



# **Characterizing Commercial High Strength Wastewater**

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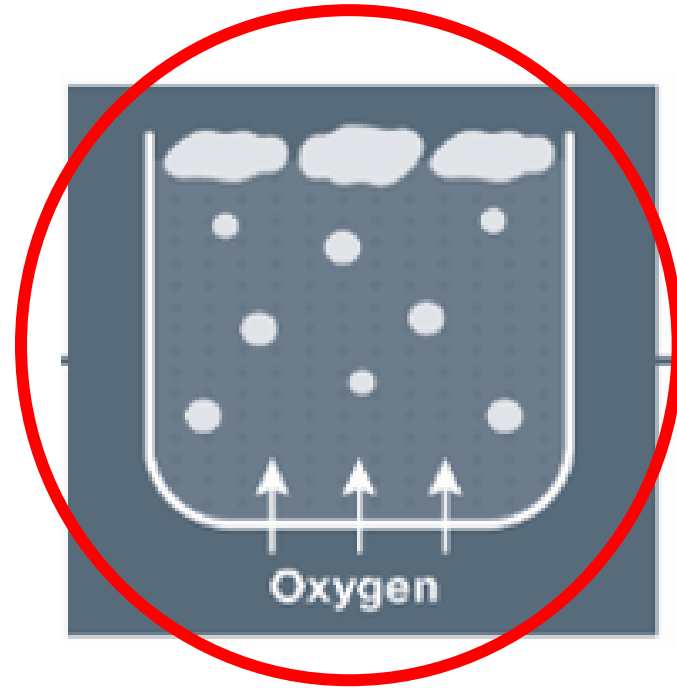
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# Defining High Strength Wastewater

- BOD<sub>5</sub> - 2 – 10 times higher than residential
- Requires 2 – 10 times more oxygen to treat

# How to Treat High BOD<sub>5</sub>?



**Oxygen AND Time Matters!**




# What is in the Wastewater

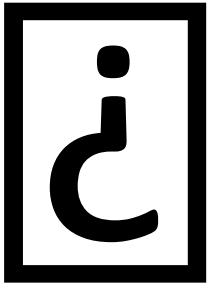
- Sugars
- Alcohol
- Milk Products
- Blood
- Sanitizers



# How High Can the BOD<sub>5</sub> get?

- Sugars – 15,000 – 18,000 mg/L
  - Alcohol – 21,000 – 35,000 mg/L
  - Milk Products – 104,000 mg/L
  - Blood – 100,000 mg/L
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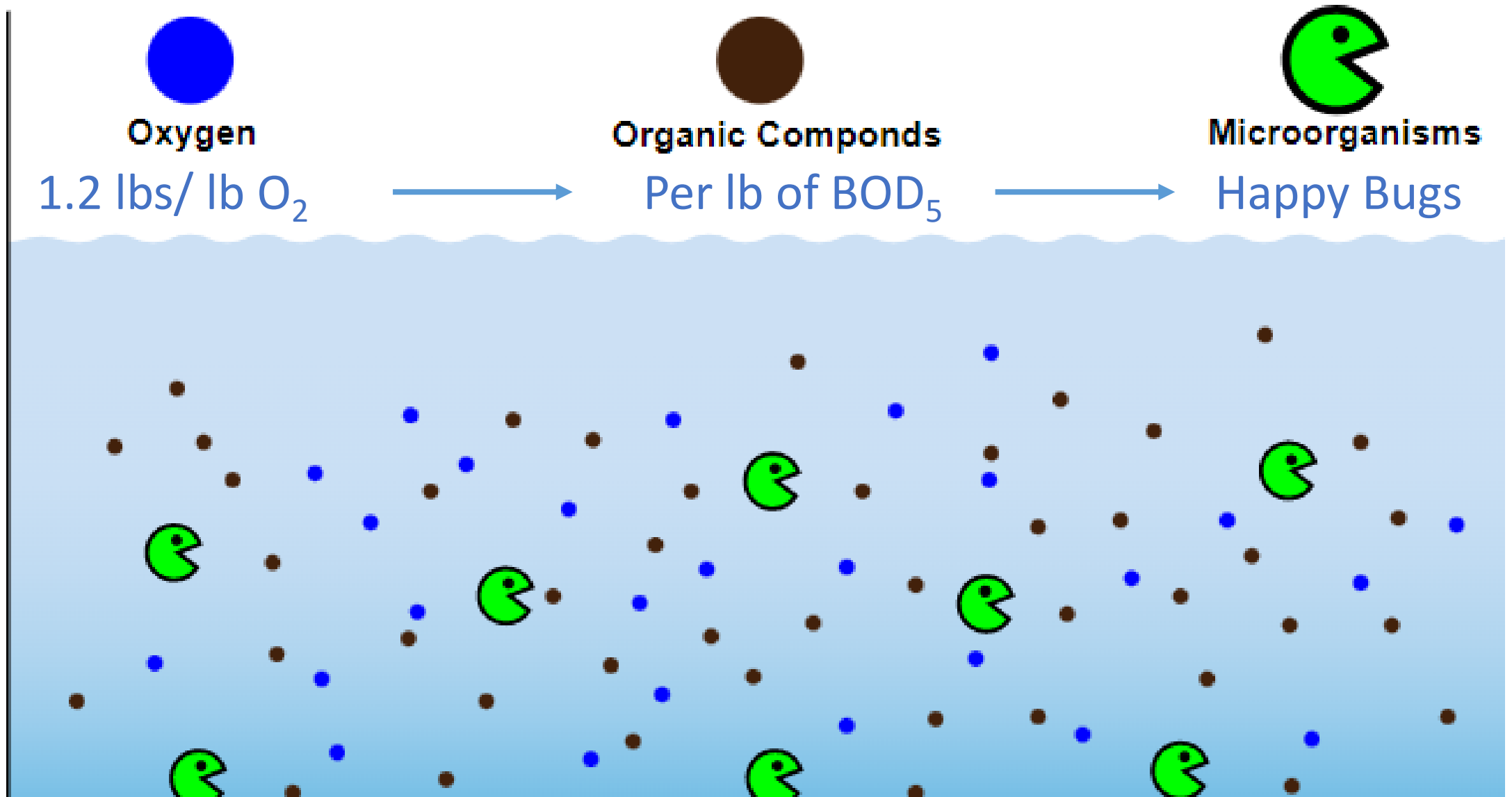
# MAGIC WASTEWATER EQUATION



