Collection System Corrosion Issues, Oil-Water Separators, and Grease Interceptors

California Regional Water Quality Board

Colorado River Basin

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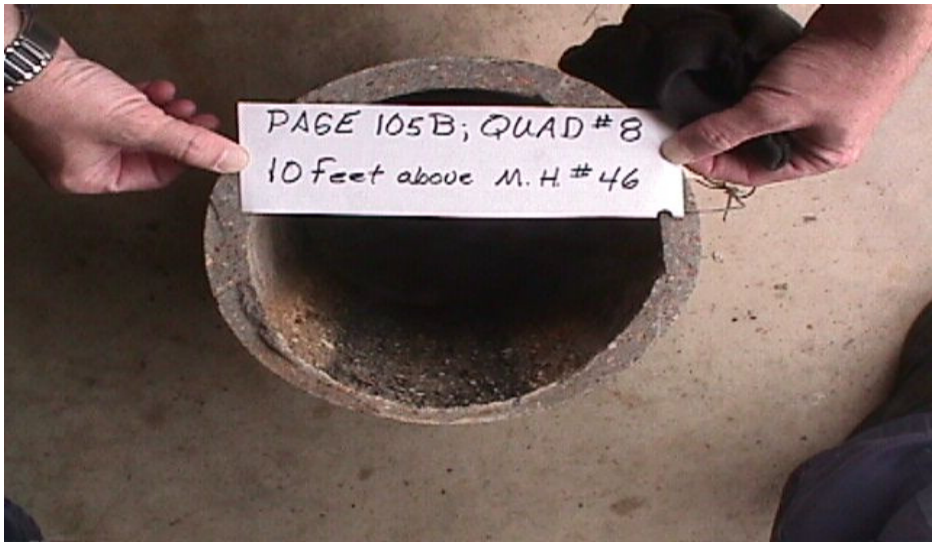
MMS

MONITORING AND MANAGEMENT SERVICES

Corrosion of sewer from Industrial Source



Industrial User Corrosion

- Corrosion impact may be further downstream than immediate downstream manholes.
  - Example: SIU initially discharges to 400 feet of PVC pipe, but then goes to concrete and iron pipe. Collapsed sewer resulted after 12 years of SIU discharge.
- Not just pH, but also alkalinity (buffer capacity) can play role
- CCTV personnel need to record sewer system impacts below IU's, especially those associated w/ dairy products, bottling operations, use of DI water & cleaners, metal finishers, etc… (scheduled CCTV)

Corrosion

- Hydrogen Sulfide-anaerobic decomposition of sulfate
  - FOG can contribute to sulfide formation in sewer pump stations and in collection system
  - Also, **sulfate** can react with calcium in concrete to form calcium sulfate, which can cause concrete to crack
- Chloride
  - Can cause decay and penetrate coatings
- Chlorine
  - HCl and HOCl can increase rate at which iron and steel corrode
- Nitrates and Nitrites
  - Can contribute to iron and steel corrosion
- Dissolved Salts
  - Electrolytic action on base material can corrode concrete, cement mortar
- Organic Compounds
  - Solvents will promote the dissolution of gaskets and rubber and plastic linings

Other sources of corrosion

Sewer corrosion below a coffee shop

Food Service Establishments…

***Coffee Shops**

(coffee pH 4.6 to 5.1)

***Bakeries, FSEs with high sugar use**

Industrial Users: Dairy products, colas

Sewer Maintenance personnel need to be on watch for corrosion problems in sewer system

Corrosion Control

- Development & implementation of site-specific corrosion control measures (hydrogen sulfide or other corrosives)
- Monitoring program to evaluate corrosion control measures? Documentation?
  - Chemicals Added? Volume per day, week, month?
  - Weather conditions
  - Field Analysis, Pictures
- Performance measures, and mechanism to include corrosion control program in Information Mgt. System.
  - Trend Analysis- Improvements?

Performance Indicators

- Corrosion Monitoring
  - Hydrogen sulfide monitoring location trends
  - Recording pH, ORP and other measurements at odor problem areas or below IU's
  - Additives used, volume of product, effectiveness. Track costs.
  - CCTV results below IU's (annual comparison), sulfide or odor problem areas, or below FSEs. Work with Pretreatment staff on locations and communicating results.
  - Sewer line replacement or repair due to corrosion. Track costs.

