Alcohol and fermentation industry

Wastewater compliance information

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Glossary of terms

Alcohol and fermentation operation – In the context of this document alcohol and fermentation operation refers to home brewers, micro-breweries, cideries, distilleries and kombucha producers

Biological oxygen demand (BOD) – the quantitiy of oxygen utilized in the biochemical oxidation of matter as set forth in the standard methods

Pre-treatment system – a treatment system or device that is designed to remove substances or contaminants from wastewater produced on site before that wastewater passes into the wastewater system. This includes interceptors, separators and sumps.

Standard methods – the analytical and examination procedures set out in the current edition of "*Standard methods for the Examination of Water and Wastewater"* published jointly by the American Public Health Association, the American Water Works Association and the Water Environment Federation

Total suspended solids (TSS) – particles that are larger than 2 microns which can be found in the water column

Wastewater – the composite of water and water-carried substances released from premises or from any other source

Wastewater treatment facility –a facility that stores, treats and disposes of wastewater, but which is not part of the wastewater system

1.0 Introduction

In recent years there has been a great deal of growth in the alcohol and fermentation sector both in the province of Alberta and within the City of Calgary (The City). Operations that fall into the alcohol and fermentation category include home brewers, micro-breweries, cideries, distilleries and kombucha producers. Many of the brewing and fermenting processes used in these operations are capable of producing a high-strength discharge, when compared to typical municipal wastewater. This wastewater is of concern as it can cause issues at the receiving wastewater treatment plant. High-strength wastewater can result in increased treatment costs for The City to meet regulatory requirements and, if in large volumes, can cause treatment plant upsets.

The purpose of this compliance information document is to offer guidance in addressing the high-strength discharge from fermentation operations. By following the recommendations outlined in this document, establishments will be able to lower the risk of fines for non-compliance with The City's Wastewater Bylaw 14M2012 and reduce monthly surcharge fees (if any). **Non-compliance fines for discharging a prohibited substance begin at $1000 and can exceed $3000.** Applied monthly surcharge fees can vary greatly from customer to customer as they are based on the strength of the wastewater and water usage. This document contains some federal, provincial and municipal regulations relevant to fermentation operations as well as strategies to lower the risk to wastewater infrastructure and the environment.

2.0 Regulations

The regulations listed below are a summary of some, but not all, of the guidelines and requirements that apply to alcohol and fermentation operations in the City of Calgary. This regulation list is for informational purposes only. Reference of the actual legislation document is recommended.

2.1 The City of Calgary regulations

Wastewater Bylaw Number 14M2012 (from now on referred to as Wastewater Bylaw) is a City of Calgary bylaw that allows the municipality to regulate wastewater. This bylaw sets conditions, criteria, and concentration limits for contaminants found within fermentation wastewater. There are multiple sections addressing contamination limits within this bylaw. These sections include but are not limited to:

- ***Monitoring Access Points***
  - Section 28. An *owner* of *ICI Premises*, or *owner* of an individual business operation with *ICI premises* must:
    - (a) provide one or more *monitoring access points* for the monitoring of *wastewater*, designed and located in a manner satisfactory to either the *Director*, *Water Services* or the *Director, Community Planning*; and
    - (b) provide direct access to any monitoring access point located on the premises.

*****(This typically requires the installation of a sanitary sewer test manhole.)*****

- ***Schedule A***
  - This section lists substances that should not be released into the wastewater system in any concentration. An example of prohibited substances relevant to the fermentation industry include:
    - Wastewater with a pH of less than 5.5 or greater than 10, or with a temperature exceeding 75 degree Celsius.

- ***Schedule B***
  - This section states concentration limits for inorganic and organic contaminants.

- ***Schedule C***
  - This section outlines concentration limits for substances for which a surcharge fee will be applied if limits are exceeded.

