



Annual Convention & Exposition

September 11-14, 2019 Palm Springs Convention Center and Renaissance Palm Springs Hotel

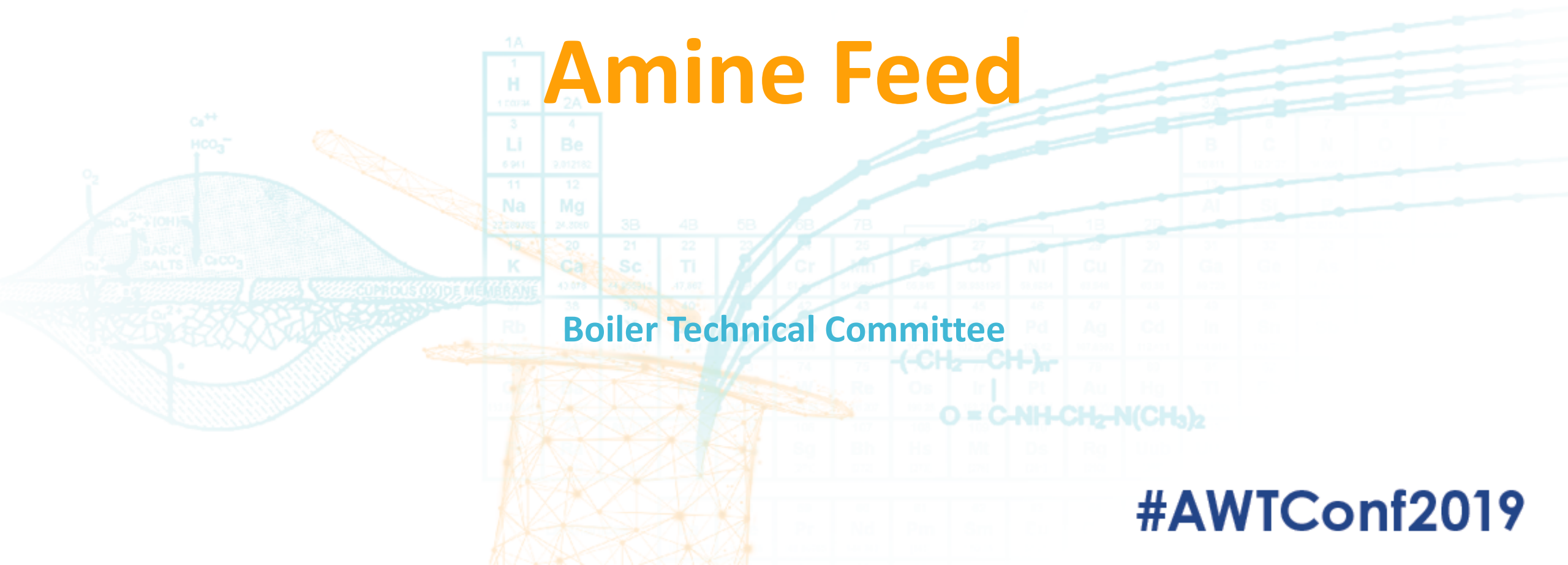
Palm Springs, CA

Chemical Diagram Labels:
O₂, Ca²⁺, HCO₃⁻, Cu²⁺, (OH)⁻, BASIC SALTS, CuCO₃, Cu²⁺, CUPROUS OXIDE MEMBRANE, Cu²⁺

Periodic Table Elements (Orange Highlighted):
H, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Sc, Y, Zr, Hf, Rf, Ti, V, Nb, Ta, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr, Xe, Rn, Mo, Tc, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Te, I, At, Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn, Os, Ir, Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn, Sg, Bh, Hs, Mt, Ds, Rg, Uub, Pr, Nd, Pm, Sm, Eu

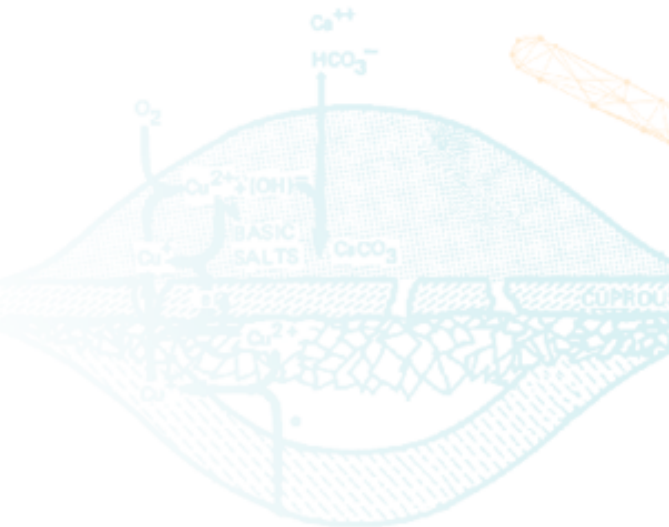
Chemical Structures:
 $(-CH_2-CH-)_n$
 $O=C-NH-CH_2-N(CH_3)_2$

Mechanical Alternatives to Amine Feed



Boiler Technical Committee

Carbonic acid attack on horizontal pipe. Most commonly found at threads.



