



Wastewater Recycling at Boeing Kent

Jim Beshaler & Dave Sizemore



- »»» Aluminum, Titanium, Steel
- »»» Chromium, Copper, Cadmium Plating
- »»» Conversion Coatings
- »»» Cleaning / Surface Preparation



Project Goals

- »»» Reduce operating costs (\$\$\$\$\$)
- »»» Meet process water quality specifications
- »»» Retain ability to treat process solutions onsite

Evaluation Process

A vertical bar on the left side of the slide, transitioning from blue at the bottom to orange at the top. It features a yellow arrow pointing up at the top, a grey arrow pointing left at the top, and a red arrow pointing right at the top.

»»» Wastewater Analyses

»»» Computer Simulations

»»» Pilot Scale Testing



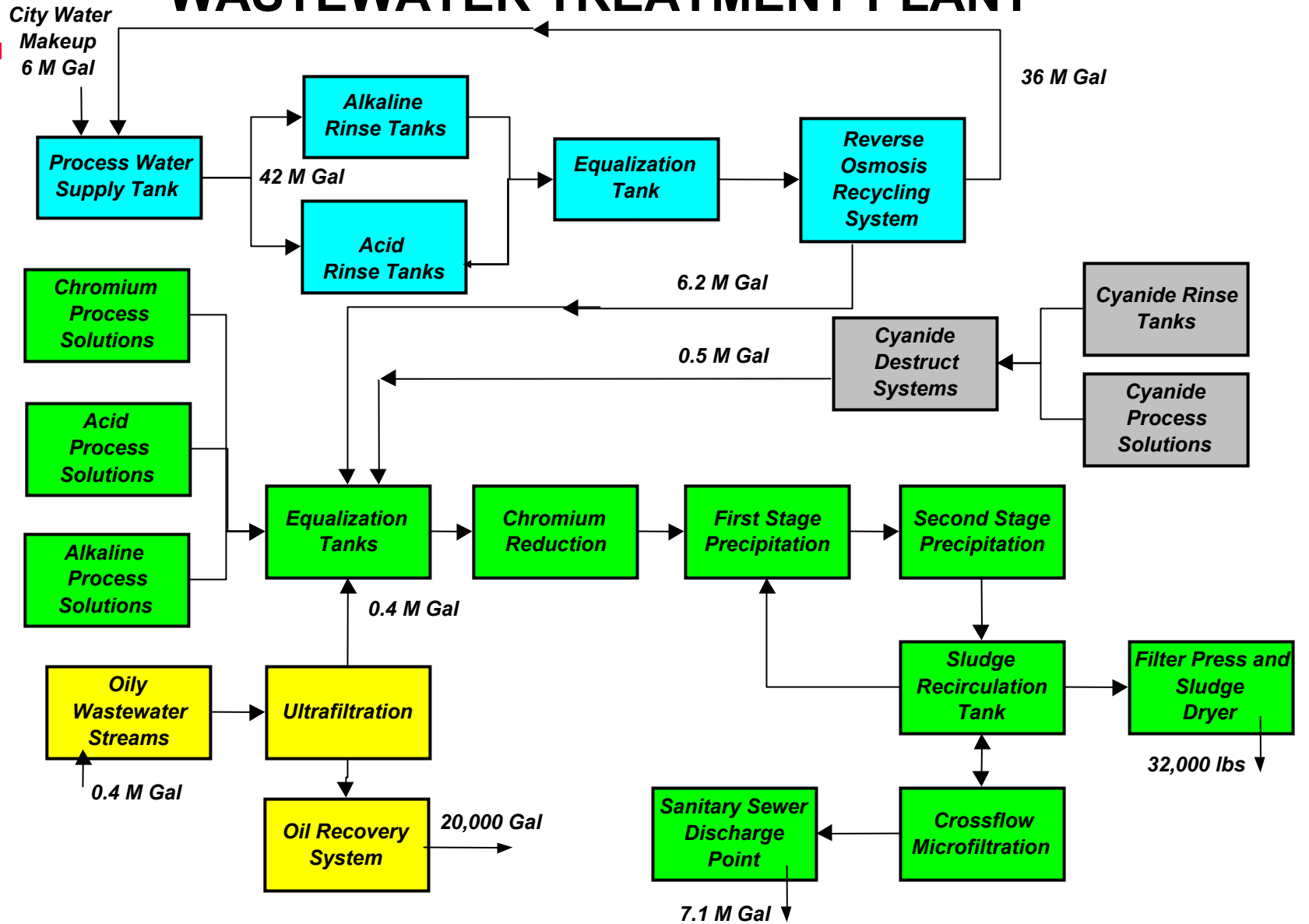
Reverse Osmosis

- »»» 83% Recycle of rinse tanks, scrubbers, etc.
- »»» Minimized Chemical Usage
- »»» Produces High Level of Water Quality
- »»» Retained Ability to Treat Process Solutions