Stormwater Bylaw Number 37M2005 (from now on referred to as Sormwater Bylaw) is a City of Calgary bylaw that allows the municipality to regulate storm drainage, including discharges to the storm water collection system. Sections include but are not limited to:

- ***Section 2 (t)***
    - "Prohibited Material" means any substance that may, directly or indirectly, obstruct the flow of water within the storm drainage system or may have an adverse effect and includes, but is not limited to:
        - Soaps or detergents
        - Soil, sediment, waste or other solid matter
        - Industrial waste (including empty chemical containers and drums, acids, caustics, sludge and industrial sump water)
- ***Section 4***
    - No Person shall Release, or allow to be Released, any Prohibited Material into the Storm Drainage System unless permitted in Subsection (3)
        - Subsection (3) does not include wash water generated from alcohol and fermentation operations.

2.2 Provincial regulations

Environmental Protection and Enhancement Act supports and promotes the protection, enhancement and wise use of the environment while recognizing the need for economic growth and sustainable development as well as other factors.

Wastewater and Storm Drainage Regulation is an Alberta regulation under the *Environmental Protection and Enhancement Act* that addresses wastewater discharge and storm drainage.

- ***Section 7***
  - Owners of wastewater or storm drainage systems are not permitted to use, or dispose of, substances into the wastewater or storm drainage system in an amount, concentration, level or rate of release that may hinder the integrity, operation or quality of the treated materials within these systems.

2.3 Federal regulations

Fisheries Act is a Canadian regulation that focuses on protecting the productivity of commercial, recreational and Aboriginal fisheries through regulating construction, impact and wastewater discharge.

***Canadian Environmental Protection* Act** is one of the most important environmental laws in Canada as it protects the environment as well as the health and well being of Canadians. A major part of this Act is to sustainably prevent pollution by addressing wastewater discharge and dangerous chemical substance exposure.

3.0 Basic brewing process

Below are common steps involved in a typical brewery.

1.) Milled grain is added to water and heated.
2.) The liquid (wort) is separated and boiled in another tank. Hops are added at this time.
3.) After boiling, the wort is separated and transferred to a fermentation tank.
4.) In the fermentation tank, yeast is added and sugars are converted to alcohol.
5.) The product is filtered, then allowed to mature.
6.) The product is filtered once more and then carbonated.
7.) The final product is Packaged (bottling or canning).

The steps and processes in the manufacture of other fermented products will vary and could contain a wide range of ingredients.

4.0 Waste reduction and treatment options

This section provides information on practices that may help to reduce the impact fermentation operations have on the environment, local community and wastewater treatment facilities. This information may assist in meeting regulatory requirements, lowering wastewater surcharge fees as well as better protecting your business, community and environment.

The practices in this document emphasize eliminating pollutants at the source. Once pollutants are mixed into a single waste stream, reduction and separation of these pollutants becomes increasingly difficult and cost intensive.

4.1 Contamination Limits

Two primary contaminants of concern regarding fermentation wastewater are the Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). Below are concentration limits outlined in the City of Calgary Wastewater Bylaw:

Surcharge Parameter	Bylaw Limit
Biological Oxygen Demand (BOD)	300 mg/L
Total Suspended Solids (TSS)	300 mg/L

If the above limits are exceeded, then surcharge fees may be applied to the customer's monthly water/wastewater bill. See Wastewater Bylaw 14M2012 Schedule "C" and "F" for more information on the surcharge program and formula used to determine fees.

It also common for wastewater in the fermentation industry to experience fluctuating pH values and high temperatures. Either of the conditions below would qualify as a prohibited substance and should not be released to the wastewater system in any quantity:

- Wastewater with a pH of less than 5.5 or greater than 10 and temperature more than 75°C.

It is important to note that the contaminants mentioned above are likely common substances found in the fermentation industry. Individual operations may have additional contaminants based on their source ingredients, type of processes etc. It is the responsibility of each individual fermentation operation to ensure their wastewater meets all requirements of wastewater bylaw 14M2012.

