as any type of filter that is found at the point of entry. Its job is to separate solids from fluids by having only the fluids pass through.

**Media Bed:** A media bed consists of stones and organic material that odours pass through in the biofiltration process.

**Biofilter Media:** The biofilter cells are filled with a light-weight synthetic media called BIOSORBENS® which supports bacterial growth. This material is designed to remove the maximum amount of odour from wastewater.



## Activated carbon filter

**How it works:** Physical/Chemical

**Processes Treated:**

Sludge Pumping Station

**Primary Odour Source:**

Hydrogen Sulfide Gas-H<sub>2</sub>S<sub>(g)</sub>

The activated carbon unit eliminates odour by trapping odour-causing compounds in its pores. A fan located at the end of the unit draws the air through the carbon filter and the treated air is released through an exhaust stack.

**Activated Carbon Filter Media:**

Activated Carbon is coal that has been ground into pellets or fine pieces and is heated to increase the pores or empty spaces in the carbon. Increasing pore size allows the carbon to trap more odours. The filters can be rinsed and reused multiple times before they have to be replaced.

**Volatility** describes how easily a substance will turn into a gas or vapor.

## Always looking ahead



Odour control and the overall efficiency of the Plant go hand in hand. With the capacity to be the second largest wastewater treatment plant in Ontario, we have a dual responsibility: to operate a disciplined facility, as well as to protect the surrounding environment and water quality of Lake Ontario. Environmental concerns top the list with new sulphur dioxide limits coming

into effect from MECP. Equipment upgrades and new technologies are regularly examined. As the Regions grow and prosper, the Plant will continue to scale up to meet the demand with a disciplined approach to wastewater treatment. We invite you to learn more about our initiatives in our Environmental Sustainability Report.



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