$$\frac{\text{Flow (gpd)} * \text{Influent BOD or TKN (mg/L)} * 8.34}{1,000,000} = \text{lbs/BOD or TKN/day}$$

All treatment systems should use this to size their system –  
Provides the oxygen and time needed!

# Creating the Right Environment





# Sanitizer Use – Spoils Bacterial Happiness!



# Source Matters...





# Facility Type

## Influent Strength

&

## Flow Patterns



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Hours of Operation

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Days of Operation

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High Peak Flow Times

Flow  
Patterns

Looking at  
Facilities and  
Waste Inputs





What's  
Coming Down  
the Pipe?





# Food Service

- Food AND Drinks





**Biggest  
contribution  
Dishwashing!**



Table Service or Single Service?



### RIGATONI al FILO di FUMO

Rigatoni in Pomodoro **Sauce** With Pancetta, Fresh Mozzarella and Fresh Basil, topped with Pecorino Cheese.

### FUSILLI alla TOPO GIGIO™

Corkscrew Shaped Pasta in our own Four-Cheese **Sauce** with Pancetta and Savory Pieces of Chicken.

### TORTELLINI alla PANNA

Tortellini in Cream Sauce, With Fresh Mushrooms, Pancetta, Sweet Peas, and Parmigiano Reggiano cheese.

### CONCHIGLIE alla SARDA

Seashell Pasta in a Tomato-Cream **Sauce** with Ground Sausage, Peas and Pecorino Cheese.

### SPAGHETTI con le POLPETTE

Our Very Own Spaghetti in a Bolognese **Sauce** with Meatballs.

### GARGANELLI con le LUGANIGHE

Hand Rolled Garganelli Pasta, Porcini Mushrooms and Sausage Ragù, Parmigiano Reggiano.

### FUSILLONI TOCCO DELICATO

Large Corkscrew Pasta with Arugula, Cherry Tomatoes, Fresh Basil, Shaved Parmesan with Garlic & Oil.

# Menus!!







## Restaurants

- Pots and pans
- Dishes, silverware, and glassware
- Alcohol or not



# Bar & Grill

- Serving in baskets or on plates
- Cleaning greasy equipment





# Buffets & Salad Bars

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# Schools

- May not be super high BOD<sub>5</sub>





# Central Kitchens





# Satellite Kitchens



# Grocery Stores

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They aren't just for groceries anymore!





