INDUSTRIAL WASTEWATER TREATMENT & APPLICATIONS

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Background

- Wastewater collected from industrial plant
  - Extal: Metal finishing
- Contained high amounts of metal contaminants
  - production of aluminum-copper alloys
- Needed to re-introduce the treated water into a stream/river

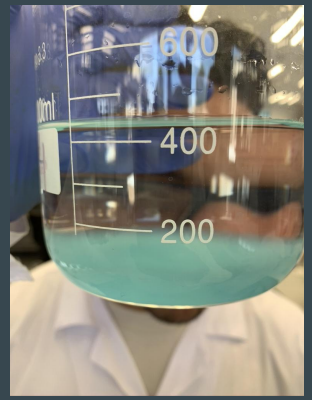
Water Analysis

Tested for the following categories of parameters:

- Physical
- Chemical
  - Organic
  - Inorganic
- Microbial

Parameter	Measurement	What does it mean?
pH	3.5	Acidic
Turbidity	4.59 NTU	Low
TSS	128 mg	Low
COD	24 mg/L	Very Low
Phosphates	13.7 mg/L	Low
Coliforms	2	Low
Copper	387 ppm	High

Water Treatment Step



- Principle contaminant - Toxic metals (Cu) and nutrients (phosphate)
- Treatment: precipitation + filtration + ion exchange

-Determine best pH for copper precipitation

- 3 liters of wastewater into 6 vessels
- Addition of NaOH and fast mixing at 120 rpm for 30 sec, then slow mixing at 15rpm for 15 min. (volumes of NaOH 0, .5, 1, 1.5, 2, 3ml)
- Cu is measured in supernatant of each vessel to determine optimal pH

Treatment Implemented in Israel

- Stabilize pH
- Lower the metal content
- Only enough to meet sewer standards
- Municipal wastewater treatment plants take care of the water afterwards
- Elad's Industrial Wastewater Treatment
  - Removal of heavy metals, cyanides, chromates, etc.
  - Ion Exchange, RO, Evaporation, Chemical Treatment, etc.

Treatment Implemented in Israel: Continued

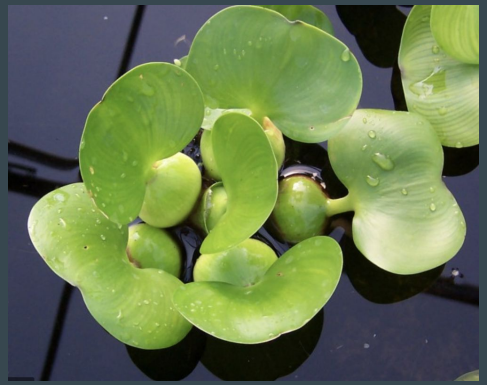
- Wastewater Legislation in Israel
  - Cannot discharge sewage of:
  - pH<6.0 or pH>10.0 into sewage system
  - pH<6.0 or pH>9.0 into reservoir

Schedule
(Regulations 2, 3(d) and (e), 6(b) (3), 10,13(c)and 17)
Maximum Pollutant Concentrations

Pollutant	Concentration (milligrams per liter)
Arsenic	0.1
Zinc	3.0 or the concentration in the water supplied to the plant with the addition of 3.0 milligrams per liter, whichever is the higher of the two
Tin	2.0
Aluminum	25.0
Silver	0.1
Mercury	0.05
Chrome-3 valent	0.5
Chrome- 6 valent	0.1
Nickel	0.5
Molybdenum	0.15
Lead	0.5
Cadmium	0.1
Cobalt	1.0
Suspended solids	30
Mineral oil	20
Total dissolved halogenated hydrocarbons (DOX), expressed as Chlorides	1
Total cyanides	0.5
Free chlorine	0.5
Copper	1.0 or the concentration in the water supplied to the plant with the addition of 1.0, whichever is the higher of the two
Manganese	1.0 or the concentration in the water supplied to the plant with the addition of 0.5, whichever is the higher of the two

Application in the Southwest

- Anocote Metal Finishing
- Discharge in Los Peñasquitos Creek (4 miles north)
- Annocote Metals
- Effluent Limitations (US Federal Relations)
- Removal of Nickel
  - Double Chamber Electrodeposition Cell (DCEC) removal of Ni
  - Use of water hyacinth leaves
  - 99.98% removal in 72 hrs
  - 0.4 mg/L →meets limitation 3.98 mg/L

