



Brewery Wastewater

BEST MANAGEMENT PRACTICES AND
SIDE STREAMING

DRAINS ARE NOT TRASH CANS!



Wastewater Terms

- ▶ BOD (biochemical oxygen demand) – the amount of oxygen required by aerobic organisms to treat the wastewater.
- ▶ COD (chemical oxygen demand)- indicative measure of the amount of oxygen that will be consumed by reactions in wastewater
- ▶ TSS (total suspended solids) – the dry weight of solids that can be trapped by a filter

Which U.S. Cities Have The Most Microbreweries Per Capita?

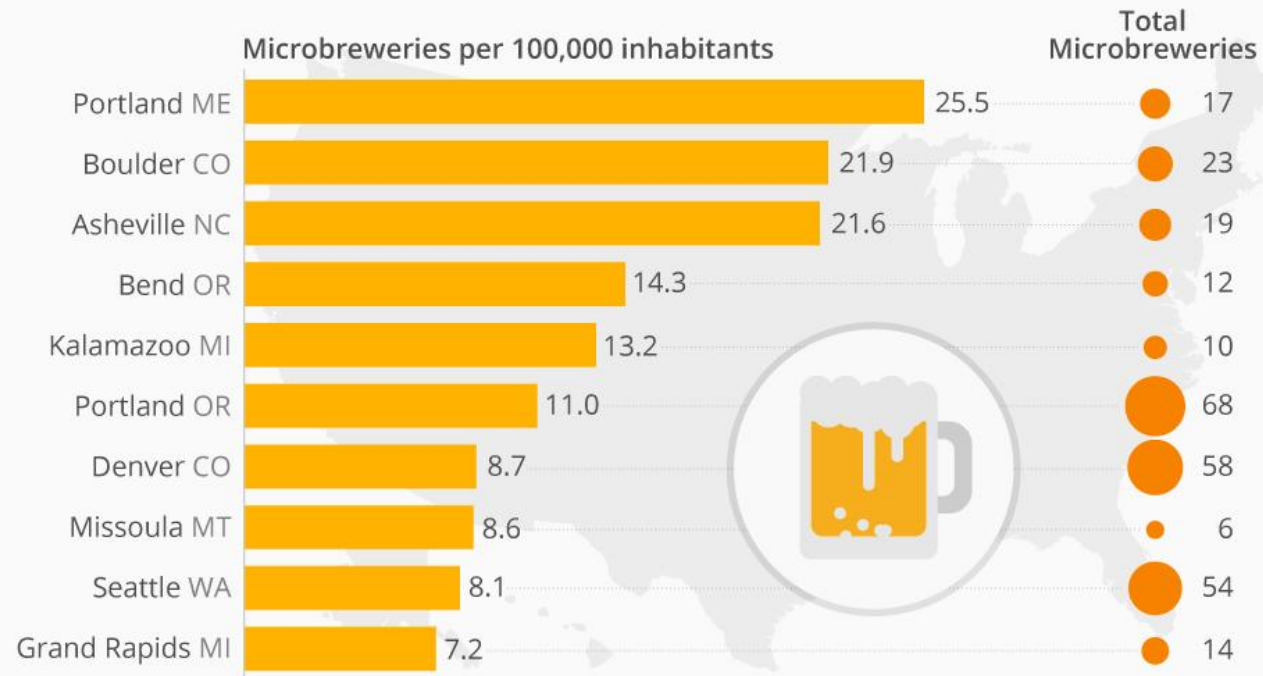
[Niall McCarthy](#),

Contributor

Article Published in Forbes November 1, 2016

America's Craft Beer Capitals

Number of microbreweries per 100,000 inhabitants and in total across US cities in 2016



@StatistaCharts Source: Smartasset

Forbes statista

Are those number accurate?

The current list of breweries maintained by MSD shows **approximately 130** when you include brands with multiple locations current active breweries/cideries/distilleries! That number is still increasing. I have several breweries not included in that number because they are not yet open.



2019 C + R Research

- ▶ 2019 C + R Research Listed Asheville as #2 in the nation for the number of breweries per capita at 17 per 50,000 residents
- ▶ The previous number was 21.6 per 100,000 residents.
- ▶ That number only includes breweries- no cideries, wineries or distilleries
- ▶ The number only includes breweries in the city limits!
- ▶ Portland, Maine is at the top with 18 per 50,000 residents

WW Treatment Plant Comparison

- ▶ MSD has a maximum flow of 40 MGD, with an average flow of 21 MGD. ~130 Active FBM's. NC has 380+ according to NC Craft Brewers Guild. So we have ~ 35% of the breweries in NC.
- ▶ Seattle Washington has a maximum flow of 440 MGD, Average of 125 MGD. 121 Breweries. The state of Washington has 426 breweries.
- ▶ Portland Oregon has an average flow of 150 MGD. 139 Breweries.
- ▶ Denver Colorado has a wastewater plant that is big enough to cover 60 small towns! 158 Breweries.
- ▶ Portland Maine is #1 per capita with 18 per 50,000 people. They treat 25.09 MGD across 4 WWTP's. They don't know the total # of FBM's but permit all over a certain flow. The permits include monthly monitoring for BOD and TSS. The largest Brewery produces 100,000 BBL/ Year

Bend Oregon

- ▶ Bend Oregon was the only other city in the country with a similar size wastewater treatment plant. They Currently have 23 (per their pretreatment coordinator) craft breweries. They are third on the list at 16 breweries per 50,000 residents.

