SAND2007-3575 C

SAND2007-3575C

Sandia NM PPOA

Microelectronics Development Laboratory

June 5, 2007

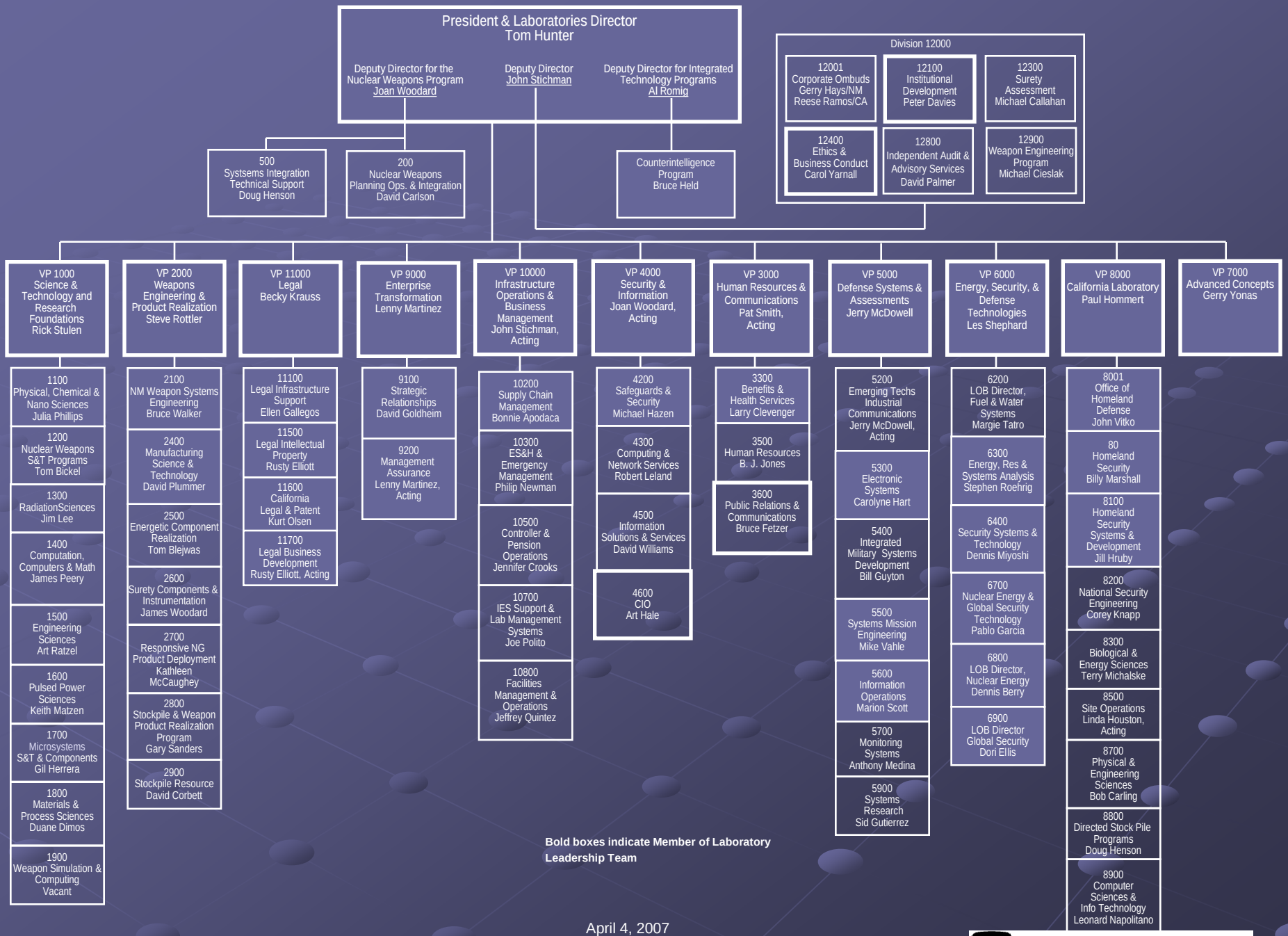
Morgan Gerard
Pollution Prevention
Sandia NM