Reverse Osmosis System



WASTEWATER TREATMENT PLANT



Water Quality

Contaminated Rinsewater (Typical Influent)

- »»» pH (3.0 to 4.0)
- »»» TDS (400 - 800 mg/l)
- »»» Silica (0 to 15 mg/l)
- »»» Hardness (70 mg/l)
- »»» Alkalinity (80 mg/l)
- »»» Chloride (40 to 125 mg/l)
- »»» Fluoride (20 to 60 mg/l)

Reverse Osmosis Product Water

- »»» pH (6.5 to 7.5)
- »»» TDS (< 10 mg/l)
- »»» Silica (0 mg/l)
- »»» Hardness (<5 mg/l)
- »»» Alkalinity (<5 mg/l)
- »»» Chloride (<1 mg/l)
- »»» Fluoride (<3 mg/l)

City Water

- »»» pH (6.5 to 7.5)
- »»» TDS (60 to 100 mg/l)
- »»» Silica (1 to 15 mg/l)
- »»» Hardness (70 mg/l)
- »»» Alkalinity (80 mg/l)
- »»» Chloride (1 to 2 mg/l)
- »»» Fluoride (1 mg/l)



Wastewater Costs

Per 1000 gallons

Treat & Discharge 83% Recycle

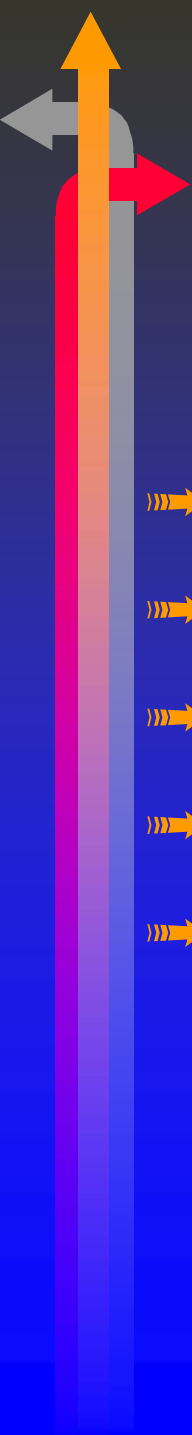
»»»→	Water	\$2.47	\$0.41
»»»→	Sewer	<u>\$4.85</u>	<u>\$0.81</u>
»»»→	Total	\$7.32	\$1.22



Reverse Osmosis Operating Costs

Per 1000 gallons

»»»→ Chemicals	\$0.20
»»»→ Energy	\$0.40
»»»→ Membranes	<u>\$0.73</u>
»»»→ Sub-total	\$1.33



Benefits of Wastewater Recycling

- »»» Conserves a valuable natural resource
- »»» Reduced water purchases by 36 million gal / yr
- »»» Reduced operating costs by >\$200,000 / yr
- »»» Reduced chemical usage
- »»» Reduced manpower



Boeing Recycling History

- »»» Wichita (Boeing's Largest Chem. Proc. Plant)
- »»» RO treats over 1 million gallons per day
- »»» 80% Recovery
- »»» Operating since 1997
 - »»» Two Reverse Osmosis Units
 - »»» One RO follows wastewater clarifier
 - »»» One RO directly treats rinsewater from tanklines

A decorative vertical bar on the left side of the slide, featuring a color gradient from blue at the bottom to orange at the top. It includes a grey arrow pointing left at the top, a red arrow pointing right, and an orange arrow pointing up.

Metal Products & Machinery

»»» Significantly Reduces Effluent Limits

»»» Chromium 0.25 mg/l Copper 0.55 mg/l

»»» Lead 0.04 mg/l Nickel 0.50 mg/l

»»» Zinc 0.38 mg/l

»»» MP & M encourages recycling

Adjust Limits Upwards for recycling

»»» Ex. 50% recycling - Copper limit 1.10 mg/l



Lessons Learned

- »»» Know your SDI and Membrane Selection
- »»» Regular cleaning schedule based on NPF (-10%)
- »»» Use Clean-in-place not a separate cleaning skid
- »»» Need to make sure that have identified all discharges to RO. Do not want to shock system.

2000 Governors Award



Pollution Prevention

Wastewater Recycling.....



.....we're not just the end of the line,

.....we're also the beginning