FOG: From *Notice of Violation* to Compliance

Free Oil vs. Emulsified Oil in Interceptor Tanks

JNE Environmental

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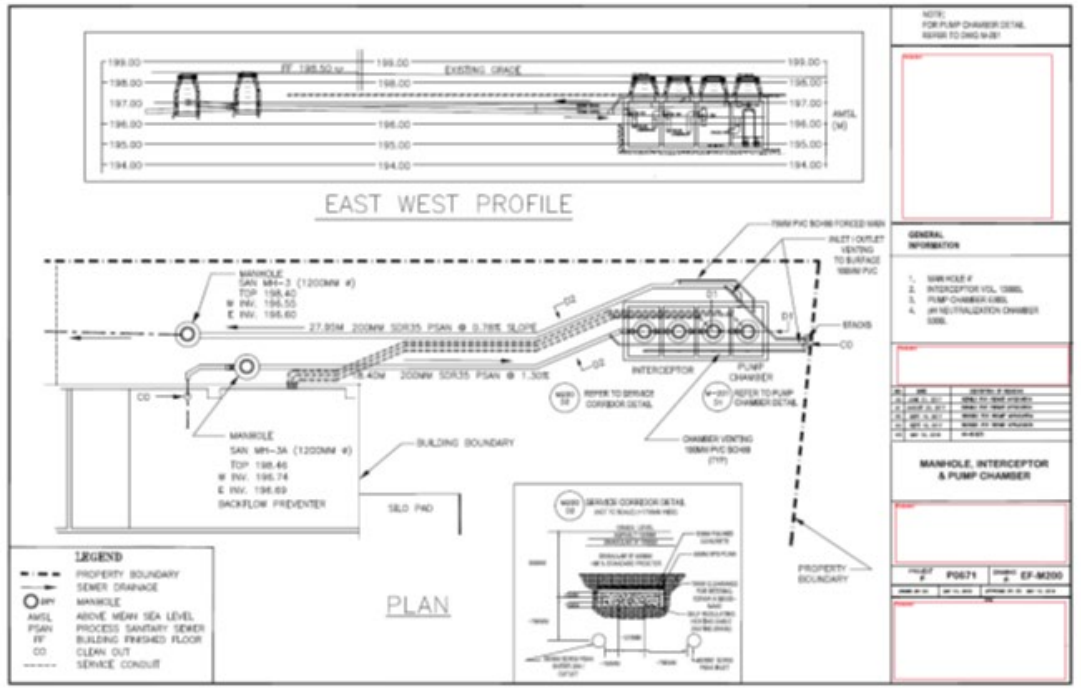
Compliance, Part 1

- It is often the case that our clients have attempted a previous wastewater solution, often based on the input from consulting engineers
- The most common solution for FOG exceedance is the installation of a grease trap
- In this case, a dual strategy was used as part of the first compliance plan
  - Diversion of cheese whey from wastewater
  - Installation of grease trap for FOG treatment

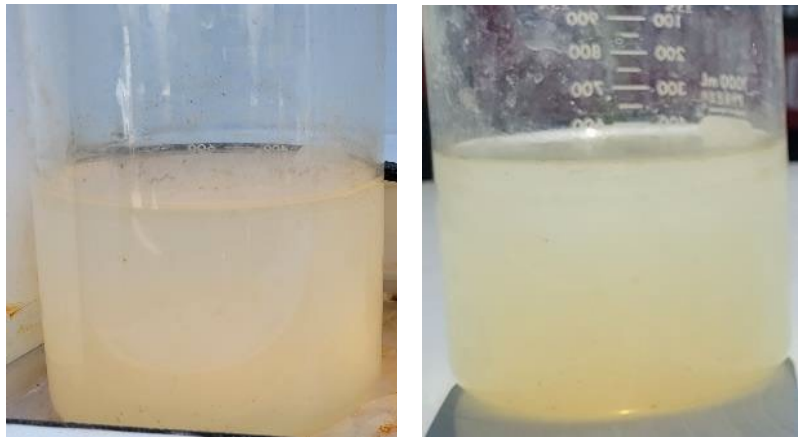


Compliance, Part 1: Diversion

- Diversion of waste from wastewater is the most economical solution.
- Engineering calculation showed diversion of whey and installation of grease trap/interceptor would achieve by-law compliance.
- Reality:
  - Diverting 100% of whey was not achievable in practice.
  - Grease trap/interceptor not capable of (significant) FOG removal.

