

# METAL FINISHING WATER CONSERVATION

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# AGENDA

Disclaimer

The LADWP Technical Assistance Program

Examples of Technical Assistance Projects

What is Metal Finishing?

BMPs for the Metal Finishing Industry

NEW projects

# Disclaimer

- The materials in this presentation are meant to cover water conservation measures for the Metal Finishing industry, based on personal experience and research. The materials are not intended to provide legal advice, or to establish legal standards of reasonable behavior or to discredit any companies involved in the Metal Finishing industry.

# Technical Assistance Program (TAP)



## Customized Water Conservation Projects

Rebate pays \$1.75 per 1,000 gallons of water conserved during first 2 years

### Popular Projects:

- Cooling Tower Water Treatment Efficiency Upgrade
- Recirculation
- Recycling
- Reverse Osmosis

Application and Pre-Inspection Required

Go to [www.ladwp.com/TAP](http://www.ladwp.com/TAP)

# TAP PROJECTS: Customer Success!

## Recirculation Project

### LADWP Business Customer

- Waste stream from their Reverse Osmosis equipment of 7.8 million gallons annually
- Water treatment vendor suggested reusing waste stream as make-up water for their cooling towers

### LADWP Water Conservation Staff

- Customized rebate program for installation of a two-tank storage system to hold wastewater until needed for cooling tower
- Provided FREE meter to measure water pumped from RO system to cooling tower

Total Project Cost  
\$15,000

Total rebate  
\$14,141

Estimated Annual  
Water Savings  
5,656,533 gallons

Estimated Annual  
LADWP Bill Savings  
\$45,000

Project payback in less than 1  
month

# TAP PROJECTS: Customer Success!

## Recirculation Project

Industrial Launderer:

\$800,000 - \$30,000 (LADWP rebate)  
- \$20,000/yr. (Gas Company rebate -  
\$130,000/yr. from water, sewage,  
and gas costs.

They pay an additional cost of \$15,000  
(to get rid of their sludge) each year.

PAYBACK:  $(\$750,000 + \$15,000) / \$130,000 = 5.88$  yrs.

Total Project Cost

\$800,000

LADWP Rebate

\$30,000

Gas Company rebate

\$20,000

Savings by decreasing water  
usage and sewage:

\$60,000/yr.

Payback 5.88 years





# What is Metal Finishing

- Metal finishing changes the surface of metals to resist corrosion.



# Water uses in metal finishing include:

- Process water
- Chemical solutions makeup
- Air scrubbers
- Water treatment
- Parts and plant cleaning
- Cooling towers
- Boilers
- Domestic use
- Irrigation

# General Water BMP's in the Metal Finishing Industry include:

1. Utilizing recirculating water when possible
2. Using substances other than water (i.e. oil, resin, and other chemical compounds) as process mediums
3. Eliminating once-through cooling water and utilizing air cooling when feasible
4. Recycling water from final rinse tanks
5. Optimizing Revers Osmosis production

# Specific BMPs for Industry

1. Drag out Control
2. Chemical Concentration Control
3. Multiple Tank and Countercurrent Rinsing
4. Mechanical Mixing, Agitation, and Air Blowing
5. Cleaning Method Selection
6. Pretreatment of Makeup Water

# California Department of Water Resources – Commercial, Industrial, and Institutional Task Force Water Use Best Management Practices Report to the Legislature - Volume II

(continued)

7. Evaporator Control
8. Air Scrubbers
9. Water Recovery and Reuse

<http://www.water.ca.gov/legislation/docs/CII%20Volume%20II%20July%202014.pdf>

10. Planting Tank Cooling
11. Rectifier Selection and Cooling
12. Metering, Flow Control, and Data Acquisition

# BMP's in plating, Printed Circuit Board, & metal finishing operations

- ***Drag out Control*** - Minimizing the carryover of chemicals from one tank to another is the objective of drag out control. Methods to accomplish this include:
  - Designing racks, barrels and processes, so that liquids captured in bends and curves of the pieces being processed are minimized, allowing time for parts to drain (dwell) over tank
  - Using sprays in place of dipping parts
  - Using air knives, fogs or misting to remove solution

# BMP's in plating, Printed Circuit Board, & metal finishing operations- Drag-out control (continued)

- Vibrating or " bumping" parts to knock liquid off
- Ensuring parts are pointed down so that they drain most efficiently
- Using wetting agents
- Hanging bars above tanks to allow parts to drain
- Installing drip guards between tanks
- Using drain boards.





