

# Pollution Prevention Practices in Small and Medium-sized Metal Finishers

Presented at the Canadian P2 Roundtable (Ottawa)

*By:*

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# Introduction to the Research Study

## ■ Objectives of the Study

- Analyze P2 Practices incorporated by four SMEs in the Metal Finishing Sector, reflect their strategies and experiences

## ■ Why Metal Finishing?

## ■ Research Method (Qualitative)

- Criteria: Metal Finishers under SME category (<500 employees), with facilities within GTA (local)
- Two main techniques of investigation:
  - ❖ A Survey Questionnaire (June 2002)
  - ❖ Conduction of Semi-Structured Interviews with SME Representatives (July – August 2002)

# Background of Participating SMEs

## SME1 – 15 Employees

- Family owned
- Manufacture metal products including fireplace inserts, tools, and airport weight scales

## SME3 – 71 Employees

- Zinc plating and phosphating of automotive parts, electrical components, and fasteners

## SME2 – 35 employees

- Family owned
- Offer electroplated metal finishes to lighting, furniture, and store fixtures markets

## SME4 – 350 Employees

- 3 facilities in GTA
- Fabricators of Printed Circuit Boards (PCBs)

**Main Processes: Degreasing (cleaning), Plating, and Painting (coating)**

# Questionnaire and Interview Session Analysis

- Part 1: Environmental Activities in SMEs:
  - ❖ Responsibility of Environmental Issues, Existing Environmental Policy, Development of an ISO 14001 EMS
- Part 2: Pollution Prevention Practices in SMEs:
  - ❖ P2 Methods Implemented, Use of P2 Planning Process, and Management Practices to Promote P2
  - ❖ Triggers for Implementing P2 Practices
- Part 3: Benefits and Challenges of Implementing P2 Practices

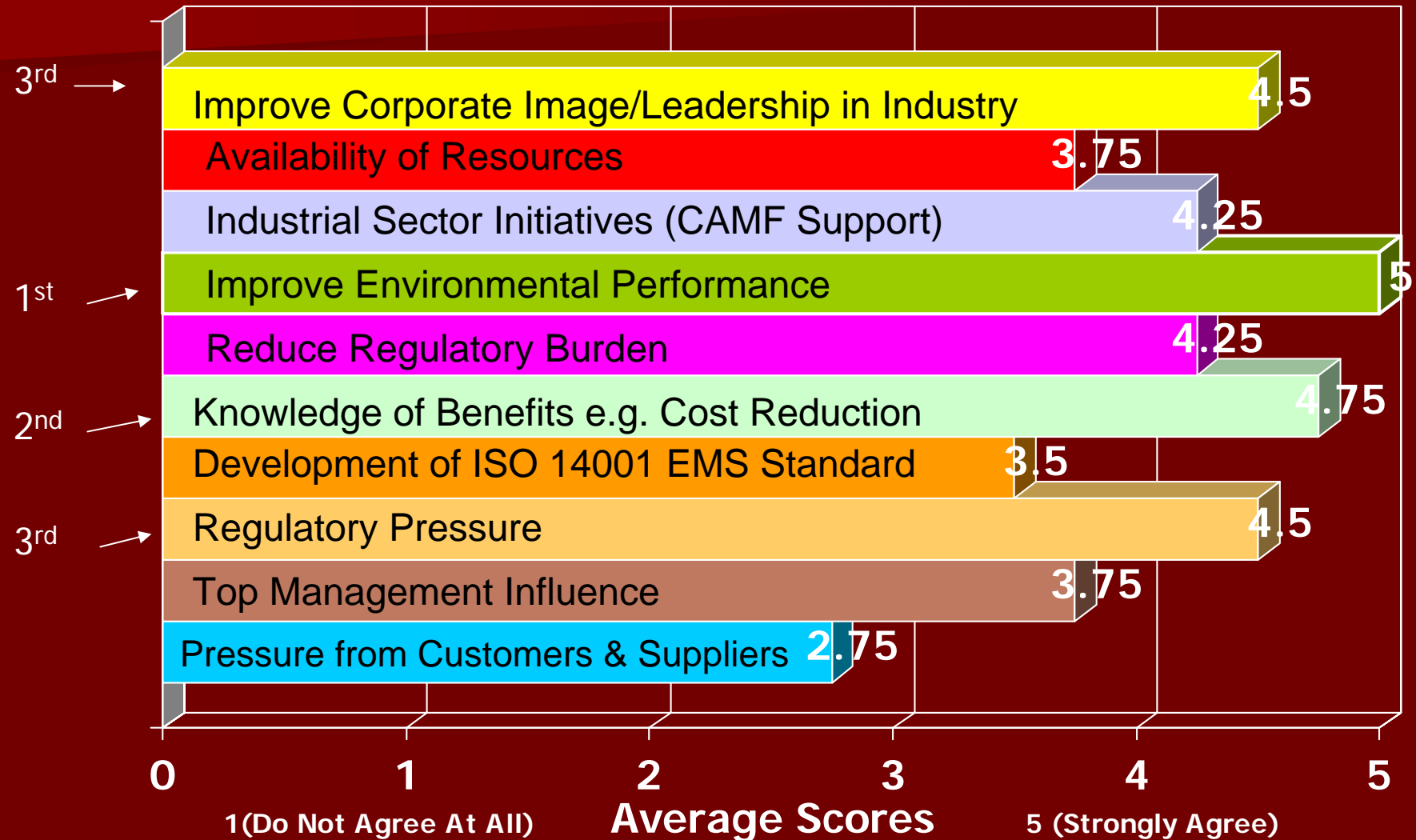
PART 1: RESPONSES	SME1 (15) (Small) Family owned	SME2 (35) (Small) Family Owned	SME3 (71) (Medium)	SME4 (350) (Medium)
Responsibility of Environmental Issues in SMEs	Production Manager (owner)  No Environmental Department	Technical Manager (owner)  Joint Health and Safety Committee	Quality Assurance / Environmental Manager  Environmental Committee, Joint Health and Safety Committee	Director of Environment & Environmental Health and Safety Manager  Environmental Department
Environmental Policy with P2 Commitment	YES	YES	YES	YES
EMS – ISO 14001?	NO	NO	Development in Progress	Registered Integrated P2 component

