To Compliance and Beyond

Valley Chrome Plating's Journey to Compliance

Presenter

Ray Lucas

President: Valley Chrome Plating Inc.
Past President: NASF, MFANC
Board Member: MFANC

- Manufacturer of Truck Bumpers
- Zero Discharge Decorative Chrome Plating
- 1st Plating Shop in U.S. to be permitted for Nickel Air Emissions.
- Participant in Environmental Management Systems
- Awarded DTSC Model Shop: 1 of 3 in California
- N.P.E.P. (Nat. Partnership for Environmental Priorities)

Valley Chrome Plating
Company History

- Founded 1961
- Originally Job Shop
  - Car bumper routes
  - Now Captive Shop
- Production Decorative Electro-Plating
- Truck Bumper Manufacturing

Who is this?

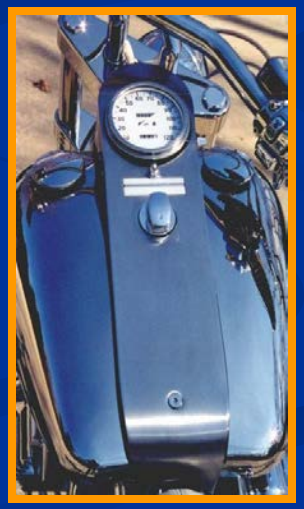
Erin Brockovich:

Changed the public perception of Hexavalent Chromium

Tri-Chrome vs. Hex Chrome

- Benefits of Hex Chrome
  - Harder, thicker, bluer.
- Benefits of Tri-Chrome
  - Environmentally friendly, better throw, no buffing
- Latest Generation of Tri-Chromes
  - Thickness, corrosion, hardness
- CARB Passes New Regulations in California

Typical Parts that are Trivalent Chrome Plated



Cr^{+3} Advantages

- Eliminates use of Cr^{+6}
- Provides environmental benefits
- Enhances worker safety (PEL)
- Affords easier waste treatment
- Reduces solid waste disposal problems
- Is less destructive to processing equipment

Cr^{+3} Advantages

Improves productivity

- Allows for more parts on plating racks because:

  (a) coverage is better in recessed areas

  (b) less burning in high current density areas

Graphite vs. Lead Anodes

(a) No Sludge on bottom of tank (Toxic)

Cr^{+3} Advantages

- Improves productivity
  - Fewer rejects because:
    (a) process is tolerant to current interruption
    (No “chrome white wash”/No buffing required)

    (b) process is more tolerant to presence of organic films

Cr^{+3} Disadvantages

- Less Tolerant to Metallic Impurities
- First 2 Weeks Chrome surface is softer than Hex
- As Impurities increase, the bath becomes darker
- Higher Chemical Additions Cost
- Non Plated areas may flash rust

Post Dip Sealer

(After Chrome)

- Non-Plated areas must be sealed
- Many Options are available (Boric Acid Dip)
- Large non-plated areas may require paint or primer
- Interlox 5707 dip promotes paint adhesion

High demand to eliminate Cr(VI) plating

- New corrosion requirements
- TriChrome® is gaining momentum in the automotive industry
- Experience exists for the introduction in mass production
- Plating conditions must change compared to standard Hex-Cr plating
- Possibility for new colors and design

Trichrome Cost

New Trichrome Tank Installation

1. Trichrome Tank Chemistry Approximately	$17.00	/gal	
2. Trichrome Pre Dip Chemistry	$1.00	/gal	
3. Poly Trichrome tank/Pre dip tank	$13,000		2 tanks
4. Graphite Anodes with Titanium Hangers	$3,500		qty. 50
5. Filter	$4,500		Disc.
6. Titanium Heating/Cooling Coils	$6,000		
7. Air Blower	$3,500		
8. Feeder Pump and Meter	$910		Stabilizer
9. Ion Exchange Resin Dowex M4195	$5,800		
10. Ion Exchange System	$3,500		
11. Cooling Tower	$5,000		Could use a chiller
	Total	**$45,710**	

Legislation Aspects

- To replace hexavalent chromium (REACH, SVHC Annex XIV)
- Seveso II (hazardous incident management required)
- Exposure limits for Cr(VI)
- PFOS-replacement unnecessary
- Meets the demand of current legislation

- Trichrome® is a well known alternative for Hex-Cr plating
  - Running in production for 30+ years
- Freedom for new colors and designs
  - In combination with bright or satin nickel
- High performance processes
  - High plating speed
- Excellent CaCl2 Resistance