Effluent



Process Wastewater

- ▶ 70% of water ends up as effluent (7:1 Ratio)
 - ▶ Cleaning
 - ▶ Drainage
 - ▶ Disconnecting piping
 - ▶ Opening false bottom under the screen
 - ▶ Wasting yeast slurry
 - ▶ Bad batches of beer
- ▶ 87 – 94% of beer is water.

Why do we care what you send down the drain?

- ▶ MSD's wastewater treatment plant was designed to treat domestic wastewater.
- ▶ The plant was built in 1967/1968
- ▶ The plant was updated/changed over to RBC's in 1988
- ▶ Brewery Wastewater is higher in BOD, COD, TSS, Nitrogen, and Phosphorus than domestic wastewater
- ▶ Brewery wastewater can have a corrosive pH



Efficient ways to reduce impact to the Wastewater Treatment Plant

- ▶ Implementing Best Management Practices (BMP's)
- ▶ Side streaming
- ▶ Pretreatment – adjusting pH, screening (rotating drum screen), settling solids, flow equalization
- ▶ Employee training is a must!
- ▶ Chemical Containment

What is sidestreaming

- ▶ Sidestreaming is removing the higher strength wastewaters from the flow to the sanitary sewer.
- ▶ Sidestreams include yeast, trub, wort, waste beer, hops, grains, and fruit solids, heads and tails for distilleries
- ▶ Most of the side streams can be utilized by farmers for feed or compost.
- ▶ Yeast is the hardest to get rid of because of the high % liquid

Waste Streams



Hops



Grains



Yeast

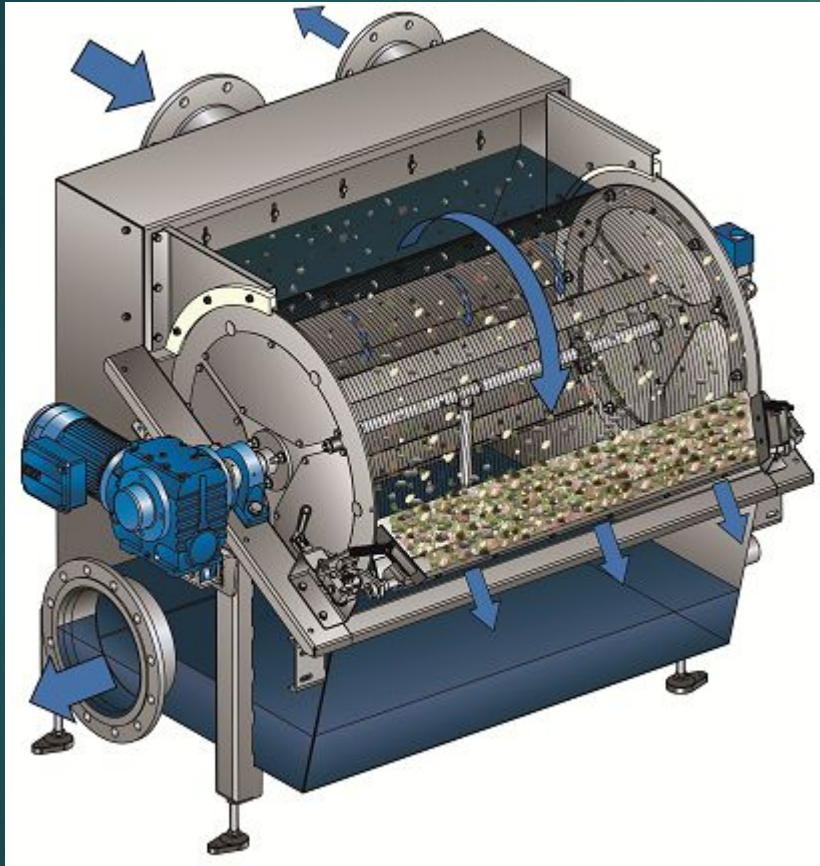
How does sidestreaming help

- ▶ Sidestreaming removes the highest strength wastewater and the heavier solids from the sanitary sewer system.
- ▶ Sidestreaming can reduce the strength of the wastewater sent to the municipality by more than half.

Chemical Containment



Solids Removal



First Signs of TSS





Typical Domestic Wastewater Characteristics

BOD <240
mg/l

COD 450
mg/l

TSS <240
mg/l

Nitrogen
20 mg/l

Phosphorus
4-6 mg/l

pH 6-8 s.u.

Brewery wastewater with and without sidestreaming

Without Sidestreaming

- ▶ pH 4.5 s.u.
- ▶ COD 17,000 mg/l
- ▶ BOD 10,200 mg/l (we have seen #'s as high as 45,000 mg/l)
- ▶ TSS 8,000
- ▶ TKN 190mg/l
- ▶ TP 93 mg/l

With sidestreaming

- ▶ pH 4.5 s.u.
- ▶ COD 1,800 – 9,000 mg/l
- ▶ BOD 1,080 – 5,400 mg/l
- ▶ TSS 400-1,000 mg/l