PART 2 RESPONSES	SME1 (15) (Small) Family owned	SME2 (35) (Small) Family Owned	SME3 (71) (Medium)	SME4 (350) (Medium)
Past or Current Voluntary P2 Initiatives?	NO * Member of Emery Creek Environmental Association	YES Signatory participant P2 MOU	YES Signatory participant P2 MOU	YES Signatory participant P2 MOU
Use of P2 Planning Process to develop P2 Plan?	YES Submitted P2 Plan (City of Toronto)	YES Submitted P2 Plan (City of Toronto)	YES Submitted P2 Plan (City of Toronto)	YES Submitted P2 Plan (City of Toronto)
Hired Consultants?	YES Funding assistance - OCETA	NO Assistance through Networking	YES	YES

# P2 Methods Implemented by SMEs

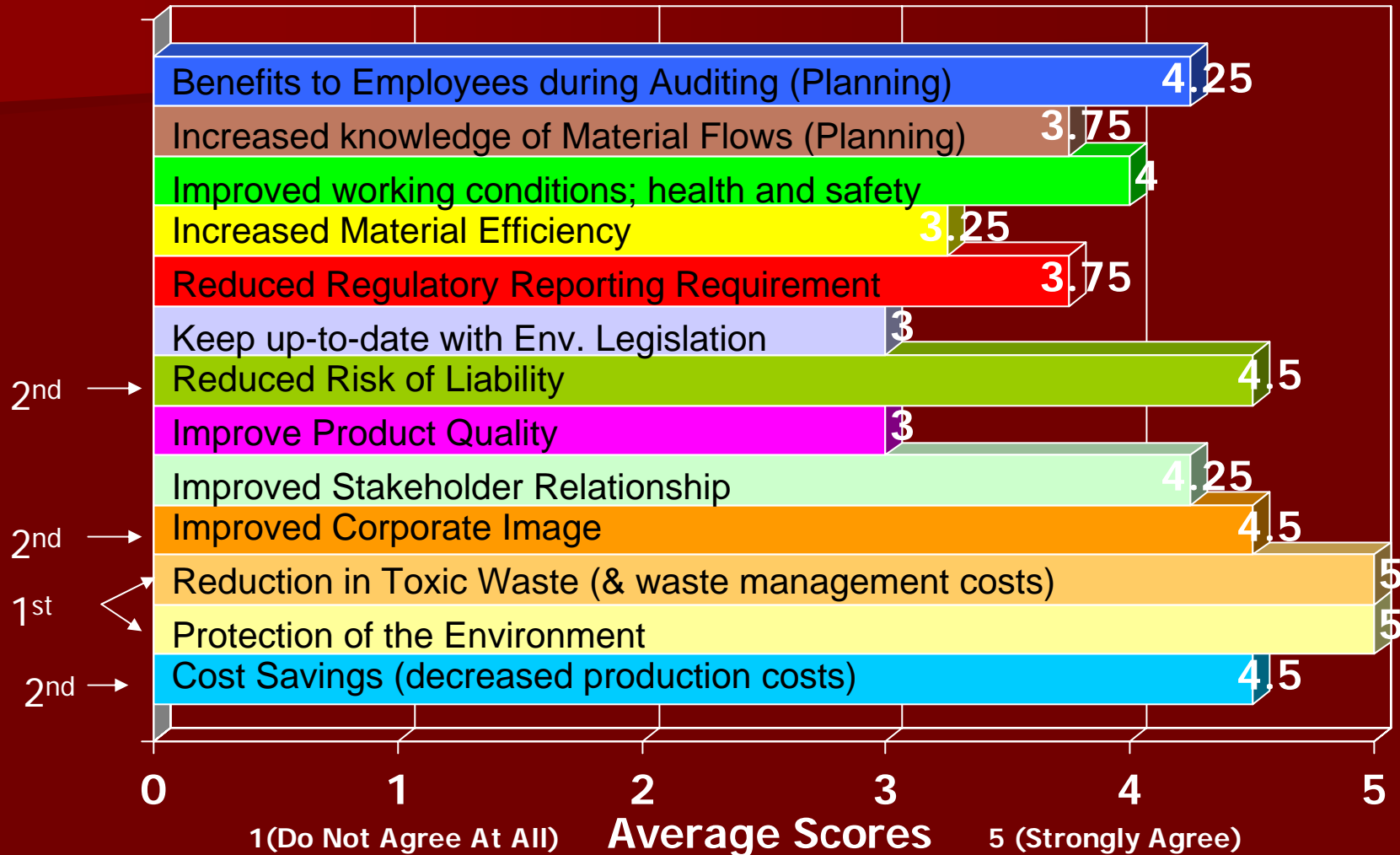
- All SMEs had implemented P2 measures
- Methods and approaches varied
- Majority modifications – Process Changes
- SMEs > 15 employees had greater technical expertise, and experience in the field of P2
- Significant reductions in use and generation of targeted pollutants
- Reduced waste management and disposal costs
- Overall, cost savings reported (or anticipated)
- Short payback periods (<2.5 yrs)

