

# How Industrial Wastewater Treatment Plants Work

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# Three major types of industrial waste water treatment systems

- Metal Hydroxide Precipitation
  - Electroplaters
  - Phosphate Coatings
- Oil Water Separation
  - Coolant Removal
  - Cutting Oils
- Dissolved Air Flotation
  - Food Processors
  - New Bio Diesel Facilities

# Metal Hydroxide Precipitation

- Analytical Instruments Used:
  - Hach Test Kit
  - Atomic Absorption Unit
  - ICP
- Tests are conducted on the effluent at different times of day and can vary. If you are having trouble, you could run several tests a day until problem is resolved.
- If problem is high metals in effluent:
  - Determine if the problem is a "chemical" problem or a "mechanical" problem.

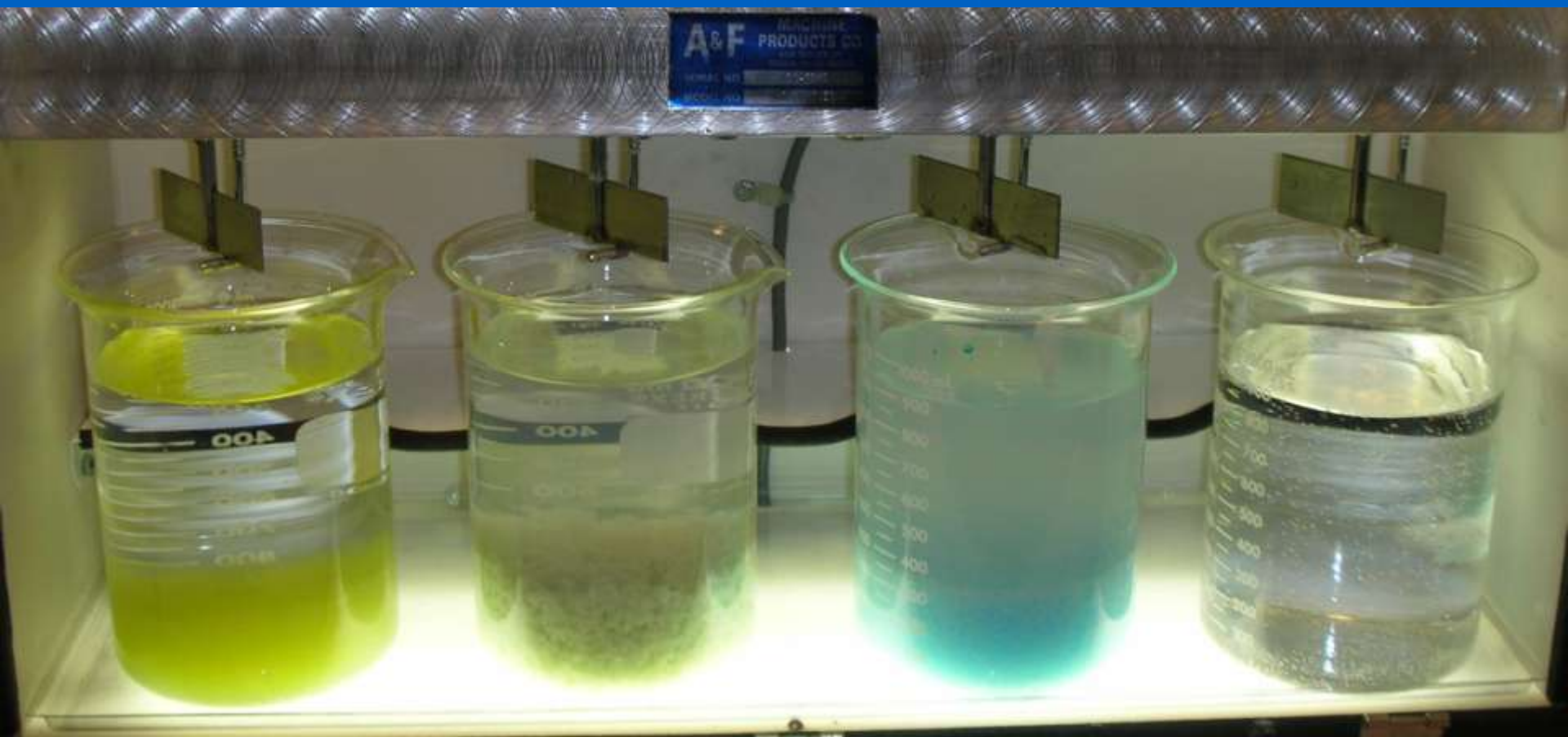
# Hach Meter Reads Metals



# Chemical Problem

- Conduct jar tests to duplicate system
  - A four-paddle gang stirrer is ideal
    - \* Is there not enough coagulant?
    - \* Is there not enough flocculent?
    - \* Is the pH too high or too low?