Values of Sidestreams

Wort

- ▶ pH 5.5 s.u.
- ▶ COD 250,000-400,000 mg/l
- ▶ BOD 150,000-240,000 mg/l

Beer

- ▶ pH 4.5 s.u.
- ▶ COD 125,000-300,000 mg/l
- ▶ BOD 75,000-180,000 mg/l

First Sign of BOD





Values of Sidestreams

Yeast

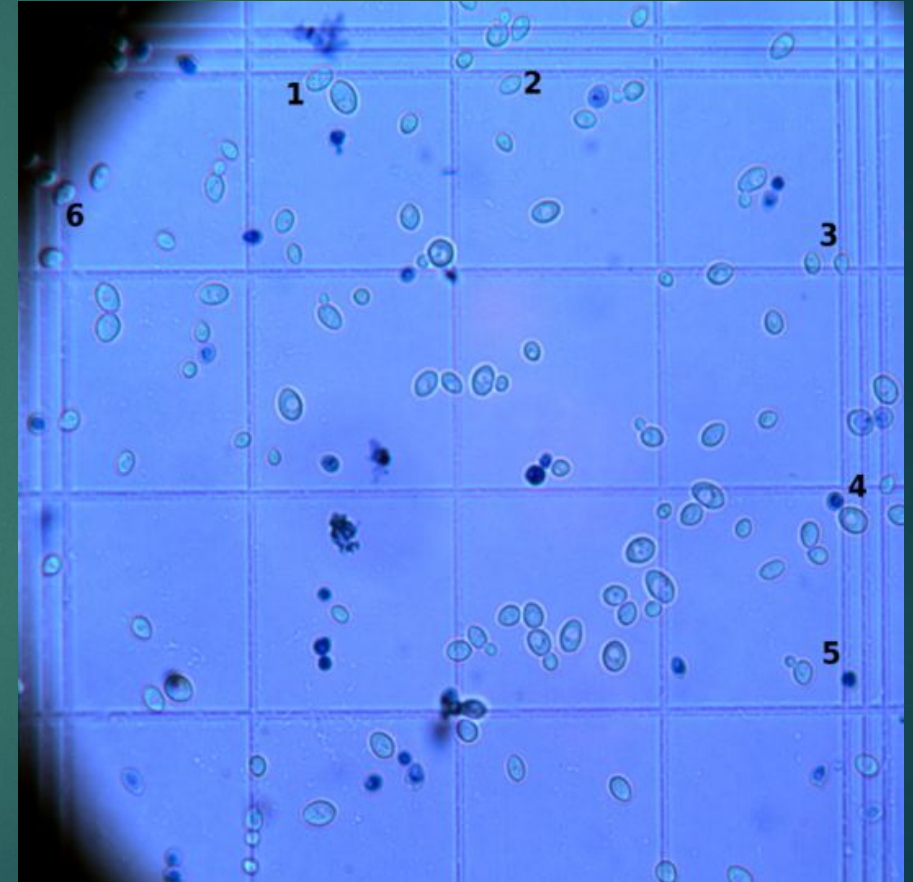
- ▶ pH 4.5 s.u.
- ▶ COD 120,000–200,000 mg/l
- ▶ BOD 72,000-120,000 mg/l
- ▶ TSS 60,000-100,000 mg/l

- ▶ Molasses has a BOD of 900,000 mg/L – Liquid sugar is about the same!