Bright Finishes

- Trichrome Ice
  - New Chloride Free Process
  - Bright Color Closest to Hex-Cr
  - Good Throwing Power
  - Excellent Corrosion Resistance
  - Use of IMO Anodes
- Trichrome Plus
  - Industrial Standard for Trivalent Chrome Plating
  - No burning of the parts
  - High Plating Speed
  - Improved plating parameters for color close to Hex Cr look
  - Excellent Corrosion /CaCl2 Resistance
  - Use of Graphite Anodes

Dark Finishes

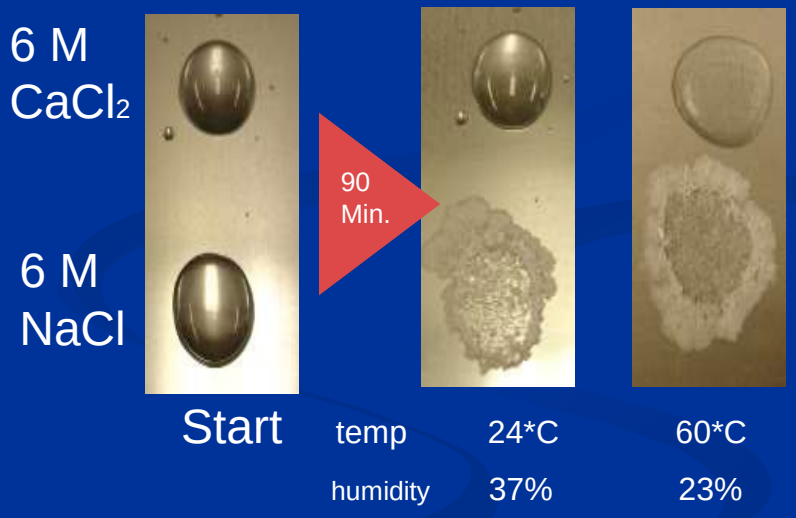
- **Trichrome Smoke 2**
  - Soft darkness w/warm look
  - Wide working range
  - Used for car exterior applications (08)
- Trichrome Shadow
  - **Dark bluish/greyish appearance**
  - **Automotive/Electronic applications**
  - **Wide range and Stable working process**
  - Controlled by hull cell & color measurements.
  - Approved by one of the biggest PC Manufacturers.
- Trichrome Graphite
  - Very dark & Warm Appearance
  - L*<55
  - A unique color for new design

Applications

- Automotive Parts
  - Interior/Exterior applications
- Steel Based Materials
- Mobile Phone Components
- Electronic Components
- Articles where a noble dark look is requested.
- Coating of choice for green minded OEMs
  - Ikea, LG, Assa Abloy, Motorola, Samsung

Solutions for Higher Corrosion Protection Requirements

- Calcium chloride corrosion problem was highly publicized after observing corrosion in Russia
- Since the corrosion was usually associated with a muddy vehicle, it acquired the name "Russian Mud" corrosion.
- Calcium Chloride ($CaCl_2$) is used to:
  - Melt snow/ice at lower temps than NaCl
  - Sprayed as a liquid prior to a storm
    - Stays effective for multiple days
  - Sprayed on dirt/gravel roads to reduce dusting.