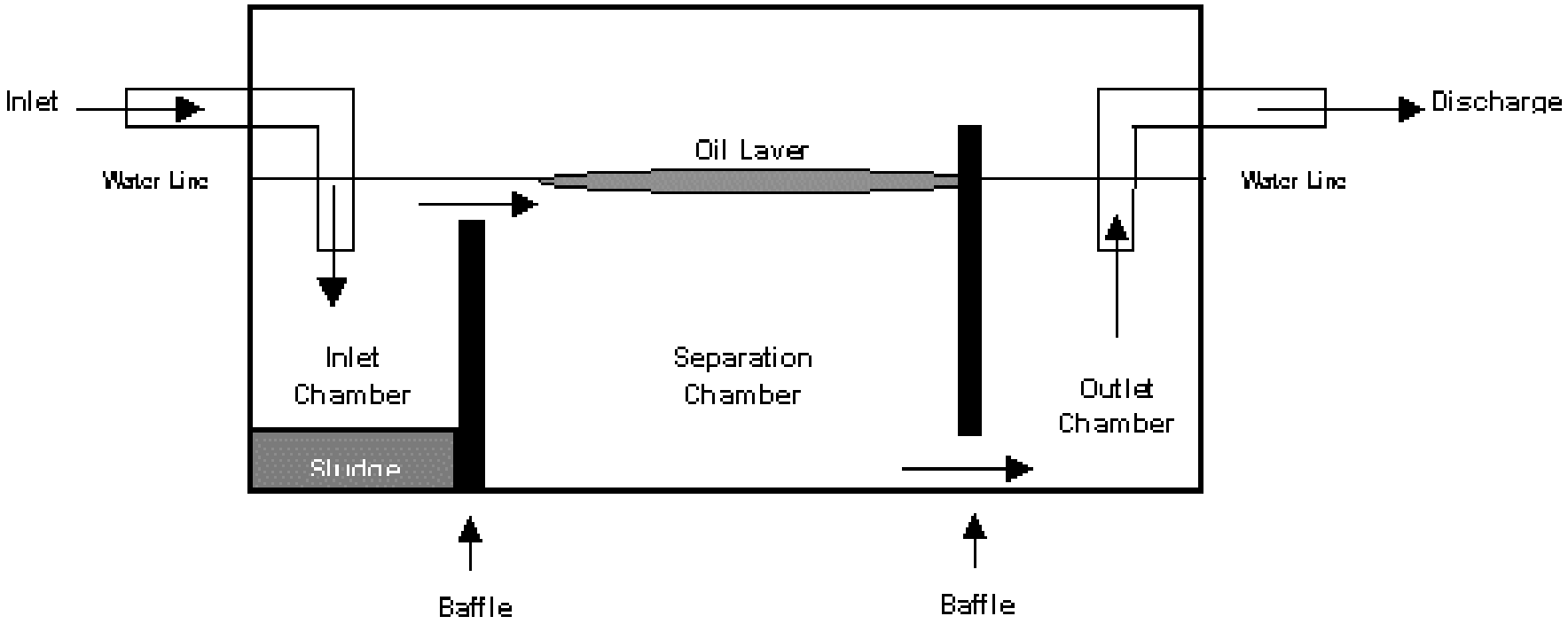
Oil / Water Separators

- Types
  - Gravity
  - Coalescing (“Binding together”)
    - Inclined fixed plates/filters (30 to 60 degree angles)
    - Filter media made of oleophillic (oil loving) fibers such as polypropylene. Droplets get larger until they release to surface.

Installations:

- Car Washes
- Maintenance Shops
- Garages
- Oil Change Facilities
- Industrial applications

Gravity Oil/Water Separator



Consider Stoke's Law: a 100-micron diameter oil droplet will rise approximately 6 inches in water every ten minutes. A 20-micron diameter oil droplet will take over 2 hours to rise the same distance. Thus, coalescing oil/water separators can remove smaller oil droplets at higher efficiency.