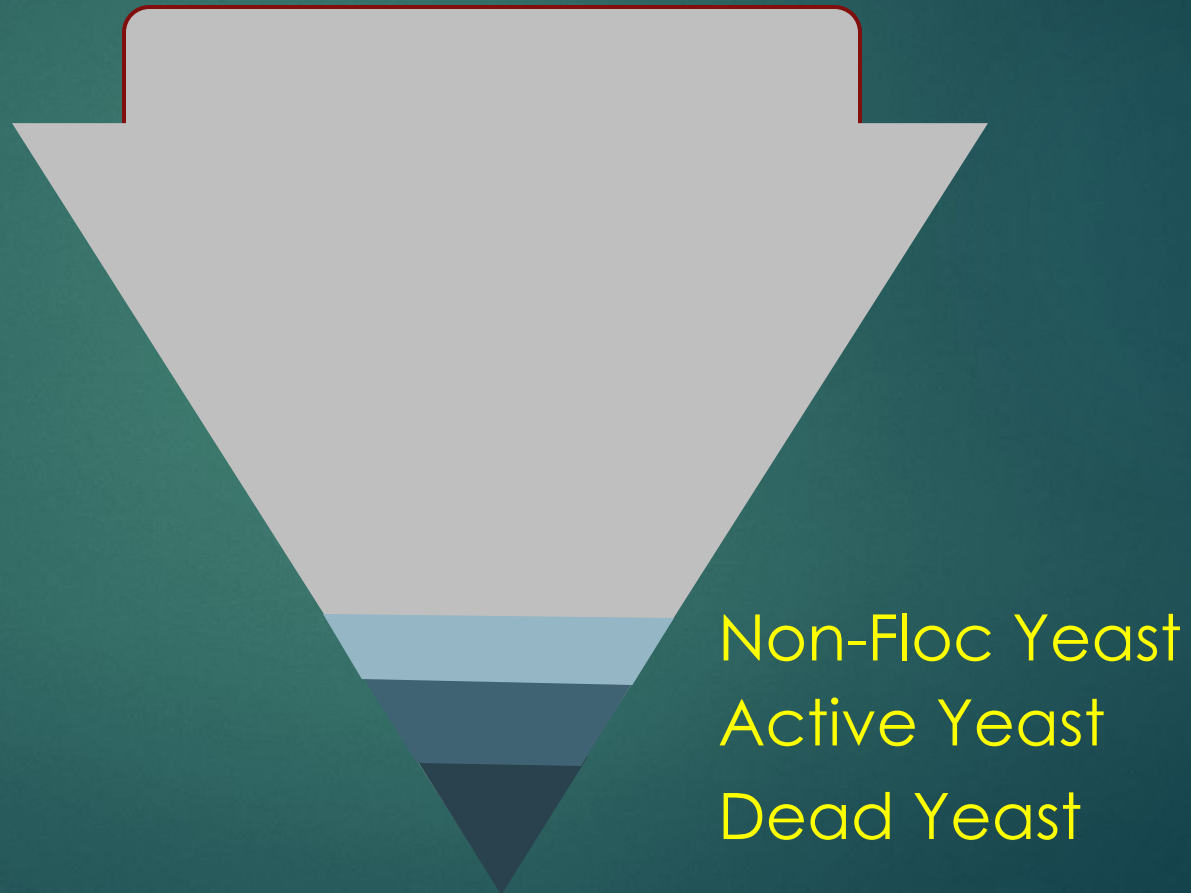
Propylene Glycol

- ▶ pH 7 s.u.
- ▶ COD 600,000 mg/l
- ▶ BOD 360,000 mg/l

Checking Viability of Yeast



Viable Yeast



Yeast



Values of Sidestreams

Label glue

- ▶ COD 50,000 mg/l
- ▶ BOD 30,000 mg/l

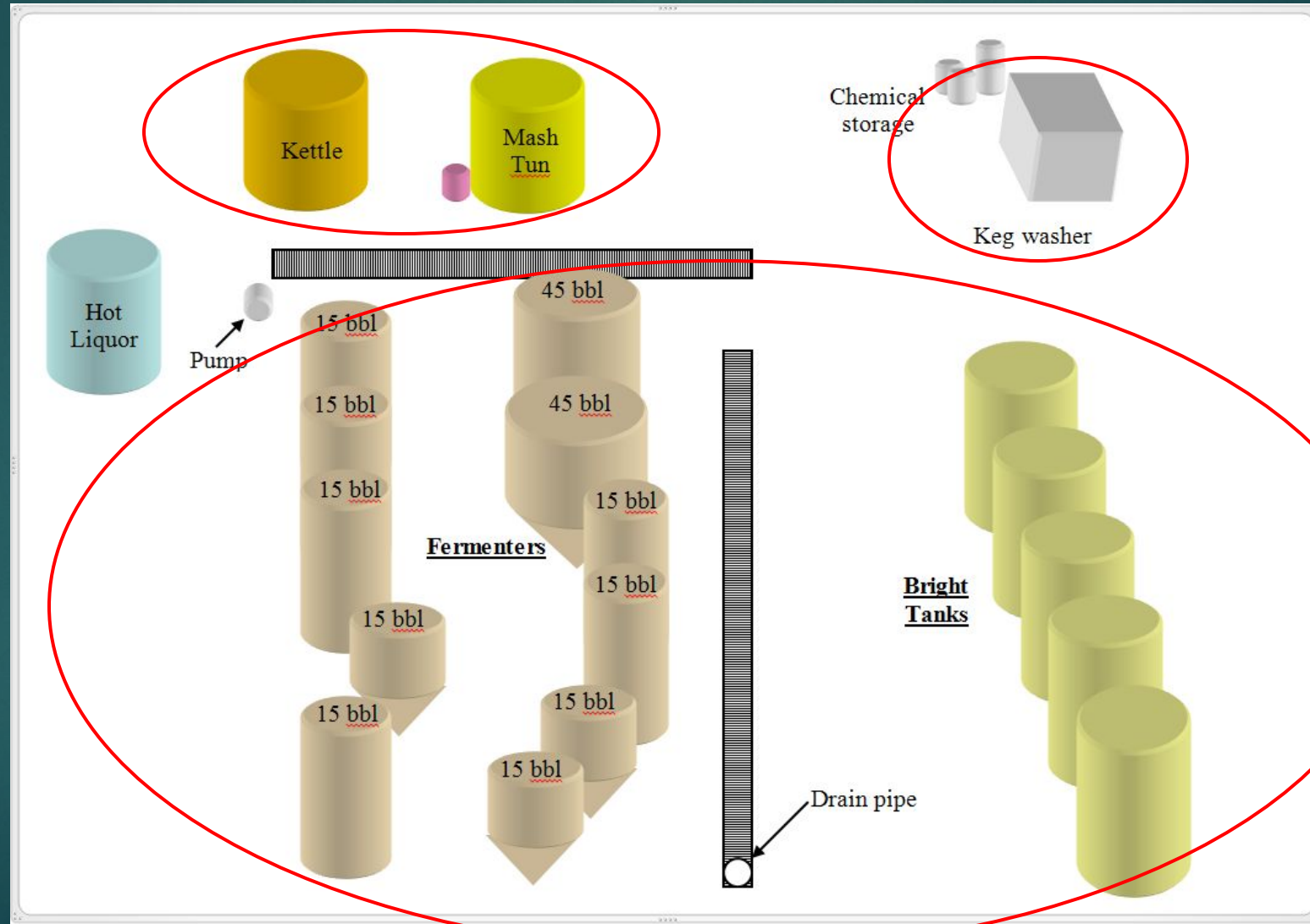
defoamer

- ▶ COD 700,000 mg/l
- ▶ BOD 420,000 mg/l

Other Issues

- ▶ pH
- ▶ Passivation

First Signs of pH Exceedance



Passivation: Ni and Cr



Best Management Practices

- ▶ Place screens over drains- The screens should be able to capture grains
- ▶ Sidestream all high strength waste
- ▶ Monitor the amount of water used in the process add automatic CIP equipment where possible
- ▶ Make sure to use the right amount of cleaning chemicals- wasting chemicals causes pH issues as well as cost money

Best Management Practices

- ▶ Use an Oxygen cleaner where possible- oxygen cleaners contain hydrogen peroxide
- ▶ Use cool water spray instead of defamer
- ▶ Send side streams to be reused in some manner where possible

What are we currently doing?