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Presentation Overview

1. Brief Overview – PPOA
2. Why Organization 1700
3. Priority Waste Streams
4. Ideas and Opportunities
5. Outlook



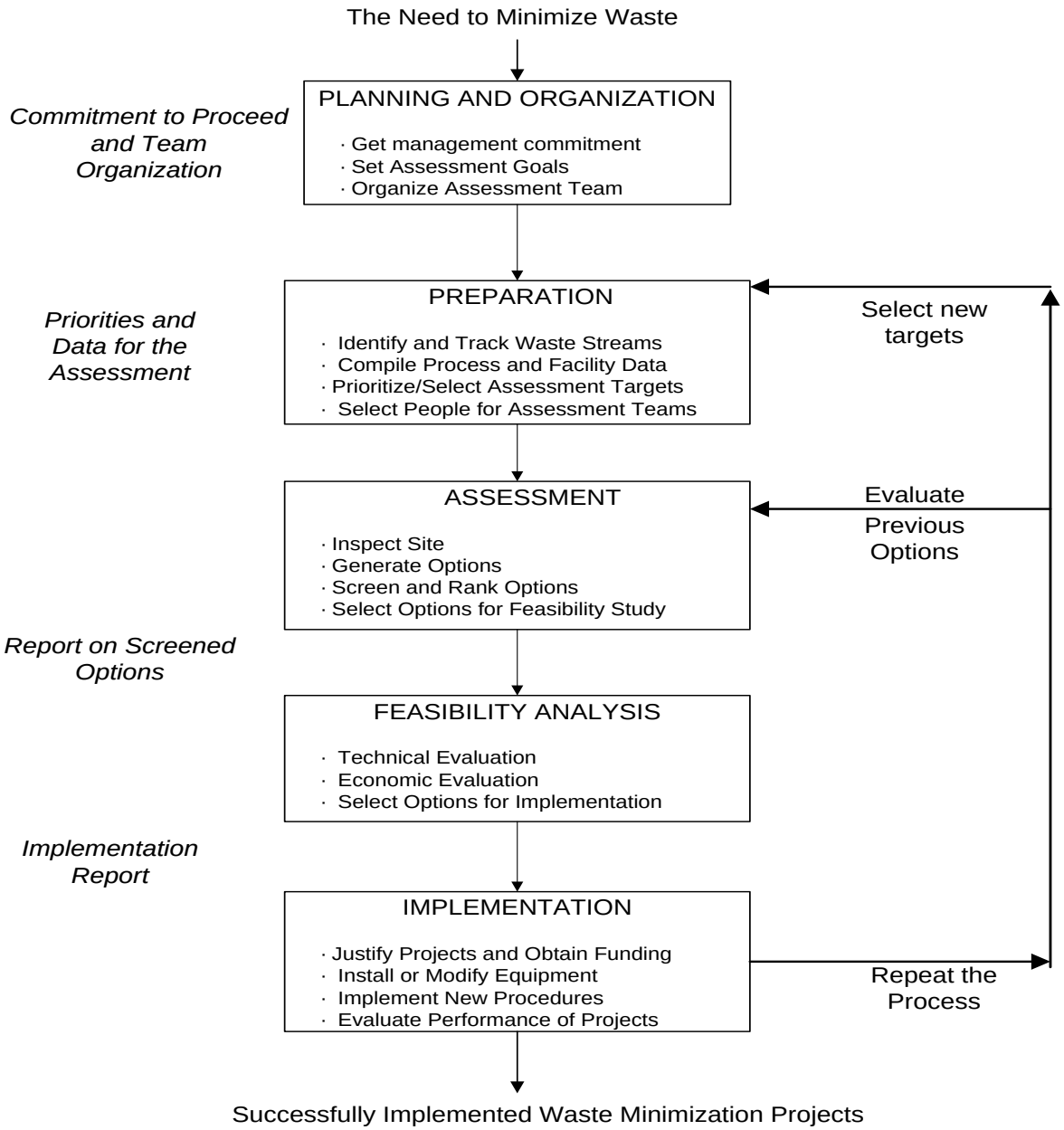
Bold boxes indicate Member of Laboratory Leadership Team