# Chemical Problem



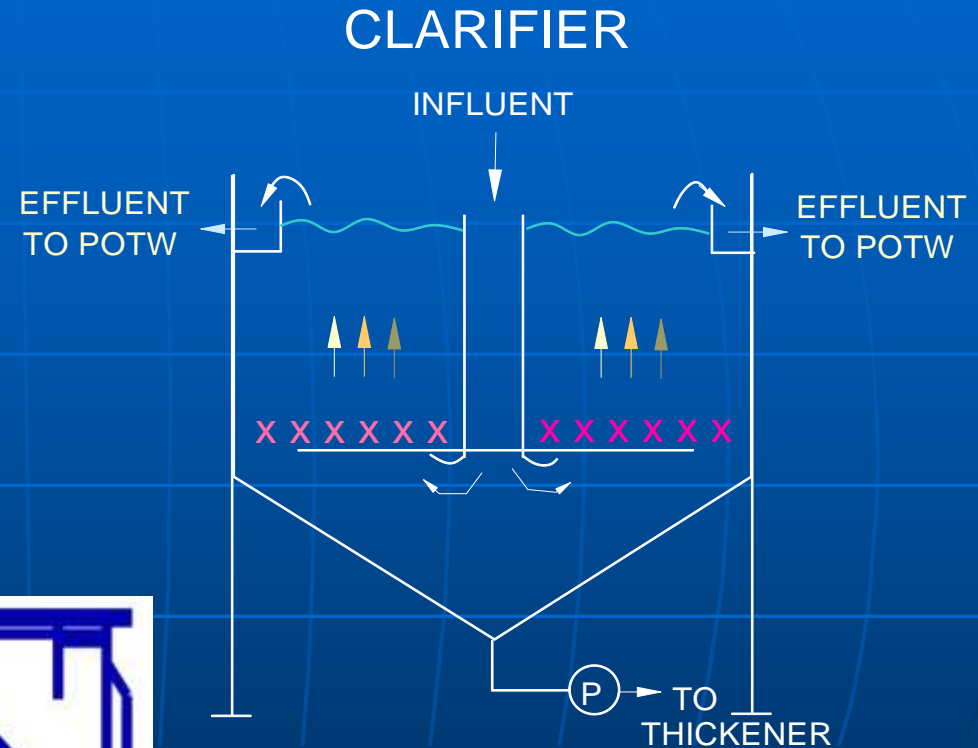
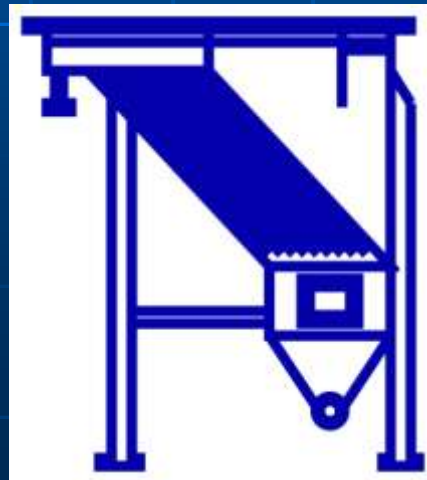
# Gang stirrer guidelines:

- 1 mil of chemical in a 1,000 mil jar is 1,000 ppm
- $\frac{\text{Flow} \times \text{PPM}}{119,904} =$  pounds of coagulant to be fed
- Filter sample to see if chelation has occurred.
  - Definition of chelation