- ▶ The larger breweries have or are installing pretreatment
- ▶ MSD is working with breweries on education and best management practices to reduce BOD/TSS loading to the plant
- ▶ MSD is working with WNC communities and the local brewers association for waste grain, yeast, hops, waste beer, and trub disposal.

FBM's – Fermented Beverage Manufacturers

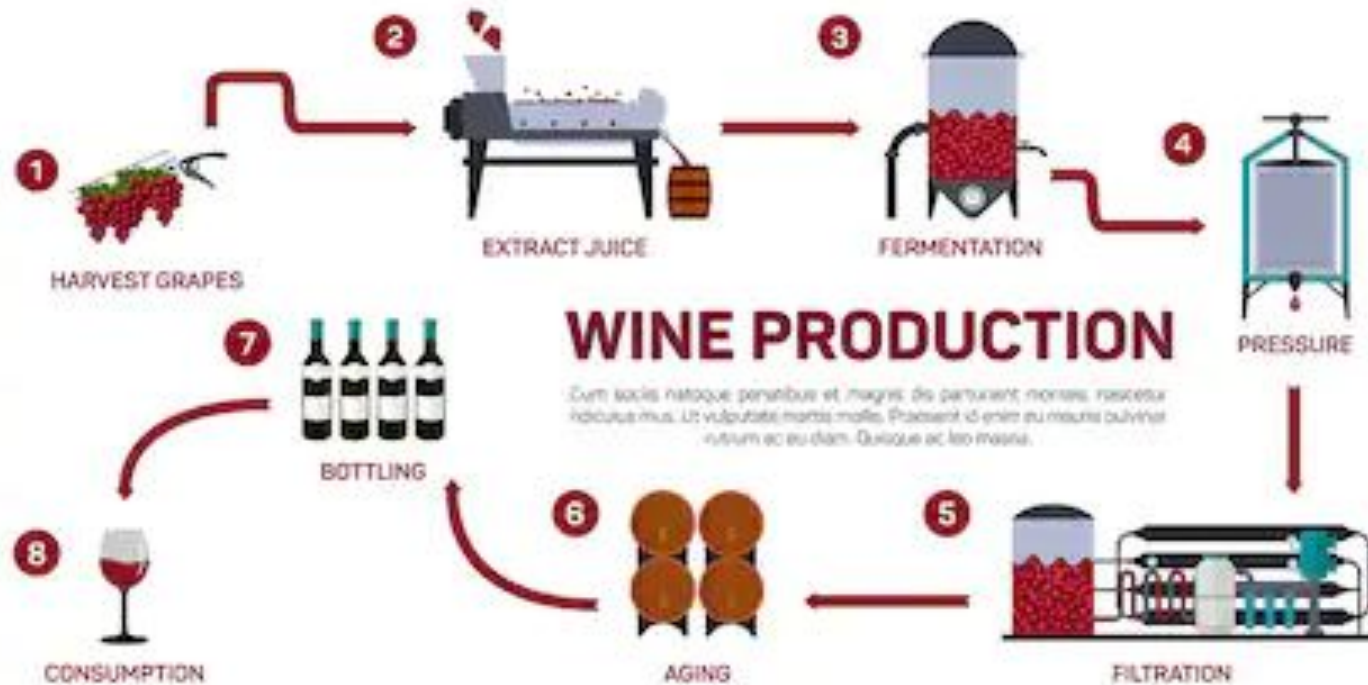
Everyone knows that FBM's produce all our favorite tasty beverages, but what is the cost to the sewer and to the wastewater plant?





CIDER

FRUIT JUICE IS
FERMENTED INSTEAD
OF GRAINS. SOME
CIDERS EVEN USE
HOPS. CIDER
PRODUCERS CAN
HAVE JUICE AND
SUGAR TANKS AS
WELL AS FRUIT
MASHERS.



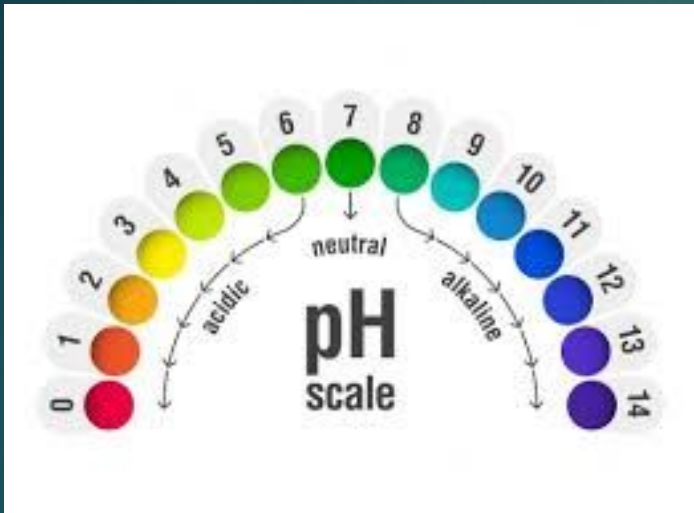
shutterstock.com • 370660691

WINERIES HAVE MUCH THE SAME PROCESS AS BREWING AND CIDER MAKING. THE HULLS AND EXTRA SUGARS AS WELL AS COLOR AND PH CAN BE AN ISSUE.