Basic Reactions



• bicarbonate

carbonate

carbon dioxide

water



• Carbonate

water

hydroxide

carbon dioxide

Hydrogen Zeolite Softeners

• ADVANTAGES:

- Only one unit is needed
- Removes hardness ions
- Converts bicarbonates to carbonic acid (unstable in water – removed by DA)
- Bicarbonate alkalinity removed without substituting other ions - reduces total solids

Hydrogen Zeolite Softeners

• DISADVANTAGES

- Acid regeneration – usually sulfuric or hydrochloric
- Special piping required
- Alkali neutralization is required
 - Chemical additions – caustic, soda ash, etc.
 - Water blending – in parallel with Sodium Zeolite Unit

Chloride Anion Exchange

• Advantages

- Removes sulfate, nitrate, carbonate, and bicarbonate
- Regenerate with salt – no acid handling or special piping
- 3 to 4 pounds of salt per cubic foot of resin
- Rinse & regenerate rate should be 0.5 gallons/cubic foot
- 30" to 36" bed depth recommended
- Flow rate should not exceed 5 gallons per square foot per minute
- Regenerate at 27 to 31 ppm as CaCO₃
- Addition of caustic to the sodium chloride regeneration improves exchange capacity by 45 to 60%

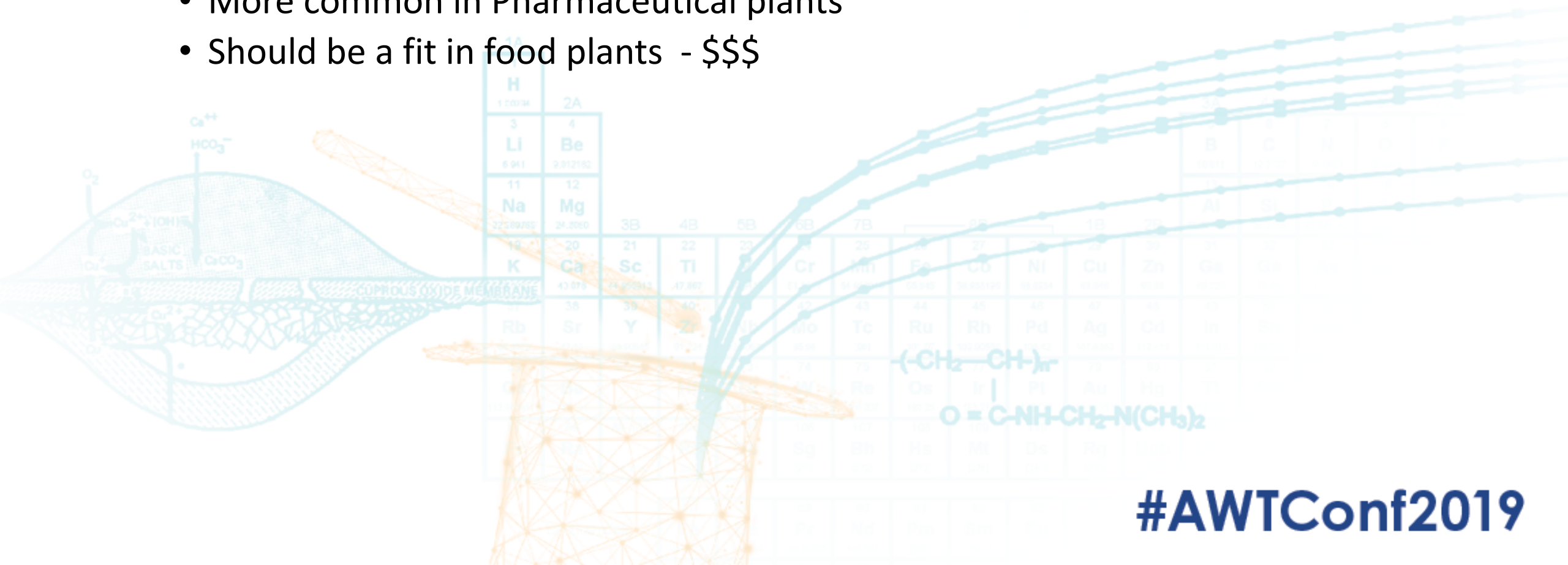
Chloride Anion Exchange

• Disadvantages

- Must have 0 ppm total hardness influent
- Influent turbidity cannot exceed 10 ppm
- Anion resin lighter than cation – backwash rate shouldn't fluctuate
- Cost of additional units
- Not practical for small areas