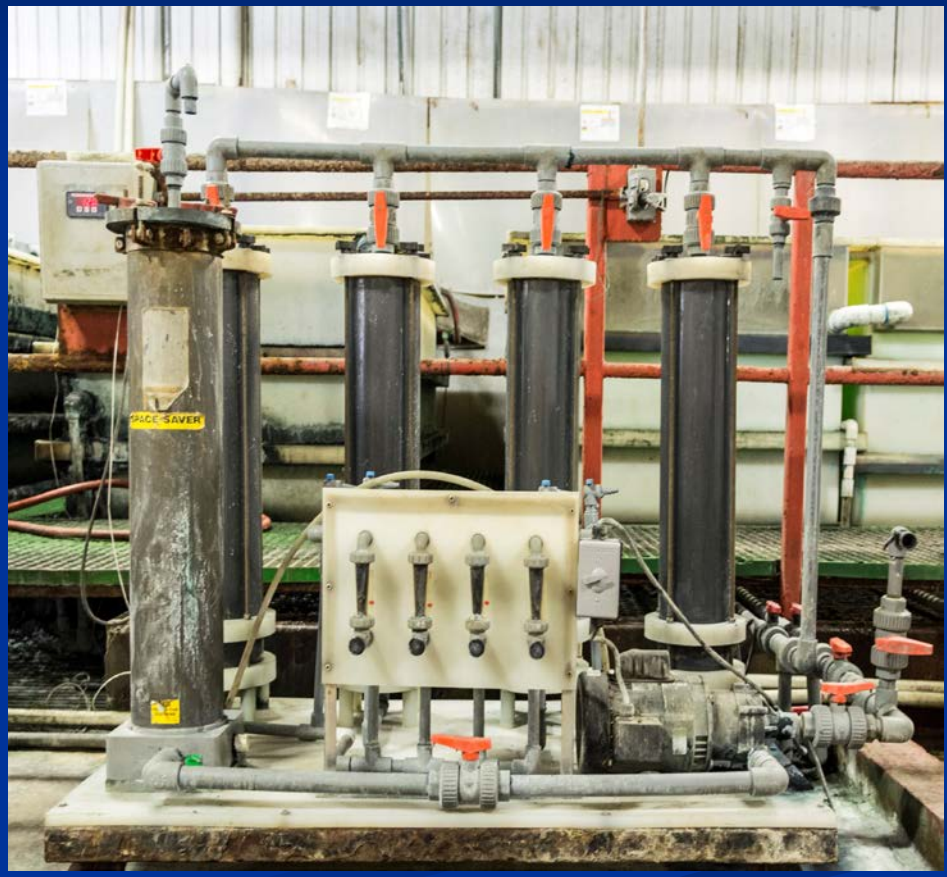


Outlook on CaCl2

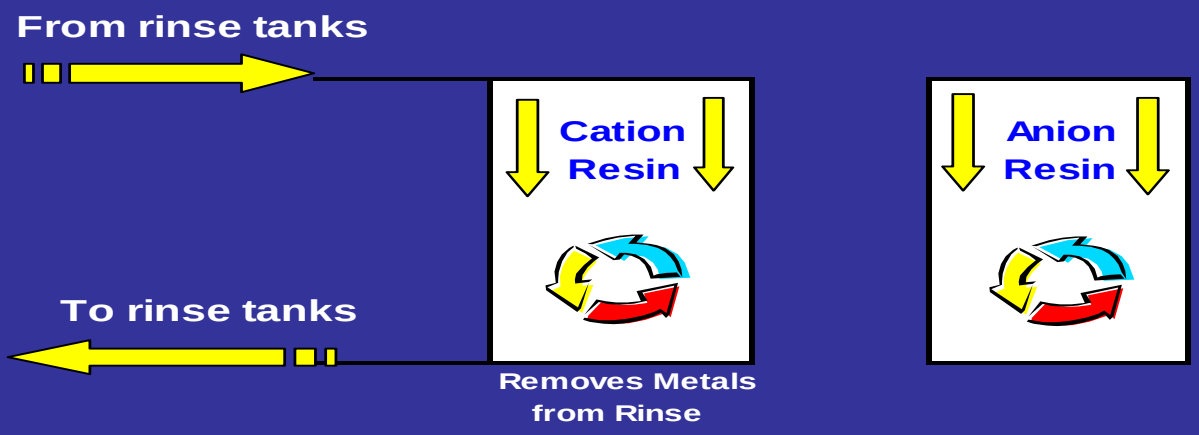
- **Usage of CaCl2 on streets as de-icing salt**
- **The OEMs went different ways:**
  - Some decided for PNS-Ni & Hex-Cr, with mixed results
  - Some are using Trichrome® (w/ or w/o TriSeal IN)
  - Other OEM's are staying with MPS-Ni & Hex-Cr, but are testing Trichrome
- **Properties of these approaches:**
  - PNS-Ni is well known and was quickly available – technically one step back and not simple to implement / manage in production, also with known disadvantages
  - MPS-Ni still offers best appearance combined with NSS / CASS results
    - – but needs at least top-lacquer for the CaCl2 issue
  - MPS 300/800 + Trichrome® Plus – controlled pore count and STEP
  - Trichrome® Plus – well known, reputation growing for automotive application, in full production for many years
- **All techniques are available**