KOMBUCHA AND SAKE – RIGHT NOW WE ONLY HAVE ONE SAKE MAKER, OUR KOMBUCHA MAKER MOVED. I AM NOT AS WELL VERSED IN THESE AS THE BREWERIES, CIDERIES, AND DISTILLERIES.

So What's the problem?



- ▶ pH is a major issue!
- ▶ Barley Beer ranges from 4 - 5 s.u.
- ▶ Ales vary from 3 - 6 s.u.
- ▶ Sour beer is as low as 3.3 s.u.
- ▶ Cider ranges from below 3 to 3.8 s.u. (considered microbially safe below 3.0 s.u.)
- ▶ White wine ranges from 3 - 3.4 s.u.
- ▶ Red wine ranges from 3.3 – 3.6 s.u.
- ▶ Kombucha ranges from 2.5 – 3.5 s.u.
- ▶ The pH of Sake ranges from 1 – 2 s.u., typically average 1.3 s.u.
- ▶ The pH of the cleaning chemicals can spike the wastewater to a pH of 12 or higher or below 2!



So What's the problem?

- ▶ Solids and Yeast are a major concern!
- ▶ A typical brewery has an average TSS of 1,000 mg/l to 8,000 mg/l
- ▶ Yeast not only increases the solids but has a great impact on the BOD and can cause issues in the treatment plant.





Half of the studies show yeast can survive in the sewer the other half say it can't

- ▶ In 2017 yeast from a brewery survived in the sewer line, made it to the plant, and concentrated in the sludge thickener.
- ▶ MSD spent \$6,000 per month for 3 months in polymer to get it to settle out.
- ▶ The yeast caused the solids and yeast to rise to the top of the thickener.
- ▶ It was not pretty and smelled worse.

This is the effluent of a brewery
after a solids retention tank!





MSD SERVES approximately **130** BREWERIES, CIDERIES, WINERIES, DISTILLERIES AND A SAKE MAKER. WE COUNT EACH LOCATION SEPARATELY. SOME COMPANIES HAVE MULTIPLE LOCATIONS.



IT WAS ESTIMATED THAT 20% OF CRAFT BREWERS THAT DO NOT HAVE THEIR PRODUCTS IN STORES WILL FAIL BECAUSE OF THE COVID SHUTDOWNS. HOWEVER, THOSE WITH PRODUCTS IN GROCERY STORES HAVE SEEN AN INCREASE AND HAVE INCREASED PRODUCTION.

ASHEVILLE WAS LUCKY TO HAVE MOST BREWERIES SURVIVE!

WE HAD TO
DO
SOMETHING
, BUT WHAT?



WE ALREADY PERMIT 2 AS SIU'S,
AND THE MIDDLE TIER FBM'S AS
LOCAL PERMITS. WE SPOKE TO
OTHER AREAS THAT IMPLEMENTED
A TIERED FEE SYSTEM. THEY SAID
IT WAS A DISASTER. PEOPLE
DECIDED THAT IF THEY WERE
GOING TO BE CHARGED, THEY
COULD DUMP WHATEVER THEY
WANTED!



Sewer Use Ordinance

METROPOLITAN SEWERAGE DISTRICT OF BUNCOMBE COUNTY, NORTH CAROLINA

WE DECIDED TO ADD A SECTION IN THE
SEWER USE ORDINANCE JUST FOR FBM'S!

We drafted the Rule and had multiple meetings with breweries/wineries/cideries/distilleries. We met with anyone who had a stake in the rule.

- ▶ We did presentations on the proposed rule and received feedback. Most of the feedback was positive and helped us to develop the final rule.
- ▶ We compromised on some things.
- ▶ The Brewers Alliance (ABA) had literature that showed breweries have a 5:1 ratio for wastewater vs. beer produced, we have literature that shows 7:1. We compromised and now use a 6:1 ratio unless the individual brewery has their own study/documentation.
- ▶ We also compromised to use a 5-day average when calculating flow. So if a brewery only operates once per week but produces a lot of wastewater on that one day, we divide it over 5 days for a 5-day average.

The new Rules! MSD SUO Section 2.16

- ▶ 2.16 Fermented Beverage Manufacturers
- ▶ Fermented Beverage Manufacturers (FBMs) must follow the guidelines below according to production rates. FBMs must implement and maintain appropriate Best Management Practices (BPMs). Average flows for FBMs will be determined from The Alcohol and Tobacco Tax and Trade Bureau records that will be submitted to MSD quarterly. FBMs with average flows greater than 2,000 gallons per day (GPD), based on a monthly average, must continuously monitor process flow as outlined in subsection b. MSD reserves the right to require flow monitoring equipment for FBMs less than 2,000 GPD. MSD reserves the right to impose discharge limits when necessary. Fermented Beverage Manufacturers may also be required to sample and/or meet NH₃ or TKN limits.

Section 2.16 a

**(a) Less Than 2,000 GPD
(average flow)**

(1) Must implement and maintain appropriate Best Management Practices (BPMs).

(2) No solids greater than 1/4 inch can be discharged to MSD.

(3) Must meet the pH limits of 6.0 to 10.5 s.u.

(4) Wastewater must not exceed 60°C (140 degrees F) at the discharge point to MSD.

(5) Must fill out Brewery Survey and update with any changes not less than once every 5 years (completed with IWS).

(6) Must create and maintain a slug/spill plan

(7) Must request and receive prior authorization from MSD prior to disposal of any off spec product over 500 gallons.