Oil Water Separators

- Designed to remove oil and solids
  - Velocity slows, oil, water sludge separate by gravity
  - Two or three chambers with baffle
  - Some units will have coalescing plates
- Oil Removal
  - Several authorities set specific guidelines
  - Max recommended oil accumulation = 3”
- Solids Removal
  - Maximum recommended sludge accumulation = 25%
- Landa Units
  - OWS with coalescing filter that need cleaning

Issues

- Emulsifying Agents
  - Detergents and soaps can adversely affect the operation of the O/W Separator
  - Excessive use of these emulsifying agents can cause oils to pass through the system
- Contaminants in wastewater sludge
  - Fuels, petroleum oils, grease, solvents, and metallic particles may be in the O/W Separator sludge, thus could be classified as hazardous waste.

Car Wash Facilities

- Coin Operated facilities
  - Lot of problems at these locations
    - Oil dumping
    - Anti-freeze
    - Debris, objects in drains causing clogs
- Supervised or personnel on site facilities
  - Less problems but still have potential for issues

Various Local Regulations

- Tacoma, WA: recommends oil removal when oil thickness reaches 1”, or when sludge reaches 6”.
- Washington State/King County: Recommends maximum oil level of 3”, maximum sludge level of 8”.
- Canadian Petroleum Products Institute: maximum oil thickness of 5% of total wetted height of separation chamber, maximum sludge thickness of 25% of total wetted height of separation chamber
- Many U.S. cities use 3” oil thickness and 25% sludge volume as recommended indication of cleaning

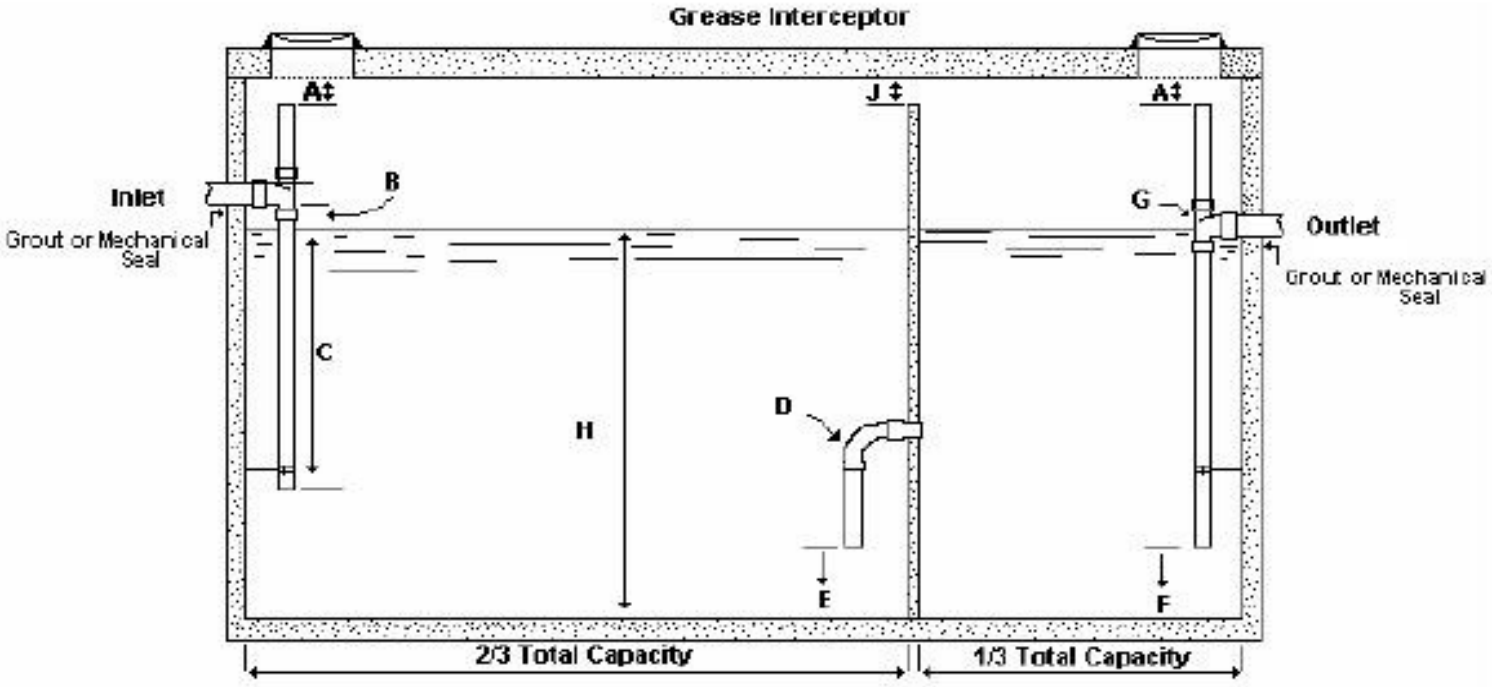
General Permits with BMPs could be alternative for these type facilities

- As discussed previously…make sure the City's SUO contains the legal authority to issue General Permits and apply Best Management Practices.