# TRIGGERS FOR IMPLEMENTING P2 PRACTICES (Average Score of Four SMEs)



# BENEFITS OF IMPLEMENTING P2 PRACTICES

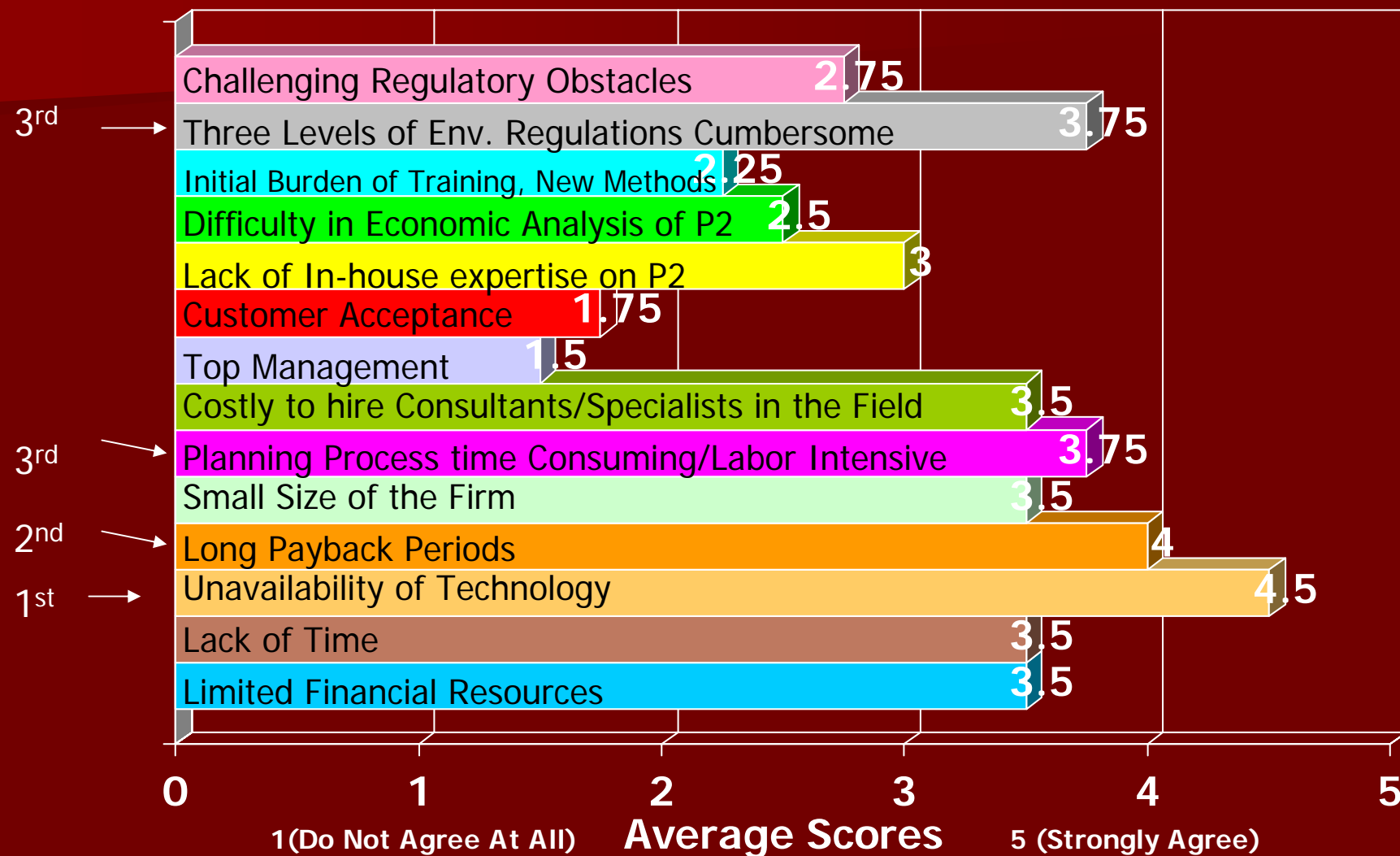
## (Average Score of Four SMEs)



# Management Practices within SMEs

- Top Management Commitment
- Tools Used e.g. ISO 14001 EMS
- Training & Employee Recognition Programs
- Dialogue with Stakeholders (Employees, Government Agencies, Industry Associations, Suppliers, Customers, or Local Community Members)
- Alliance with Industry Associations (CAMF)
- Personal Beliefs – Corporate Culture

# CHALLENGES OF IMPLEMENTING P2 PRACTICES (Average Score of four SMEs)



# Other Challenges

- Definition of P2
  - Distinction between P2 and Pollution Control
  - Challenges of the classical definition of P2
- Closed-loop Recycling
  - Not feasible at every stage of production
- Regulatory Push towards P2