# Meat

grab your fork





Convenience Stores  
and  
Truck Stops



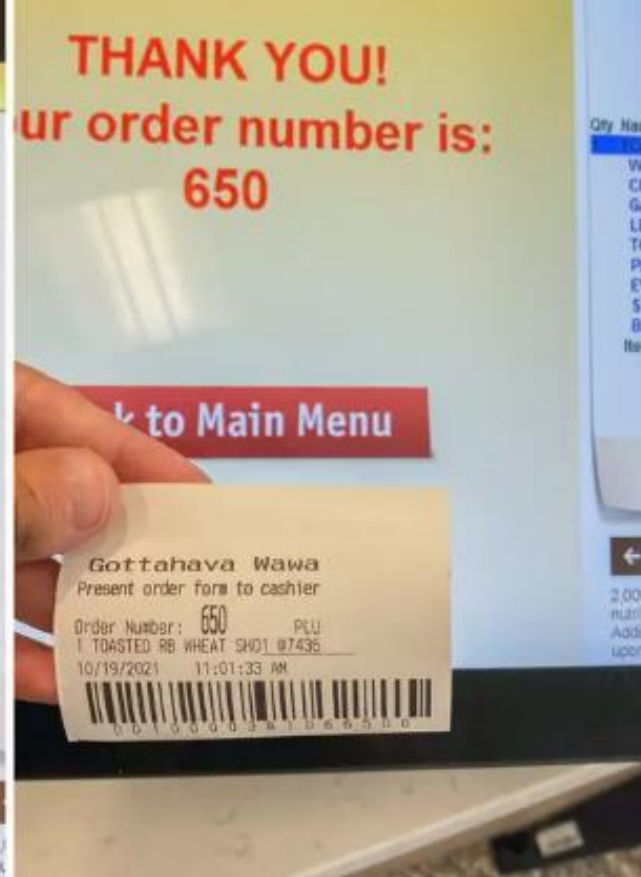
Sashimi



# Food Service

- Sell 80% of the gas in the US = lots of traffic
- 6 in 10 people looking for fast food, consider a c-store
- **Catering too!!**





# Kiosk Ordering

# Fast Food Restaurants or Full-Service Restaurants





# Coffee and Soda Still the Core Business









# University of MN Sampling

**Table 3. Wastewater Concentrations in Coffee and Soda Beverages**

	Black Coffee	Iced Coffee	Soda- Regular Coke	Coffee with Hershey's Creamer	Coffee with Half and Half	Typical Domestic Septic Tank Effluent	Convenience Store Septic Tank Effluent (Siegrist, 2017)	Restaurant Septic Tank Effluent (Siegrist, 2017)
Wastewater Concentrations (mg/L)								
Biochemical Oxygen Demand (BOD)	5,560	168,000	84,400	53,000	19800	140-200*	610	400
Chemical Oxygen Demand (COD)	12,700	321,000	110,000	46,000	32,100	389***	NA	NA
Total Suspended Solids (TSS)	260	960	265	1150	667	50-100*	263	255
Chloride	127	760	27.3	374	383	18***	NA	NA
Total Phosphorus	28.9	155	159	88.9	52	6-12**	24.2	15
Total Kjeldahl Nitrogen (TKN)	331	547	42.3	347	531	60***	NA	NA
pH	5.6	5.8	1.9	6.5	6.3	7.3***	6.6	6.9

\*USEPA (2002) \*\*Siegrist (2017) \*\*\*Lowe (2009)

# RV Parks/Dump Stations





# Data Dump Stations Vs Full Hook-ups

Park A	
	<i>RV Dump Station Effluent</i>
TKN	769
BOD	1280
TSS	230
Chloride	395
Phosphorus	56.4

Park B - RV Dump Station		
		Wast
	<i>Septic Tank</i>	
BOD	1530	
TSS	92	
Chloride	372	
Phosphorus	85.5	
Nitrate + Nitrite	-	
TKN	757	
Total nitrogen	757	
Fecal Coliform	-	