Example: Oil Change Pit Facility

- General Permit can include BMPs for monitoring, inspecting, maintaining and operating system
  - No discharge of total petroleum hydrocarbons, oils, anti-freeze is allowed
- Periodic Inspection for Separation Device
  - Clean and inspect sump pump screen daily
  - Remove accumulated solids when >25% or every 3 months
  - Remove oil when thickness is 3”
- Proper use of Drain Funnel
  - Prepare and implement “Spill Prevention Plan”
  - Clean up oil spills, manage shop rags correctly
- Maintain Sump Pump Level Controls
  - Periodically test level controls

Based on field experience, this grease interceptor design has worked best.



A.) Minimum 6", but not less than pipe diameter.
B.) Inlet pipe invert to be 2 1/2" above liquid surface.
C.) Inlet pipe to terminate 2/3 depth of water level.
D.) 90 degree Sweep, minimum size - 6".
E.) 12" from floor to end of sweep.
F.) 12" from floor to end of outlet pipe.
G.) Outlet pipe no smaller than inlet pipe, minimum - 4".
H.) Minimum depth of liquid capacity - 42".
J.) Maximum distance from ceiling - 6".

Interceptor deterioration, baffle wall collapse, leaking, and corrosion impact to public sewer

pH of wastewater in interceptor was 1.5 standard units.

Krispy Kreme pH adjustment system

Interceptor Certification

We will review grease interceptor certification program later, but one of the main reasons for the certification program is due to deterioration or leaking tanks.

Fiberglass and Plastic alternatives

Lack of adequate location has resulted in special plastic tanks being installed in basements or parking garages. Also, the pH of grease interceptor discharges ranges from 4.5 to 6.0 standard units. Some cities have allowed fiberglass and plastic tanks to be installed. If installed, you need to make sure that groundwater will not cause any to float and that the thickness will prevent any collapse to the structure.

A few cities have required installation of filters on the outlet T of the interceptor. This has been contested by some FSEs that have had wastewater back-ups in their kitchens, and has been questioned by some health department officials.

Cleaning Frequency for Grease

- Depends on facility's service volume
- Depends on size of grease interceptor
- At a minimum, pump complete contents of interceptor every 90 days
  - Based on studies conducted for pollutant concentrations, depth of FOG layer and food solids layer effecting efficiency of interceptor
  - Some facilities will have to pump every 60 days or every 30 days
  - Make sure plumber and grease waste hauler leave the grease interceptor with all proper components…Outlet T, Inlet T, Midwall baffle sweep. Its not just about pumping the interceptor
  - For facilities that have excess flour, dough, batter…will need to pump interceptor more often. Observe the 25% rule.
  - Also, food grinders are definitely discouraged. They contribute to pipe blockages and fill up the interceptor with food solids and make it inefficient

Grease Interceptor Pumping

- Pump complete contents of interceptor
  - WHY? Studies have shown that partial pumps of interceptors allow for food solids buildup that can cause shortcircuiting and increase in the tank deterioration, and decrease in pH. Pump and treat onsite vendors have been sampled and results show a pump back wastewater with concentrations ranging from 9,000 mg/L to 17,000 mg/L oil and grease.
- Pump at least every 90 days or as needed in order to meet the 25% rule (FOG layer and food solids layer combined are 25% or more of the total wastewater depth in the interceptor)

Cost of Interceptor Maintenance

- Example: FSE pumps 1500 gallon interceptor every 10 months. Thus, heavy FOG layer and food solids layer. This causes the grease waste hauler to spend much more time to clean which equals high cost (estimated $1,000 to $1900 for annual cleaning plus cost of sewer line jetting due to no regular maintenance)
- Versus 90 day cleaning…easier maintenance and prevention of FOG clog in private sewer lines. Cost estimate for cleaning every 90 days would be $250 to $350, which is less than the one time per year cost of cleaning.

Regular maintenance of interceptor will save time and money.