SECTION 2.16 B

**(b) Greater Than 2,000 GPD
(average flow)**

(1) No solids greater than ¼ inch can be discharged to MSD.

(2) Must not exceed TSS limit of 4,000mg/L, unless otherwise specified on an Industrial User Permit.

(3) Must meet the pH limits of 6.0 to 10.5 s.u.

(4) Wastewater must not exceed 60°C (140 degrees F) at the discharge point to MSD.

(5) Must fill out Brewery Survey and update with any changes not less than once every 5 years (completed with IWS).

(6) Must submit an Industrial User Permit Application not less than once every 5 years.

(7) Must create and maintain a slug/spill plan.

(8) Must request and receive prior authorization from MSD prior to disposal of any off-spec product over 500 gallons.

(9) Must complete and submit composite sampling for BOD and TSS at a minimum monthly.

(10) Must continuously monitor effluent process flow and pH. Must have an accessible sampling point where the wastewater is well mixed and representative of all process wastewater.

(11) Must report monthly flow readings and pH meter readings.

Any Fermented Beverage Manufacturer above 25,000 GPD will be issued a Permit with specific discharge limitations. Installation of pretreatment equipment must not occur until an Authorization to Construct has been received from MSD.



Please visit
MSDBC.org for
the following
forms.

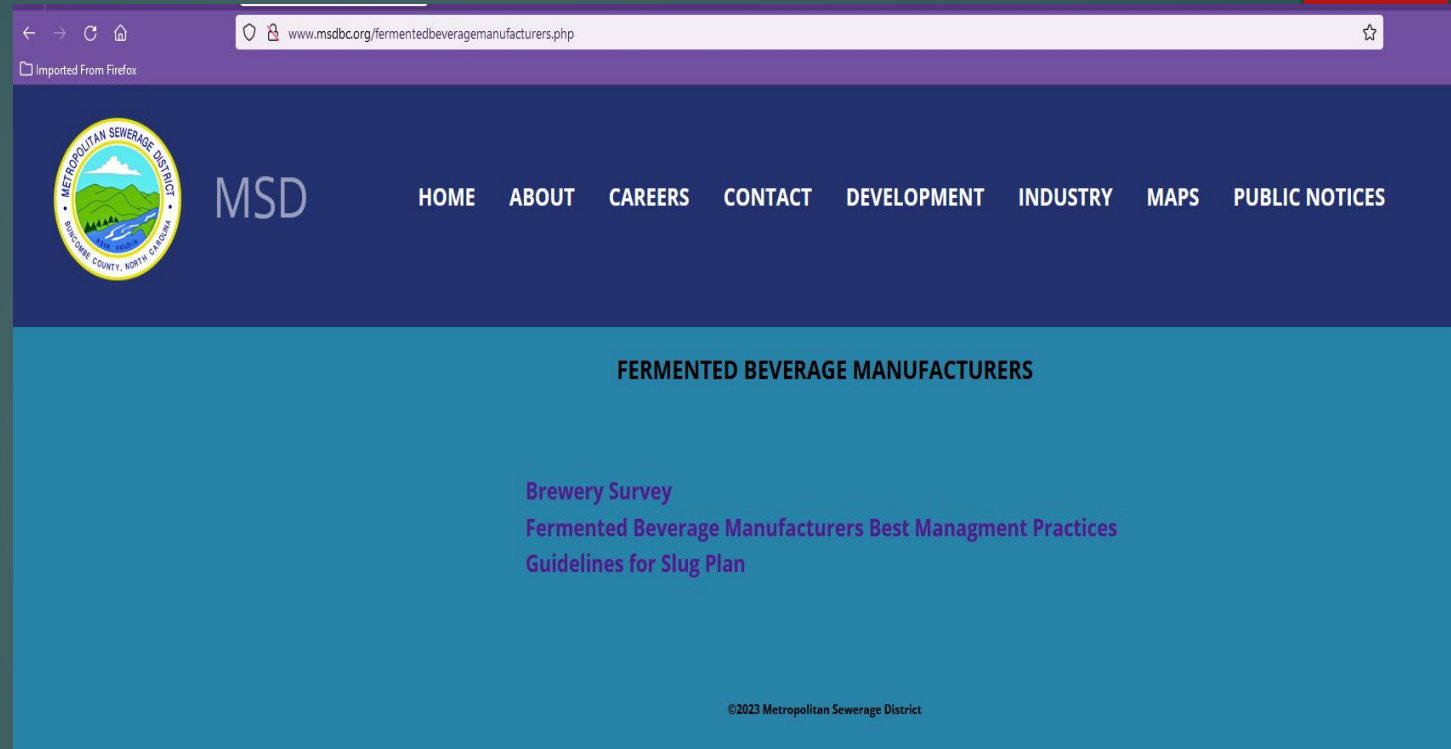
BREWERY SURVEY

FERMENTED BEVERAGE MANUFACTURES
– BEST MANAGEMENT PRACTICES

GUIDELINES FOR SLUG/SPILL PLAN

FULL SUO

We added
a FBM
section to
our
website!



All FBM's are Required to have a Slug/Spill Plan and complete annual training with employees for Slugs/Spills!
Thank you Stephanie Brixey of Durham County for the Guidelines!