If a food service establishment is combined with at fermentation operation., please refer to the *Food Service Establishments Information* document located here

4.2 Managing Contaminants

As shown in the table below, concentrations of BOD and TSS in alcohol and fermentation wastewater are typically well above the wastewater bylaw limits. To bring concentrations within limits some form of pre-treatment or waste management is required.

Parameter	Bylaw Limit	*Typical Industry Average
BOD (mg/L)	300	8,500
TSS (mg/L)	300	1,600

* Averages determined from numerous North American literature reviews

Solids reduction

All reasonable efforts should be made to maximize the capture of solid product. Solids in the process stream may include spent husks, grains, pulp, yeast, hops and trub. The use of filter or sparging bags will help ease removal of solids from tanks. Installing the correct gauge of filter downstream of processes will also lead to a significant decrease in solids. If space and additional tankage exists, settling and decanting may also be an option. The separated solids from the bottom of the vessels may have use as cooking ingredients, animal feed, fertilizer or compost. For smaller operations, disposing of this solid waste at an organic recycling facility may be the most the cost-effective option.

As a last line of defense, all operations should have some type of floor drain and/or sump to prevent solids from entering the wastewater system. Screens, filters or baskets should be installed on all floor drains and connections to wastewater system. Even with these devices in place, floor drains and water should never replace the use of a mop and broom.

Side-streaming

Different processes in the fermentation process will contribute varying quality and strength of wastewater. For example, some studies estimate that wastewater from the fermentation process can account for up to half of the BOD and 70% of the TSS. Side-streaming is a very simple and effective way of reducing effluent BOD and solids content by targeting processes that are contributing a proportionately higher quantity of contaminants. Side-streaming requires the separation of high-strength waste at the source and then either treating it onsite or sending it offsite for disposal. Off-site disposal should only be sent to waste treatment facilities permitted to receive this type of waste.

Off-spec product and spillage

Final product that does not meet the standards for consumption should never be released directly into the wastewater system. This liquid waste likely contains a very high BOD (between 90,000 and 120,000 mg/L) and an unacceptable pH value (pH<5.5). This would also apply to any spillage that may occur during the bottling process. If an unavoidable spill of product occurs, you will need to contact the City at **311** with the volume and characteristics of the spilled material (see the **spill response** section for more info).

Cleaning and water use

In the alcohol and fermentation industry the final product tends to be acidic in nature. This, combined with the fact that cleaning solutions in the industry tend to be either acidic or caustic, leads to a highly variable pH wastewater. Manual scrubbing and using less environmentally harsh chemicals may be options to minimize fluctuating pH.

Daily testing of the operations effluent pH should be completed and recorded. If effluent is outside of the acceptable bylaw limits, a neutralization or equalization tank may need to be added at the end of the process. This tank can be dosed to bring effluent within pH limits prior to discharge. If temperature exceedances are also common, this will have the added benefit of allowing process water to cool to an acceptable level prior to discharge to the wastewater system.

Explore ways to reduce the amount of cleaning that needs to be completed. Clean-in-place (CIP) systems are typically more efficient than manual cleaning. CIP systems can reduce water and chemical use by up to 50%. Proactive planning and installation of a CIP system is best as retroactive installment may be cost prohibitive. If CIP cleaning is not an option, manual cleaning and scrubbing may be the best way to reduce water and chemical use. High pressure nozzles and hoses can use up to 30% less water than a standard hose.

Installing water meters on hoses, taps and other water lines inside the facility will help to identify which processes are using the most water and where potential efficiencies may be realized. Simple awareness of total water consumption has been shown to reduce overall water use by 10 to 20%.

Other water conservation methods include:

- Performing dry clean up procedures before wet clean up;
- Installing water efficient equipment;
- Exploring alternatives to water-cooled chilling equipment; and
- Creating awareness around water usage and set water saving goals.

Advanced pre-treatment options

There are many advanced pre-treatment options to reduce solids and BOD in effluent water that may be cost effective for larger operations. These options include: aerobic digestion, membrane filtration, electrochemical methods or activated carbon treatment.