April 4, 2007

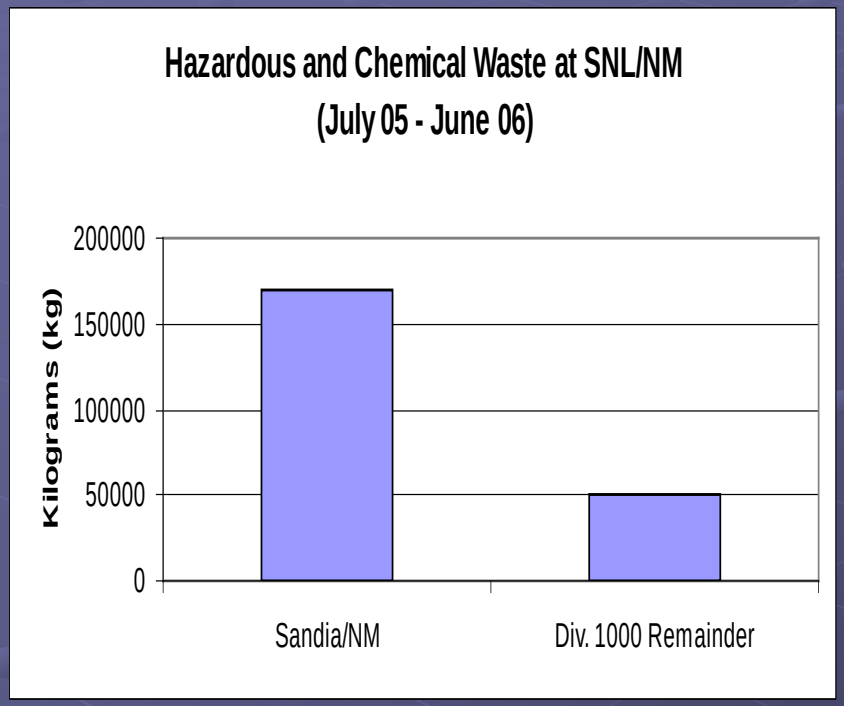
orgchart.ppt:12651:jc04/04/07

Management Structure

Sandia National Laboratories


The Need to Minimize Waste
PLANNING AND ORGANIZATION
· Get management commitment
· Set Assessment Goals
· Organize Assessment Team
Commitment to Proceed and Team Organization
PREPARATION
· Identify and Track Waste Streams
· Compile Process and Facility Data
· Prioritize/Select Assessment Targets
· Select People for Assessment Teams
Priorities and Data for the Assessment
Select new targets
ASSESSMENT
· Inspect Site
· Generate Options
· Screen and Rank Options
· Select Options for Feasibility Study
Evaluate Previous Options
Report on Screened Options
FEASIBILITY ANALYSIS
· Technical Evaluation
· Economic Evaluation
· Select Options for Implementation
Implementation Report
IMPLEMENTATION
· Justify Projects and Obtain Funding
· Install or Modify Equipment
· Implement New Procedures
· Evaluate Performance of Projects
Repeat the Process
Successfully Implemented Waste Minimization Projects

Why Organization 1700?