# *Chemical Concentration Control*

The use of conductivity meters, chemical analysis equipment, optical sensors and similar methods to control the timing of draining, rinse baths, or adding chemicals to ensure it is necessary.

# *Multiple Tank and Countercurrent Rinsing*

Countercurrent rinsing and the use of multiple tanks for rinsing allows parts to be placed in the most contaminated water first. The next rinse tank contains the cleaner water and so on. With countercurrent flow, the water from the cleanest tank is used to replace the more contaminated water in the next tank. Reactive rinsing, where the rinse water from the final tank is used for the pickle-rinse tank, can also be used in some applications.

# *Mechanical Mixing, Agitation, and Air Blowing*

Agitation of plating liquids and rinsing solution maximizes contact of the liquid with the parts being processed, thus reducing time in each bath, extending the usefulness of plating liquids, allowing lower concentrations of the chemicals in a bath, and helping to improve uniformity of the product.

# *Cleaning Method Selection*

The classic zinc and iron phosphate cleaning processes require several rinses. New zirconium compounds and methods, such as the patented Piclex process, exemplify new strategies that eliminate one or more rinses.

# *Pretreatment of Makeup Water*

The treatment of the water used to make up the solutions in the tanks can be an important measure in achieving the maximum use of chemicals. Many plants soften their water and most major platers use reverse osmosis (RO) to produce high quality water for plating solutions. By using RO water, unwanted constituents that would concentrate with evaporation are no longer present.

# *Evaporation Control*

Foams or floating balls specially designed to retard evaporation can cut evaporative losses by as much as 50 percent.



# *Air Scrubbers*

Installing recirculation systems with conductivity controllers, temperature probes, and fill and dump controls similar to conductivity blowdown controls on cooling towers helps reduce makeup water to the scrubbers. In plating operations, the reuse of spent rinse water and other sources of water is often an excellent alternate source of makeup water.

# *Water Recovery and Reuse*

Rinse water can often be used as makeup water to the process tank containing the chemicals being rinsed. This practice recovers chemicals and reduces fresh water use. Some platers have used filtration and reverse osmosis to recover chemicals and produce a very clean stream of water for reuse.

# *Plating Tank Cooling*

Where cooling is needed, air cooling offers a real option where bath temperatures can operate at 140°F or above. Using cooling tower or chilled water system represent other options, but they involve water and energy use. If cooling coils are used in the tank, some form of agitation will help ensure good heat exchange. Some platers circulate tank fluids through heat exchangers with pumps, thus providing for good heat transfer and helping to agitate the tank fluids.

# *Rectifier Selection and Cooling*

Rectifiers that convert alternating current (AC) to direct current (DC) for use in plating are found in all electroplating operations. Rectifiers may be either air cooled or water cooled. Air cooled rectifiers Must be correctly sized and placed.

# *Metering, Flow Control, and Data Acquisition*

The old adage of "if you don't measure it, you can't manage it" applies to plating and metal finishing operations. Metering of makeup water to the RO system, tank filling, cooling towers, and other major water using areas will help manage the system and reduce costs. Good metering will also alert managers to potential problems.

# FUTURE Projects

- Deionization
  - For reuse of high dissolved mineral water to boiler feed (higher cycles), cooling towers Electricity is used to save water
    - Salt in the waste stream is not a problem
  - Cooling tower/Evaporative condensers controller emerging technology
    - Measures the dissolved solids level of water coming in and in cooling tower reservoir





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THE END

QUESTIONS???