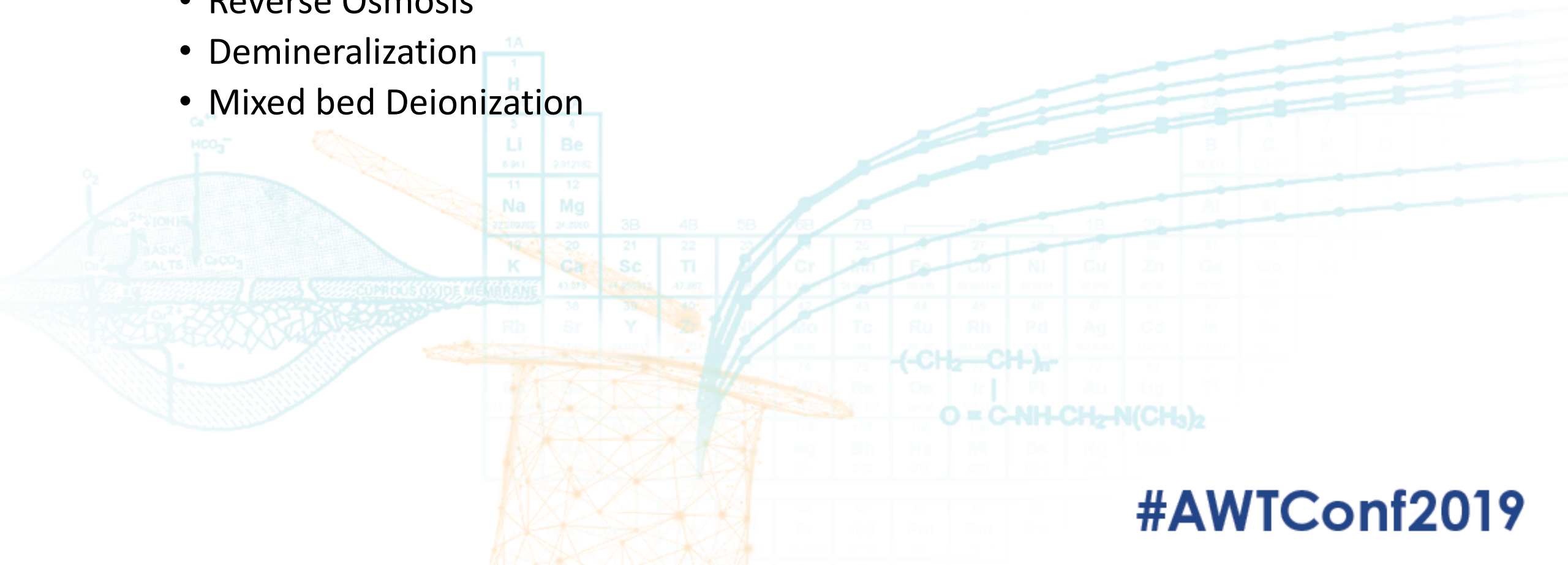
Other Options

- **Change metallurgy – Stainless Steel**
 - More common in Pharmaceutical plants
 - Should be a fit in food plants - \$\$\$



Other Options

- Ultra Pure Water
 - Reverse Osmosis
 - Demineralization
 - Mixed bed Deionization



Questions and Suggestions

The background features a collage of scientific and technical elements:

- Chemical Diagram:** A cross-section of a membrane system. On the left, a gas phase contains O_2 and Ca^{2+} ions. A Ca^{2+} ion is shown moving through a HCO_3^- ion. Below the membrane, the text "BASIC SALTS" and $CaCO_3$ is visible. The membrane itself is labeled "CUPROUS OXIDE MEMBRANE".
- Periodic Table:** A standard periodic table is overlaid in the center, with various elements highlighted in orange and blue.
- Molecular Structure:** A blue ball-and-stick model of a polymer chain is shown on the right side.
- Wireframe Tower:** An orange wireframe structure of a tower or industrial component is positioned at the bottom center.
- Chemical Formulas:**
 - $(-CH_2-CH)_n$ (Polyethylene structure)
 - $O=C-NH-CH_2-N(CH_3)_2$ (Chemical structure of N,N-dimethylacetamide)