Records

As required in section 26 (4) of the wastewater bylaw, a written record of all maintenance, cleaning and inspections of your pre-treatment system must be kept on file for two years. An example of a pre-treatment record form, shown in Appendix B, can be downloaded from calgary.ca/IMG.

4.3 Effluent metering program

Alcohol and fermentation operations typically have a water use to wastewater ratio lower than other businesses as they consume water in their product. As such, customers may want to participate in the effluent meter program. Data collected from the effluent meter will be used to calculate wastewater bills and surcharge fees.

Note: There are specific requirements that must be met to qualify for the effluent metering program. More information can be found at calgary.ca by typing “effluent meter program” into the search bar.

4.4 Employee training and education

Spill response

It is important to train all staff in the correct steps and procedures to follow when dealing with a spill. Instructions should be posted in the workplace and appropriate spill response equipment should be made available. A spill kit could consist of:

- Protective clothing and equipment
- Absorbent materials such as sand, sawdust, absorbent pads, kitty litter, mops, brooms and rags
- Brooms, shovels and dustpans to clean up the absorbent materials
- Portable barriers or storm drain covers to prevent spills from entering the storm drainage system

Secondary containment for stored chemicals is recommend as a last line of defense to prevent spills and leaks from reaching the wastewater or storm system.

During a spill it is important to act quickly to prevent wastewater from entering any nearby storm drain. Spills entering the storm drainage system could have adverse effects on the local environment. The City of Calgary Wastewater Bylaw section 35 requires the person who released or allowed the release of wastewater to notify:

- The 9-1-1 emergency telephone number
- The City by calling 311 and emailing the Industrial Monitoring Group at IMG@calgary.ca
- The owner of the premise where the release occurred
- Any other person that may be affected by the release

5.0 Inspections and Enforcement

City of Calgary Industrial Compliance Inspectors carry out inspections of alcohol and fermentation facilities and may request records with regards to maintenance and cleaning of wastewater pre-treatment systems. Samples may also be taken to verify compliance with wastewater bylaw 14M2012. Should any non-compliances be noted the City will work with the business to determine root causes and identify the best way to achieve compliance.

As per the disclaimer, the intent of this document is to act as a guidance document only. All applicable federal, provincial and municipal legislation and regulations shall take precedence.

For more information:

An educational handout sheet, included in Appendix A, can be downloaded from calgary.ca/IMG.

For more information regarding compliance information for alcohol and fermentation operations, please contact the City of Calgary at 311.

Appendix A: Information Handout

Alcohol and Fermentation Industry Wastewater Information Handout

Fermentation operators — businesses that produce beer, wine, cider, spirits, kombucha or other fermented products, must adhere to The City of Calgary Wastewater Bylaw 14M2012 and The City of Calgary Stormwater Bylaw 37M2005. Use these tips to comply with regulatory requirements, lower fees and protect your business, the community and the environment.

Why are these operations a concern?

This industry has the potential to release large volumes of high-strength wastewater into the City's wastewater system. The amount and strength of this wastewater can stress the treatment capacity of the receiving wastewater treatment plant. Individual operations may contribute smaller quantities of these substances however collectively, impact from the industry can be significant.

Substances of Concern	Sources
Organics (BOD)	Alcohol, sugars, yeast, raw materials
Solids	Spent grains, pulp, fruit, hops, trub
pH	Acidic final product, acidic and caustic cleaning solutions
Nutrients	Organic source materials
Temperature	Boiling and fermenting process

Pre-treatment options

Solids management: Install screens, filters or baskets within the process stream. Keep solids from hitting the ground and prevent material from entering floor drains. Solids may have value as animal feed or compost.