Compliance, Part 1: Interceptors

- Grease traps are very poor at removing emulsified FOG.
- Simple test to determine if plant is emulsified (right):
- Jar of plant effluent left to sit (record approximate start time).
- Record time required to generate a clear (visual) layer.
- Pictures show two samples from food processor taken 30 minutes apart — no visible floating FOG.



Compliance, Part 1: Interceptors

- Examples of vegetable oil and water mixture.
- Clear free oil present in jar.

- Even after vigorous mixing, the oil phase separates readily within seconds (10 seconds shown in picture).
- Water phase visually clear within 60 seconds.

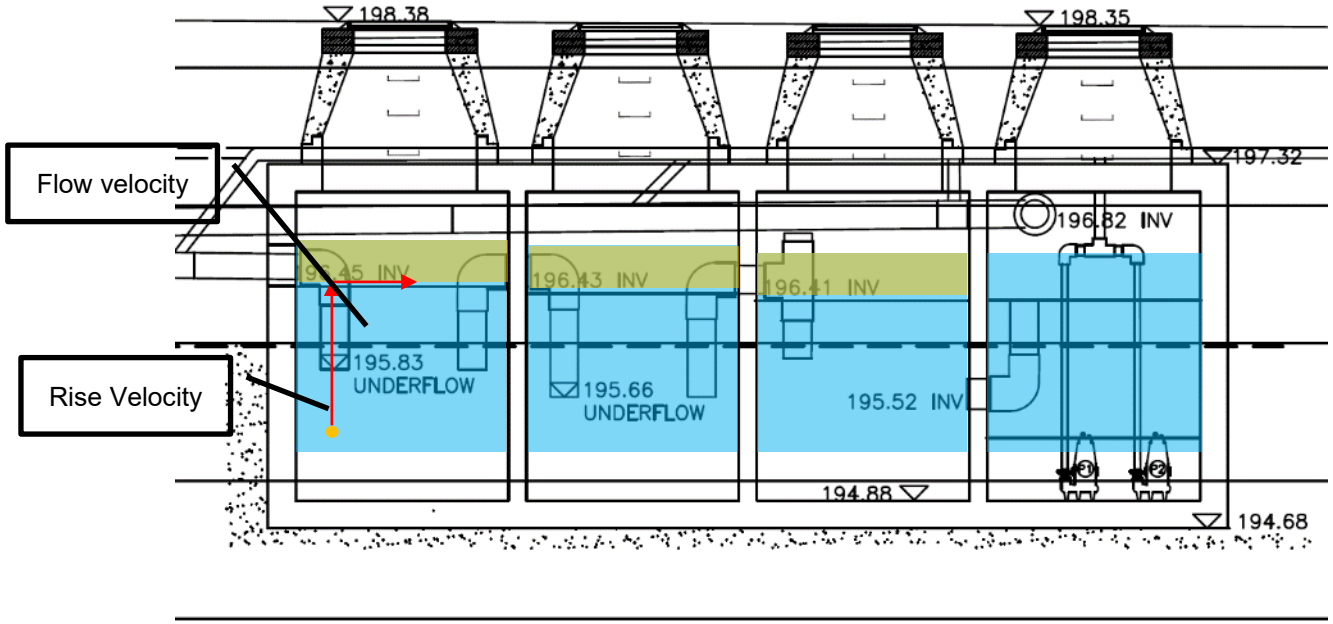
Compliance, Part 1: Interceptors

- Addition of 5 drops of soap and vigorous mixing emulsifies the mixture.