Ion Exchange

- Chelating Resin Selectivity captures metal ions from a pH of 2
- Cost of the Resin $5800 (Dowex M4195)
- Regenerate with Sulfuric Acid and Ammonium Hydroxide (2-6 weeks)
- Removes: Nickel, Iron, Copper, Zinc
- Operating time is based on the amount of contaminants being introduced to the bath.
  (8-24 hrs/day)



Ion Exchange

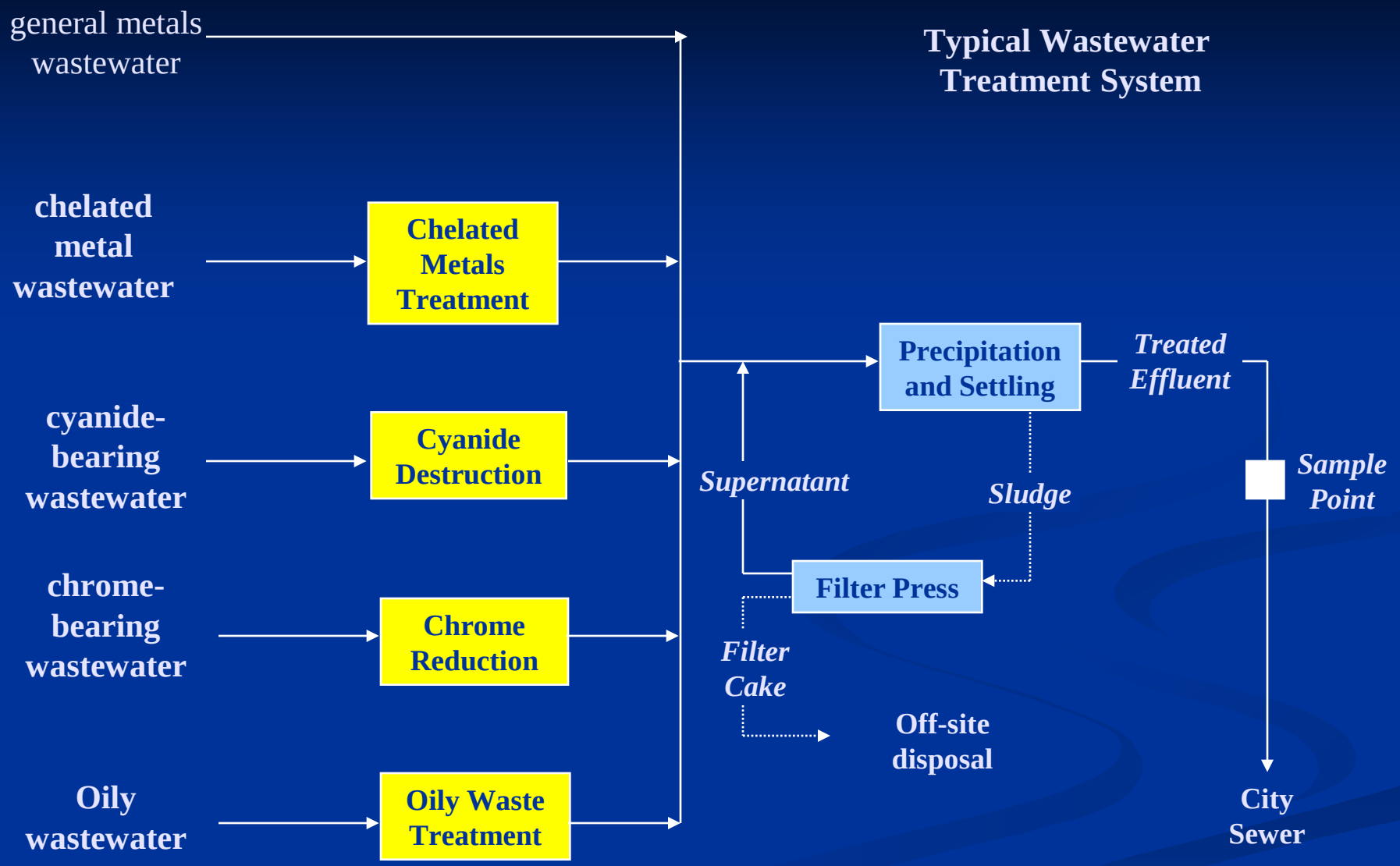


Cation Resin

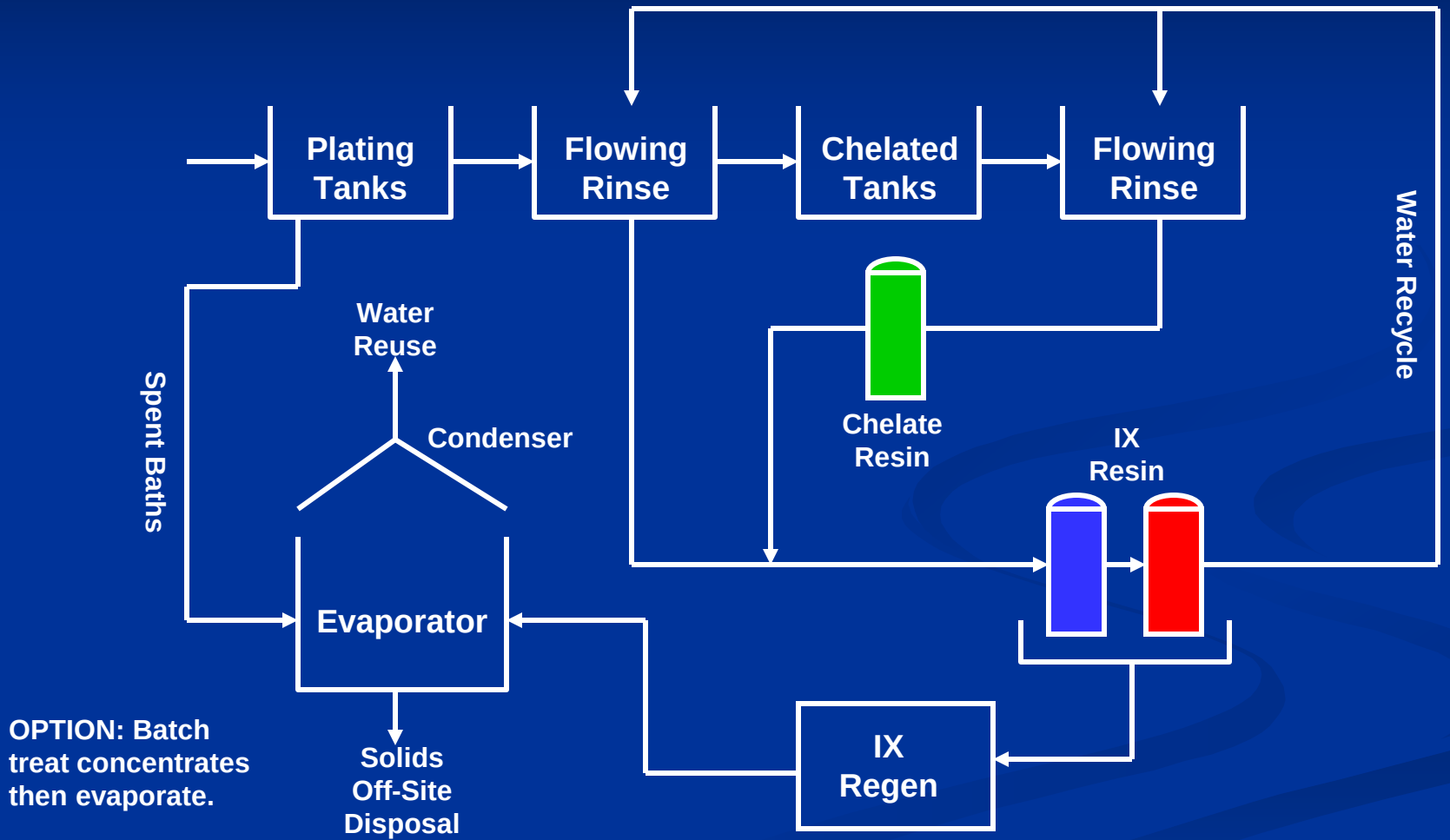
1. Rinse water is cycled through the resin which captures the metals.
2. Clean rinse water is returned to the rinses via pumps.
3. When Resin is saturated with metals, acid is added to release the metals which are returned to the bath.

Anion Resin

1. When Cation resin captures metals, it releases an acid molecule which is captured by the Anion resin.
2. pH neutral rinse water is returned to the rinses.
3. When the resin is saturated with acid, caustic is added to regenerate the resin.