- Division 1000 contributes ~30% of SNL/NM Hazardous and Chemical Waste
- Org. 1700 has ⅓ of Division 1000's Waste
- More PPOA's in the future

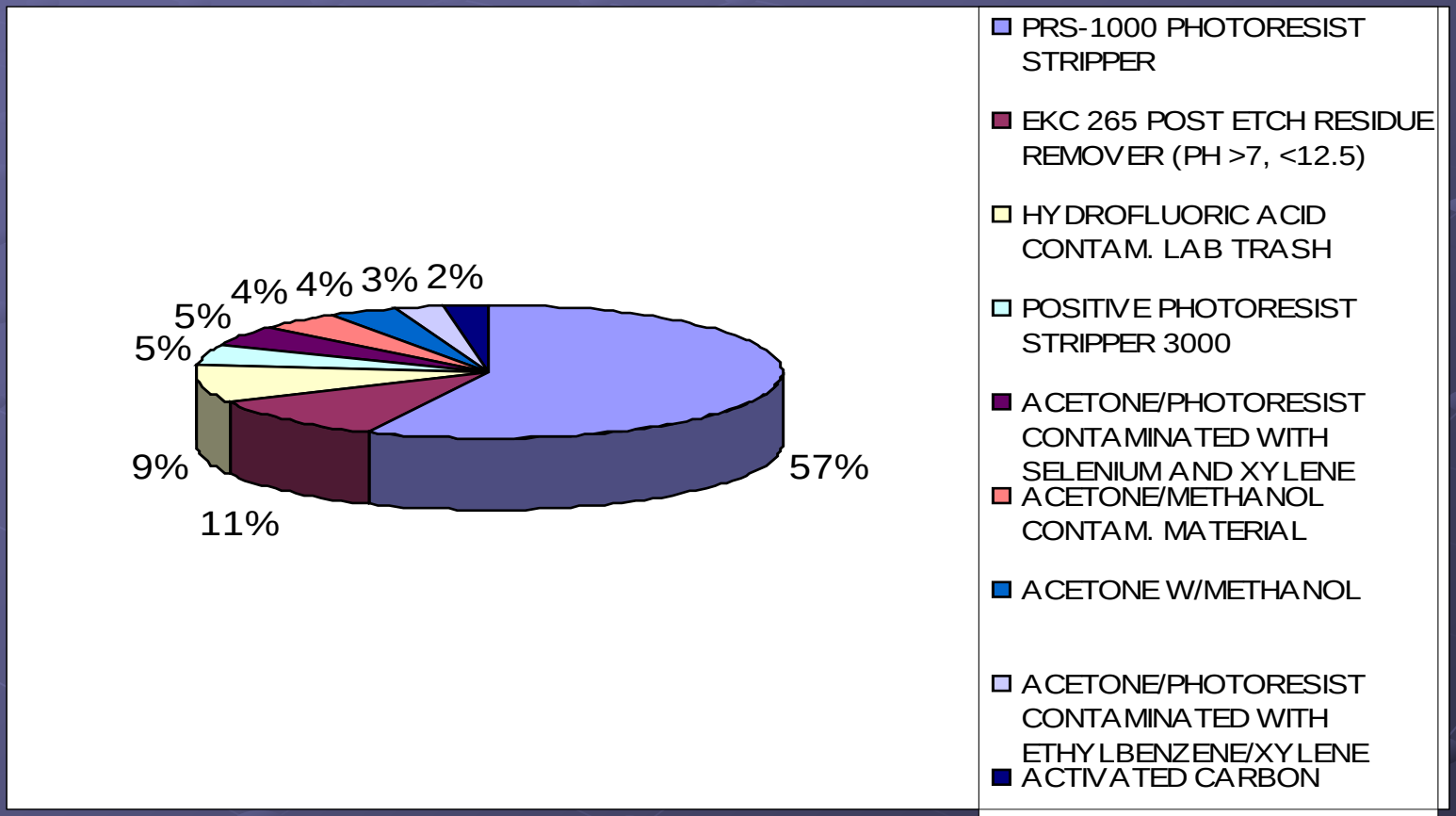
Team Members

- Org. 1700 ES&H Coordinator (2)
- Div. 1000 ES&H Coordinator
- Process Technician
- EC Coordinator
- P2 Staff (2)
- Org. 1700 Process Engineer
- Hazardous Waste Tech