Brewery tanks

Biological Oxygen Demand (BOD) reduction: Divert concentrated sources of waste rather than mixing and releasing to the wastewater system. Once segregated this high strength waste can either be treated or hauled away for offsite disposal. Ensure spilled product does not enter floor drains. Some of the options to reduce BOD in effluent are Anaerobic (commonly used in breweries) or Aerobic Digestion, Membrane Filtration, Advanced Oxidation, Electrochemical Methods or Activated Carbon treatment.

pH treatment: The wastewater bylaw 14M2012 states wastewater pH must fall between 5.5 and 10.0. This can be achieved, for example, by adjusting effluent pH through a pH Equalization/Neutralization Tank prior to releasing to the wastewater system.

Maintenance record: When maintaining a pre-treatment system, it is important to keep records of any activities completed. Records are required to be kept onsite for minimum of two years.

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What to do if you have an accidental release

In the event of an unintentional release it is important to act quickly to prevent the material from entering the wastewater or stormwater system.

The Wastewater Bylaw section 35 under *"Release Reporting"* requires the person who released or allowed the release to notify:

- The 9-1-1 emergency telephone number.
- The City of Calgary by contacting 311 as well as the Industrial Monitoring Group at img@calgary.ca
- The owner of the premise where the release occurred.
- Any other person that may be affected by the release.

For any spills that could harm the environment you will also need to report the spill to Alberta Environment.

Surcharge Program (Wastewater Bylaw 14M2012)

Untreated, high strength Alcohol and Fermentation Wastewater effluent likely contains one or more substances at a concentration that would fall under the City of Calgary's Surcharge program (Schedule "C").

Wastewater Bylaw 14M2012 Schedule "C" Surcharge Substances To recover costs incurred for the treatment of high strength effluent a surcharge may be applied to your monthly water bill. The table below shows the average effluent quality of Alcohol and Fermentation Wastewater and how it would translate to a surcharge bill. The surcharge has been broken down by parameter and range of cost by $/m3 of wastewater generated.

Parameter	Bylaw Limit	*Typical Industry Average	**Approximate Surcharge $/m3
BOD (mg/L)	300	8,500	11.83
TSS (mg/L)	300	1,600	1.49
pH	5.5-10		

" Ranges and average determined from numerous North American literature reviews
•• Approximate surcharge rate based on typical industry average
More information on the surcharge program and rate formula can be found at calgary.ca in Schedule "C" and "F" of wastewater bylaw 14M2012.

For more information please contact 311 or the Industrial Monitoring Group at img@calgary.ca

Wastewater Bylaw 14M2O12 Fines for Non-Compliance

Schedule "A" Prohibited Substances

The following must not be released into the wastewater system:

(k) wastewater having a pH of less *than* 5.5 *or greater than 10*;

(I) wastewater having a temperature in excess *of* 75 *degree Celsius.*

22 (1) (a) Releasing, or allowing the release of wastewater that contains a prohibited substance into the wastewater system

Specified Penalty $3000

Release Reporting

35 *(1) Failing to immediately notify the proper authorities in accordance with subsection* 35 *(1) where* a *substance* is *released into the wastewater* system *in contravention of the Bylaw*

Specified Penalty $1000

Monitoring* Access *Points

28 (a) Failing to provide one or more monitoring access *points for the monitoring of wastewater in compliance with subsection 26 (1) (a)*

Specified Penalty $2000

Records Maintenance

26 (4) (b) Failing to maintain a maintenance schedule and record of each maintenance for the pre-treatment system *installed at a premises for a period of two years, including records for disposal of waste residue*

Specified Penalty $500

Appendix B: Example Record Keeping Form

Pre-treatment Maintenance Record

A written record of all maintenance, cleaning and inspections of your pre-treatment must be kept on file for two years. The form below is available at calgary.ca/IMG

Business name: _____ Business Address: _____

Date of inspection	Cleaned Yes/No	Contractor used Yes/No	Contractor name (if applicable)	Disposal location	Condition of interceptor (good, fair, poor)	Sludge or Sediment layer (%)*

**Solids should not be more than 25% in the final chamber.