# Clarifier

## Mechanical Problem

- Most industries today have an inclined plate clarifier



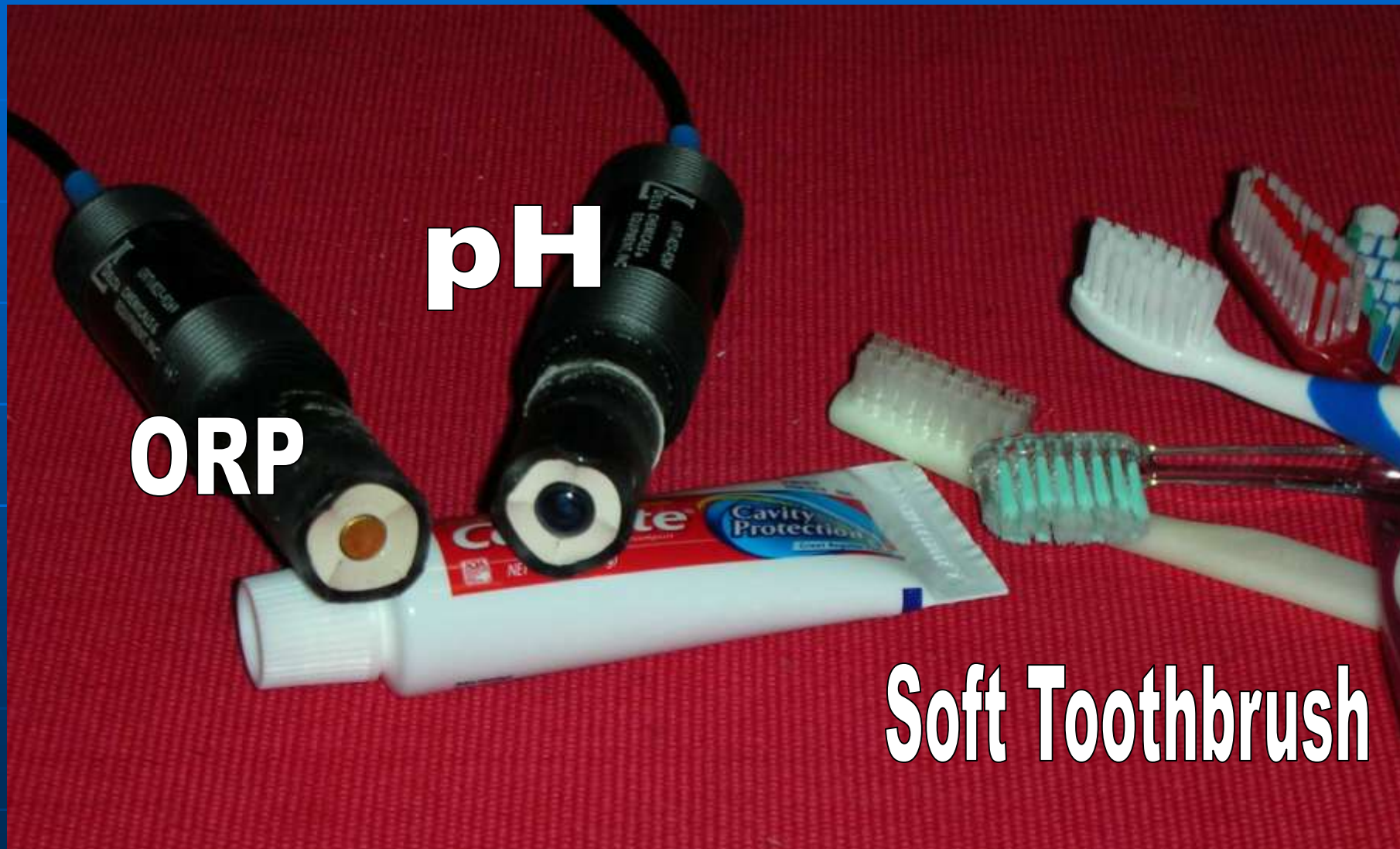
# Clarifier cont.

- Trouble shooting clarifiers:
  - Too much polymer?
  - Mixer speed too fast/slow?
  - Sludge blanket not properly adjusted?
  - Clarifier too small? Is flow exceeding capacity?
  - Anaerobic bacteria?
  - Has something fallen into the clarifier causing "short circuiting"?

# Probe Maintenance

- Probe maintenance is important! Probes get contaminated or even etched.
- pH probes
  - Buffers 4, 7, 10 a must.
  - pH is important because of formation of metal hydroxides.

# Cleaning pH and ORP Probes



**ORP**

**pH**

**Soft Toothbrush**

# ORP probes

200 milivolt solution - 600 milivolt solutions necessary

- Conversion of chromium from hex to tri
- Oxidization of cyanide to cyanate
- Are the chemical pumps delivering the proper amount of chemical (in particular, coagulant)?
  - Stop watch
  - Graduated cylinder

# Oil-Water Separation

Major ways to separate oil in water or water in oil:

- Heat (anywhere from 100° to 213°)
- Acid Crack
- Coagulation/Flocculation
- Combination of above

# Mechanical Systems for Oil-Water Separation

- Skimmers
  - Rope
  - Belt
- Troughs
  - Are they clogged?
- Socks (absorbents)

# Dissolved Air Flotation (DAF)

Remove fats, oils and greases from water

- Chemical Process:

- Proper pH is a must

- Proper coagulation/flocculation

- Jar test

- \* If it doesn't float in a jar, it will not float in the DAF unit

# Mechanical Issues (DAF)

System produces dissolved air that is pressurized and released under a vacuum.

- Dissolved air is released to form small bubbles:
  - Rise to surface
  - Carry the floc to surface
  - Form a sludge blanket
  - Removed by skimmers
  - Clean water exits out of bottom of DAF unit

# DAF cont.

- Solids are carried under effluent baffle
  - \* Sludge blanket too thick
    - + Increase rake speed

## System dirty

- \* Sludge blocking air passage
- \* Air to solids ratio not correct
- \* Overload of system
- \* Contamination of influent
  - \* Make sure metal hydroxides are kept separate

**Questions?**