- Even after 10 minutes of settling, the water is still cloudy with small, emulsified oil particles.
- All CIP chemicals contain emulsifying agents.

Compliance, Part 1: Interceptors

- Quick sizing calculation to validate interceptor sizing free oil sample:



- All particles that rise up past the outlet pipe are captured before they pass out of the chamber.

Compliance, Part 1: Interceptors

- Interceptor volume calc (simple) for free oil sample shown in pictures.
  - Particle rise velocity distance/time (from jar test = height of liquid layer = 7cm, time = 60 seconds) — therefore velocity = 7cm/minute.
  - Required residence time = distance the particle must travel to get above the outlet/particle rise velocity = 83cm / (7cm/minute) = 11.85 minutes.
  - Interceptor chamber volume = design flow rate x required residence time = 100gpm x 11.85 minutes = 1,185 gallons (4,480 L).
  - Interceptor shown in schematic has two chambers of 6,900 L each — larger than required for free oil example.
  - How does the interceptor design change if it takes 30 minutes to see clear water?
    - Particle rise velocity = 0.23 cm/min
    - Required residence time = 356 minutes
    - Interceptor chamber volume = 35,571 gallons (16.8 ft x 16.8 ft x 16.8ft)!
- **Interceptors can work, but only when the pollutant is free floating.**

Compliance, Part 1: Interceptors

- **Interceptors can work, but only when the pollutant is free floating.**
- All calculations assume constant average flow rate.
  - Not reality — average flow rate can be 1/10th of peak flow rate.
  - Interceptor sizing based on peak flow rate = 10 times larger!
  - Interceptor clean-out frequency impacts removal efficiency.
  - If float layer accumulates below the outlet pipe, no FOG removal.

Compliance, Part 1: Interceptors

- This case example proceeded with a JNE DAF-based system.

NoV to Compliance: Treatment

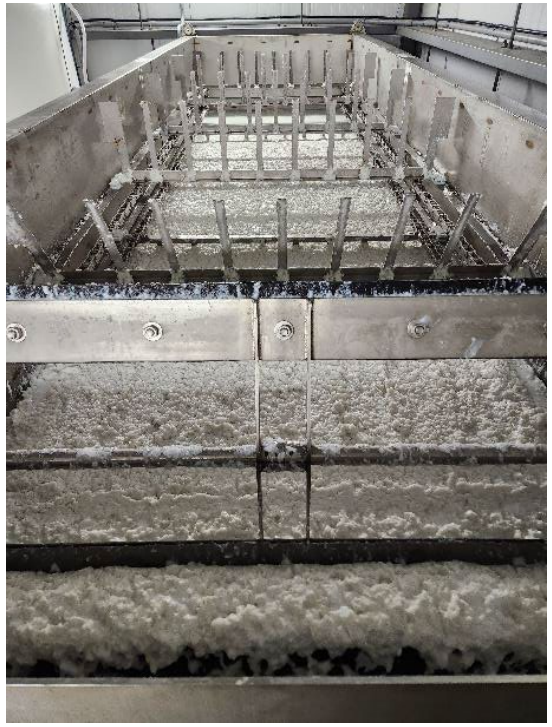
- Processing wastewater:
  - Two sample sets of untreated wastewater and treated DAF effluent were analyzed to validate the performance of the system.

January 27, 2023	Untreated	DAF effluent
pH (S.U.)	**11.6**	**7.9**
Solids (ppm TSS)	**1835**	**5**
Total Oil & Grease (ppm)	**4720**	**16**

February 8, 2023	Untreated	DAF effluent
pH (S.U.)	**11.1**	**8.2**
Solids (ppm TSS)	**1272**	**30**
Total Oil & Grease (ppm)	**1190**	**15**

NoV to Compliance: Treatment

- Processing wastewater:




NoV to Compliance: Treatment

- Often the completion of a very long journey.
- Sometimes this journey involves investments that did not yield compliance.
- Reduction in Sewer surcharges:
  - Can be significant ($400k/year)
  - Offset by new operating costs
    - Sludge disposal
    - Chemicals

End

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