Typical Wastewater Treatment System
general metals wastewater
chelated metal wastewater
Chelated Metals Treatment
cyanide-bearing wastewater
Cyanide Destruction
chrome-bearing wastewater
Chrome Reduction
Oily wastewater
Oily Waste Treatment
Precipitation and Settling
Treated Effluent
Supernatant
Sludge
Sample Point
Filter Press
Filter Cake
Off-site disposal
City Sewer

An Example Zero-Discharge Shop



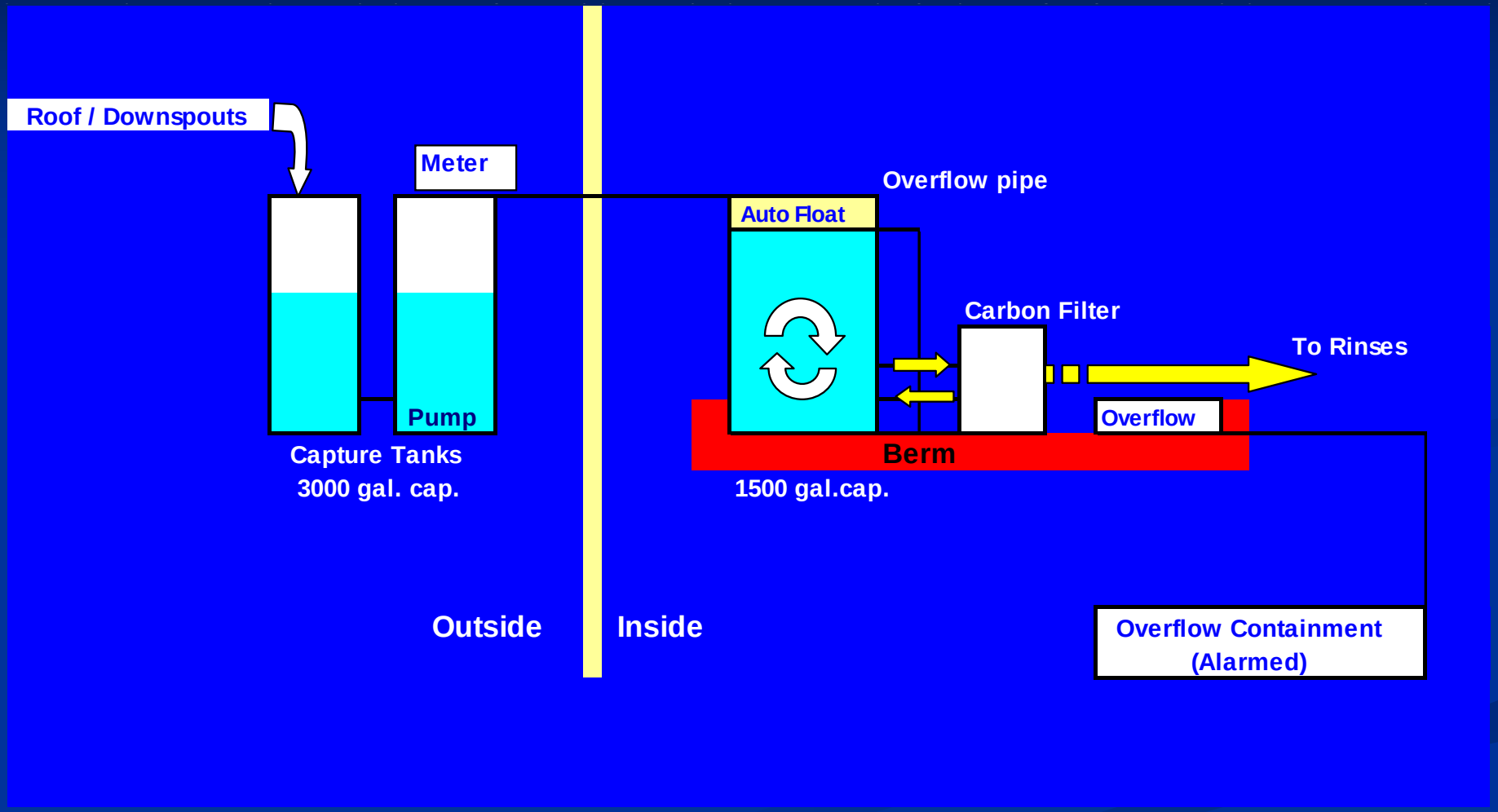
Effects of Achieving Zero Discharge

- **Positive Side Effects**
  - Saving H2O
  - No discharge to POTW
  - Re-use of Chemicals
    - Resulting in $$ savings
- **Negative Side Effects**
  - Poor Rinse Quality
  - Higher reject rate (in house/in field)
  - Higher Waste Treatment Costs