## Full Hook Ups

BOD 400 – 500 mg/L

TSS 200 – 300 mg/L

TKN 60 – 100 mg/L

**Data Dump  
Stations Vs  
Full Hook-  
ups**



# Other Things to Consider

# Trash

**“It is amazing what people can get down a toilet!”**

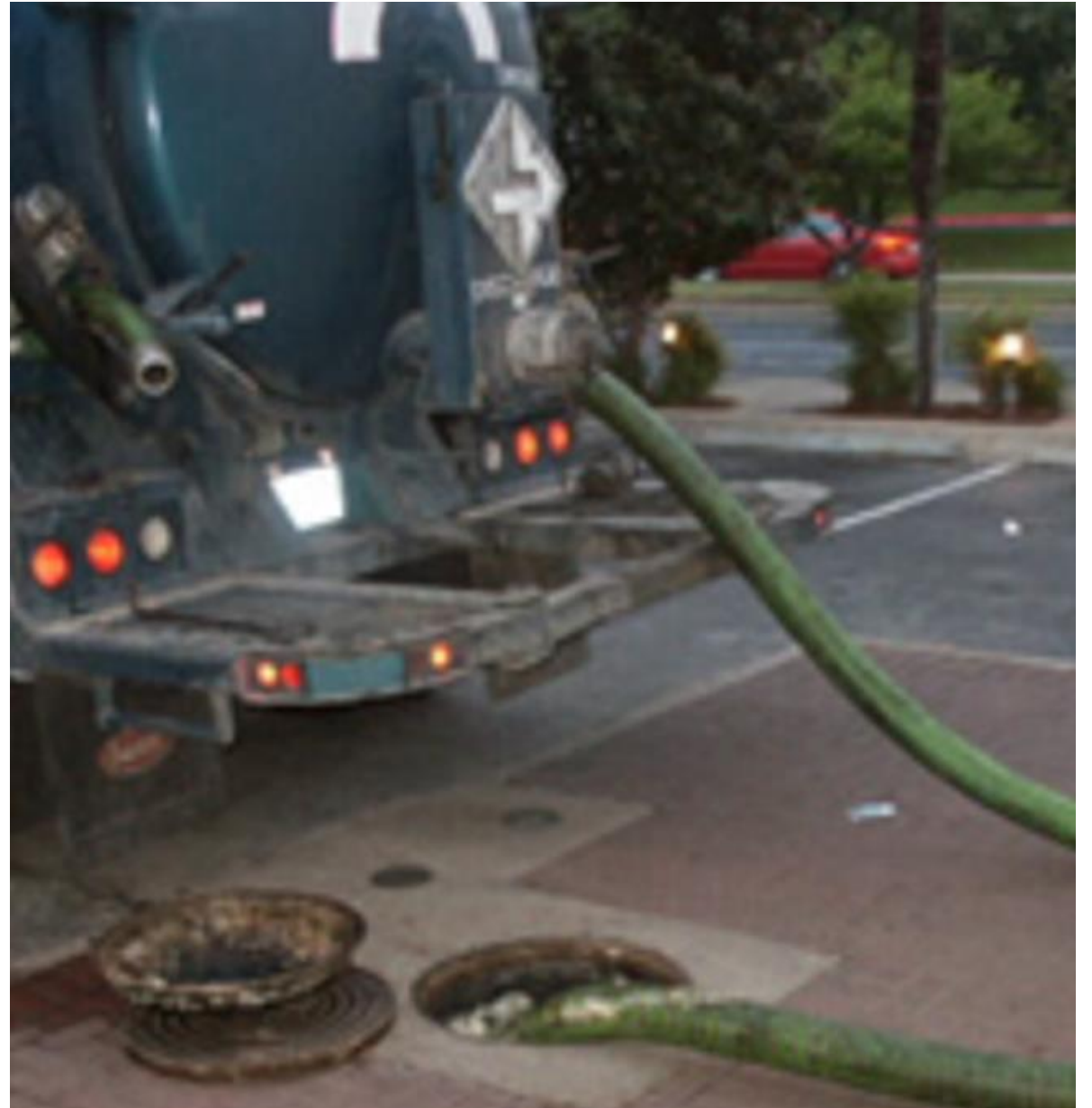
- **Baby wipes**
- **Cleaning wipes**
- **Feminine hygiene products**
- **Paper towels**
- **Tissues**
- **Trash of any kind**





# What About FOG?

- Physical removal
- PUMP AS NEEDED!
- No additives
- Watch the hot water













# Designing for High Strength Wastewater



# Have an Idea of Strength

Facility Type	Raw Influent BOD Range* in mg/L
Full Service Restaurant	500 - 1,000
Buffet	1,200 - 1,400
Bar & Grill	800 - 1,000
Bar - Limited food	600 - 700
Fast Food	800 - 1,000
School - Satellite	400 - 500
School - Central	600 - 800
Event Center	500 - 1,000
Convenience Store	600 - 1,200
RV Park - Dump Station	1,500 - 2,000
RV Park - Full Hook Ups	500 - 800

\*Ranges provide for differences in facility amenities, practices, and menu. If applicable, these assume external grease trap - properly sized, operated, and maintained and no garbage disposal.



# Food Service



# Design

Get a Menu!

Take Samples

Talk About the  
Future

Talk About  
Cleaners and  
Sanitizers

Talk About  
Dishwashing

# Design

Use a Grease  
Interceptor

Talk About  
Grease  
Management

At least 1X **DF**  
for Septic

Use an  
Effluent Filter

Use Flow EQ?





Convenience Stores  
and  
Truck Stops

# Design

Understand  
the Food

Take Samples

Talk About  
Cleaners and  
Sanitizers

Plan for Trash



# RV Parks

A solid orange horizontal bar is positioned below the text, extending across most of the width of the white box.

# Design

Use over-sized  
trash/septic  
tanks – 2X

Use effluent  
filters



# Design

Most People  
Leave on  
Sunday

Use Flow EQ!

# Do the Math

- 50 RV sites @ 40 gallons/site per day = 2000 gpd for design flow
- 75% leave on Sunday
  - 38 sites dump 100 gallons between 8AM and 11AM (checkout time)
  - 3800 gallons in 3 hours
  - Even if the flows/day are elevated the flows/hour are huge!



# Design

Understand  
the site

- Food service?

Talk about  
sanitizers for  
public areas

Questions?