# Concluding Discussion

- P2 Practices (methods) Varied:
  - Differences in company size, management practices, culture, availability of knowledge, and resources
- Diversity among SMEs in the Same Sector
  - A significant difference noted between small and medium-sized firms to deal with environmental issues
  - Variability in two small-sized SMEs
- Strong Influence of Regulatory Pressure
- One-window Approach Towards P2 Desired by SMEs

# Recommendations

- Small SMEs encouraged to participate in education workshops, training sessions through centralized organizations (C2P2)
- Small SMEs to network with Industry Associations
- Maintain a sustainable P2 Program
- Take advantage of third party initiatives e.g. OCETA
- Take advantage of programs initiated by Regulators

# Final Thoughts

- P2 an attitude that applies to all things, at all times (CIELAP, 1999)
- Organizations to adopt P2 as an attitude and not a point solution
- P2 requires a change in attitude, involvement, and actions from all stakeholders in society

PART 2: <u>P2 Methods Implemented</u>	Process Chosen & Targeted Pollutants	P2 Methods Implemented	Reductions Achieved	Cost Savings
SME 1	<u>Surface Preparation</u> (Cleaning)  Reduce evaporative losses and use of Trichloroethylene (TCE)	<p><b>SOURCE REDUCTION</b></p> <p>Process Changes:</p> <ul style="list-style-type: none"> <li>■ <i>Technological</i></li> <li>■ <i>Improved Operating Practices</i></li> </ul> <p><u>Option 2</u></p> <p><i>In progress:</i></p> <ul style="list-style-type: none"> <li>■ <i>Material Substitution</i></li> </ul>	<p>*significant reductions not calculated</p> <p>Anticipated Reduction of evaporative losses of TCE by 35%</p> <p>Anticipated 50% reduction in use of TCE</p>	<p>Anticipated to save \$1500/yr (Cdn)</p> <p>Anticipated to save \$ 2100/yr (Cdn)</p>

PART 2: <u>P2 Methods Implemented</u>	Process Chosen & Targeted Pollutants	P2 Method Implemented	Reductions Achieved	Cost Savings
<b>SME2</b>  Option 1	<u>Metal Plating Line</u> 20% reduction in the use of Copper, Nickel, and Zinc	<i>CLOSED-LOOP RECYCLING</i> ■ <i>Technological Change – electrolytic metal recovery units</i>	■ Recovery of 600 kg/yr of Copper and Zinc ■ Recovery of 1100 kg/yr of Nickel	■ Waste treatment costs reduced by \$12,800/yr ■ Disposal Cost savings \$2500/yr (payback 2.5 years)
	<u>Spray Lacquer Coating (top Coating)</u>  25% reduction in lacquer and solvent use (reduce VOC emissions)	<i>SOURCE REDUCTION</i> <i>Process Change</i> ■ <i>Technological Change – switch to HVLP spray guns</i>	■ 20% reduction of acrylic lacquer ■ Low VOC emissions	■ \$2500/yr with payback < 1 year

PART 2: <u>P2 Methods Implemented</u>	Process Chosen & Targeted Pollutants	P2 Method Implemented	Reductions Achieved	Cost Savings
SME3	<u>Metal Plating Line</u> Total elimination of Cadmium and Cyanide	<i>SOURCE REDUCTION</i> <i>Product Changes</i> <ul style="list-style-type: none"> <li>■ <i>Material Substitution</i></li> </ul>	100% reduction in Cadmium and Cyanide	Disposal cost savings of \$200,000 /yr
	<u>Currently: 1<sup>st</sup> year of Implementation</u>	<i>Process Changes</i> <ul style="list-style-type: none"> <li>■ <i>Technological</i></li> <li>■ <i>Improved Operating Practices</i></li> </ul>	Possibility of app. 80% reduction in use of zinc	Projected savings of >\$100,000 per year
	Reduction in use of Zinc and Chromium	<ul style="list-style-type: none"> <li>■ <i>Input material changes</i></li> </ul>	50% reductions in hexavalent chrome	Projected savings >\$ 80,000 a year