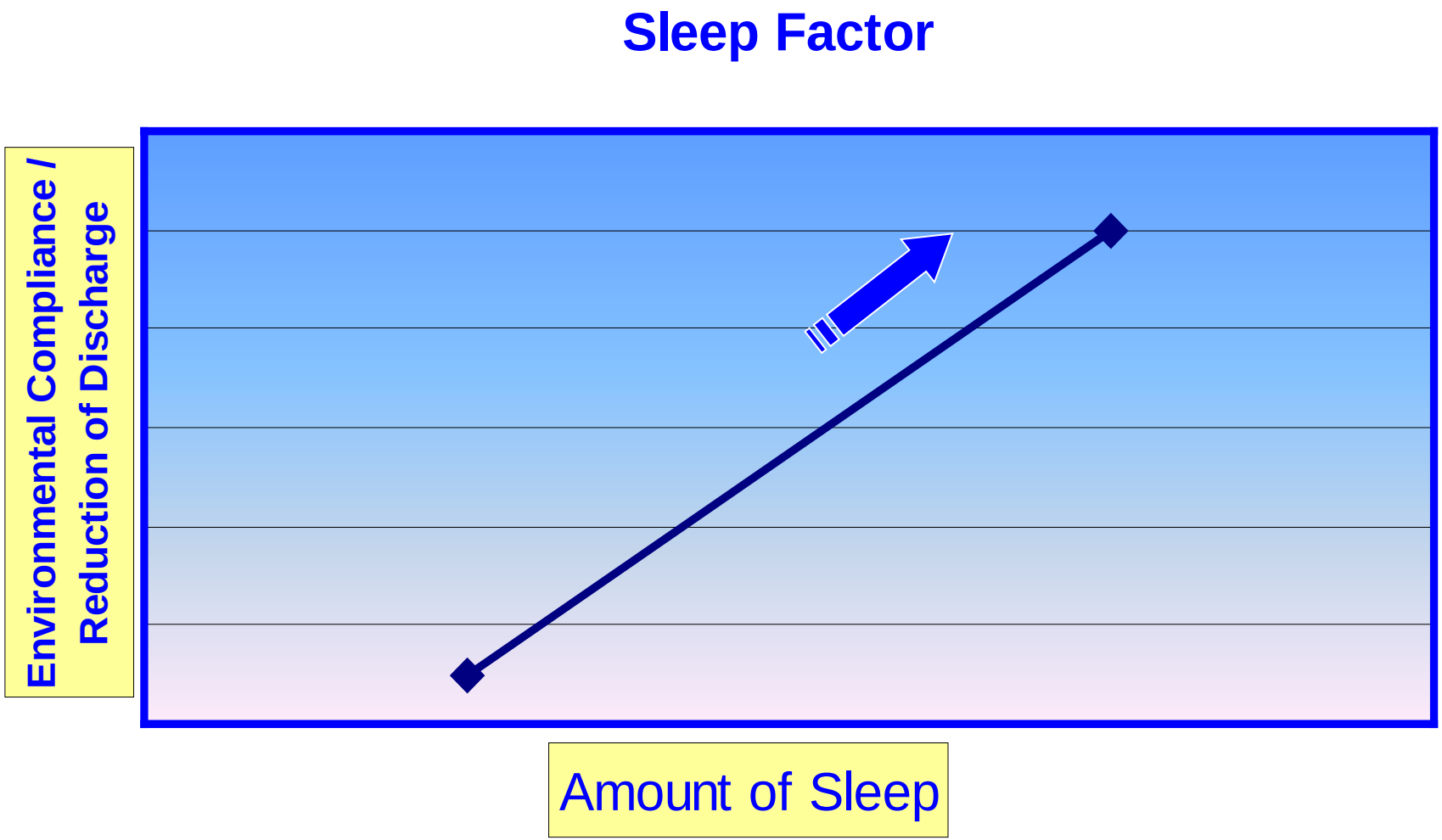
Storm Water Capture –The Next Goal

- Capture & Re-use of all rain water landing on our facility.
- Environmental Lawsuits will require metals and other limits in runoff.
- Use of runoff will help reduce plant water usage.
- Elimination of permit and regulatory reporting requirements.

Storm Water Capture Process



Environmental Compliance



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Contact Information

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