**Guidelines for Slug/Spill Plan
Industrial Pretreatment Program
Metropolitan Sewer District (MSD) of Buncombe County**

1. **GENERAL INFORMATION:** Facility name & address; facility contact(s) & phone number(s); nature of business, operating schedule & number of employees; discharge practices; previous history of spills and/or slugs & corrective measures; and security provisions.
2. **FACILITY LAYOUT AND FLOW DIAGRAMS:**
 - 2.1 Facility Diagram – A general layout of the facility including location of manufacturing or commercial activities, property boundaries, floor drains & other connections to the sanitary sewer, chemical storage (raw, final & waste), loading & unloading areas, direction of drainage, etc.
 - 2.2 Flow Diagram – A diagram showing destinations of chemical & wastewater flow including treatment systems, tanks & capacities, piping & instrumentation, and flow rates.
3. **HAZARDOUS MATERIALS INVENTORY:** Types of chemicals used (both chemical & trade names must be listed); storage location of materials; maximum volume & container volume; description of containers chemicals are stored in; transfer & transport equipment used to move chemicals; and comments about the properties of the chemicals used.
4. **DESCRIPTION OF DISCHARGE PRACTICES:** Including routine and non-routine batch discharges.
5. **SLUG PREVENTION EQUIPMENT AND PROCEDURES:** Inventory of available equipment used to prevent and/or contain spills; plans to obtain necessary equipment; and operation & maintenance procedures designed to eliminate spills and leaks.

The BMP's for
Fermented Beverage
Manufactures was
adapted from King
County Washington.



Metropolitan Sewerage District of Buncombe County
Industrial Waste Program
Wastewater Best Management Practices - 2019

Fermented Beverage Manufacturers Best Management Practices (BMPs)

BMPs Protect the Sewer System – and your bottom line

MSD's Industrial Waste Department works with industries to make sure their wastewater is properly treated and meets requirements. This protects people, the environment, and the economy.

Wastewater from breweries contain higher concentrations of organic matter than typical household wastewater. Businesses that send concentrated waste to the sewer system pay an extra surcharge fee because it costs more to treat this water.

To help breweries meet requirements and manage costs, MSD has developed these BMPs for brewery wastewater. BMPs are activities, procedures, and features designed to minimize pollutants discharged to the sanitary sewer or released to the environment.

The Requirements

1. **Meet discharge limits:** All breweries that send their wastewater to the MSD Sewer System must make sure their wastewater meets the local discharge limits and prohibitions, summarized here and listed in The MSD Sewer Use Ordinance.
 - ☐ **Solids:** Food waste, including food-grinder waste, must be capable of passing through a 1/4-inch sieve. Solids can restrict or block flow in sewer lines. A company or facility that discharges solids that causes a sewage backup is liable for any damages.
 - ☐ **pH:** The pH of wastewater must remain between 6.0 and 10.5 s.u. Wastewater that is too acidic or too alkaline can seriously corrode the sewer system, so the pH must be balanced.
 - ☐ **Temperature:** Wastewater must not exceed 60° Celsius (140° degrees Fahrenheit) at the point where it enters the MSD Sewer System. Brewery wastewater that is high in temperature can be a concern at MSD's Water Reclamation Facility.
2. **Apply for authorization, if needed:** Some businesses need permits or authorization to send their wastewater to the sewer. Breweries must apply for authorization if they meet the following criteria:

THE FBM SURVEY IS USED FOR A LOCAL PERMIT APPLICATION AS WELL. I AM WORKING ON A SPECIFIC INSPECTION FORM FOR FBM'S AS WELL. THIS FORM WAS AN ADAPTATION FROM KING COUNTY WASHINGTON.

Brewery/Winery/Cidery/Distilled Spirits Survey & Permit Application

MSD



Metropolitan Sewerage District of Buncombe County, North Carolina
Industrial & Commercial Waste Division
2028 Riverside Drive
Asheville, North Carolina 28804
(828) 254-9646

1. **COMPANY BUSINESS NAME:**

Site Location: _____ Phone : ____ (____) _____
City: _____ State: _____ Zip: _____
Mailing Address: _____
City: _____ State: _____ Zip: _____

2. **CHIEF EXECUTIVE OFFICER:**

Name: _____ Title: _____
Mailing Address: _____
City: _____ State: _____ Zip: _____

3. **PERSON ON SITE (Authorized to Represent this Firm in Official Dealings with MSD)**

Name: _____ Title: _____
Phone : ____ (____) _____ email: _____

The SUO Effective May 21, 2020.

- MSD gave the existing FBM's 18 months to comply. Therefore, they must meet the requirements by November 21, 2021.

16.1 Declaration of Intent to Adopt

Declaration of Intent to adopt this Sewer Use Ordinance was introduced to the District Board of the Metropolitan Sewerage District of Buncombe County, North Carolina and passed on Feb. 19, 2020

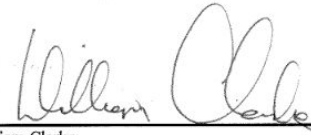
16.2 Consideration of Comments and Suggestions

Comments and suggestions from governing bodies within the District with respect to this Ordinance were considered by the District Board of the Metropolitan Sewerage District of Buncombe County, North Carolina on April 29, 2020

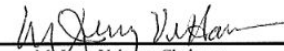
16.3 Adoption and Effective Date

- (a) Sewer Use Ordinance adopted on May 20, 2020
(b) Effective Date: May 21, 2020

Approved as to form:



William Clarke
General Counsel



M. Jerry Veach, Chairman
Board of the Metropolitan Sewerage District
of Buncombe County, North Carolina

Attest:



We will all be
glad to get
back to
normal.



QUESTIONS?