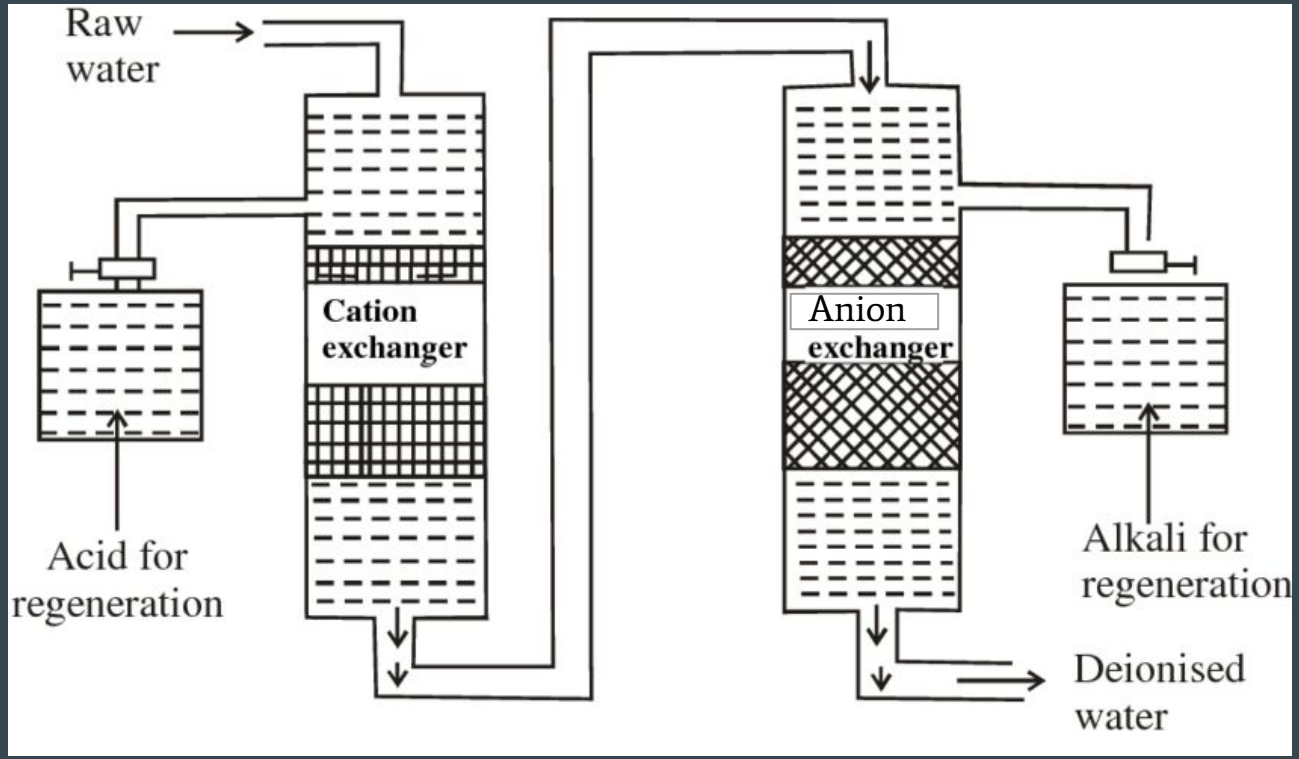


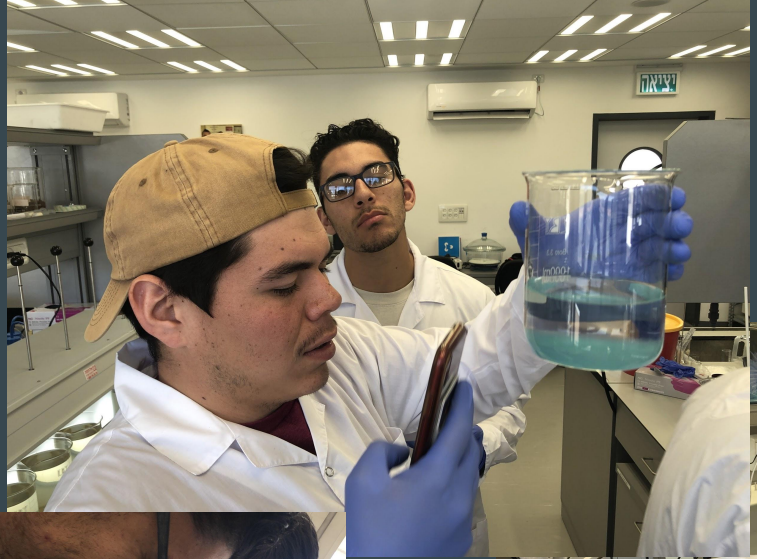
- CLEAR CHEM FILM MIL-C-5541
- YELLOW CHEM FILM MIL-C-5541
- ANODIZE, TYPE II MIL-A-8625
- ANODIZE, TYPE III MIL-A-8625
- BLACK DYE TANK
- PASSIVATE
- RED, BLUE, & GOLD
- ELECTROLESS NICKEL
- ROHS CHEM FILM
- BRIGHT TIN
- ZINC GOLD & CLEAR

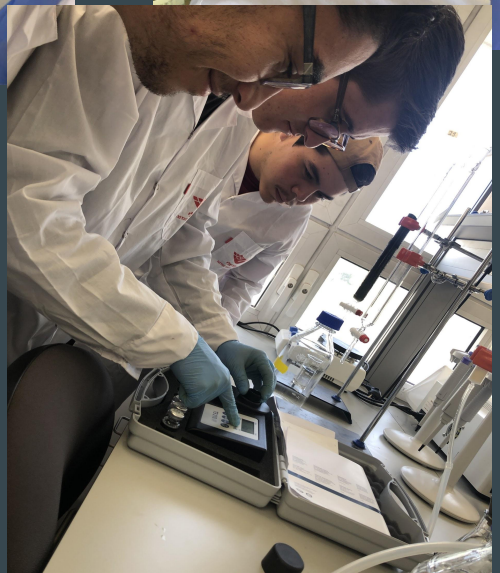
BPT Effluent Limitations

Pollutant or pollutant property	Maximum for any 1 day	Monthly average shall not exceed
	Milligrams per liter (mg/l)	
Cadmium (T)	0.69	0.26
Chromium (T)	2.77	1.71
Copper (T)	3.38	2.07
Lead (T)	0.69	0.43
Nickel (T)	3.98	2.38
Silver (T)	0.43	0.24
Zinc (T)	2.61	1.48
Cyanide (T)	1.20	0.65
TTO	2.13	
Oil & Grease	52	26
TSS	60	31
pH	(1)	(1)

Application in the Southwest: Continued







Some questions to think about:

- Why is it so important to treat industrial wastewater?

- Is there any feedback you can give on our water treatment train?

- Who should be responsible for treating this water?

BONUS: If you had to drink municipal, industrial, or agricultural wastewater, which would you choose and why?

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