Preparation Stage

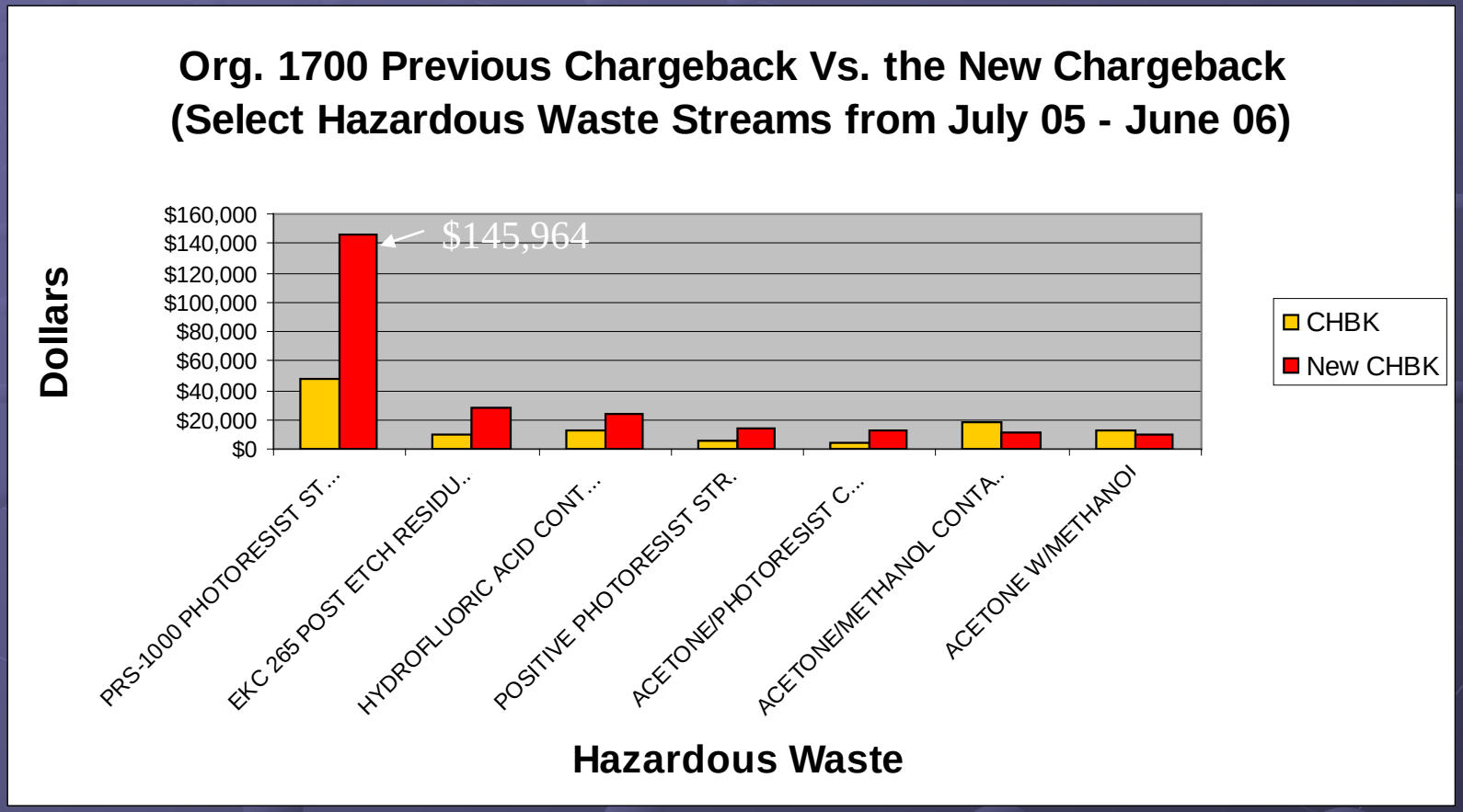
Priority Waste Streams

Priority Waste Streams

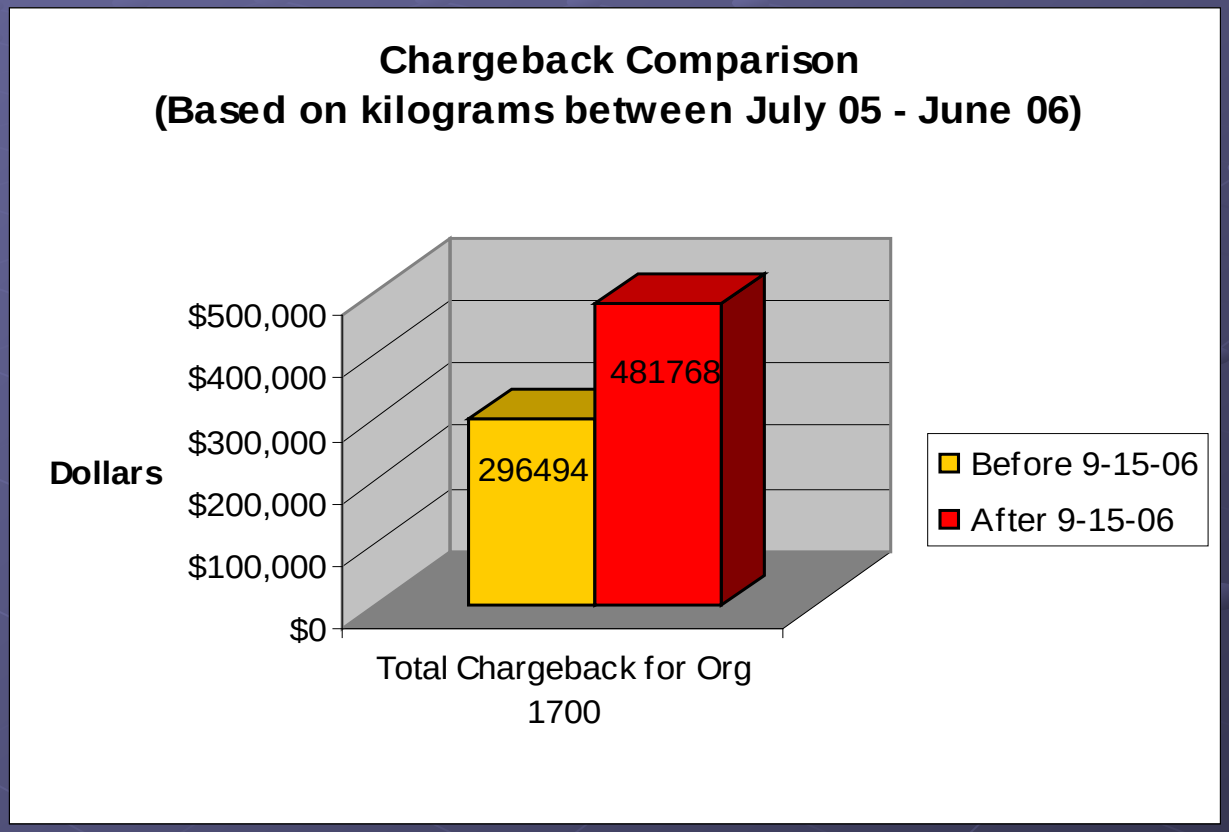


Assessment Stage

Chargeback


Org. 1700 Previous Chargeback Vs. the New Chargeback
(Select Hazardous Waste Streams from July 05 - June 06)
Dollars
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0
$145,964
CHBK
New CHBK
PRS-1000 PHOTORESIST ST...
EKC 265 POST ETCH RESIDU..
HYDROFL UORIC ACID CONT...
POSITIVE PHOTORESIST STR.
ACETONE/PHOTORESIST C...
ACETONE/METHANOL CONTA..
ACETONE W/METHANOI
Hazardous Waste

Chargeback – Another Look



Ideas and Opportunities

Ideas

- Minimize PRS-1000 (recycle, optimize)
- Minimize EKC (recycle, optimize)
- Minimize HF Contaminated Waste Stream
- Recycle Wafer Containers
- Recycle Tyvek Suits
- Reduce Water Use
- Eliminate Acetone Wipes Waste Stream

Assessment Stage -Still

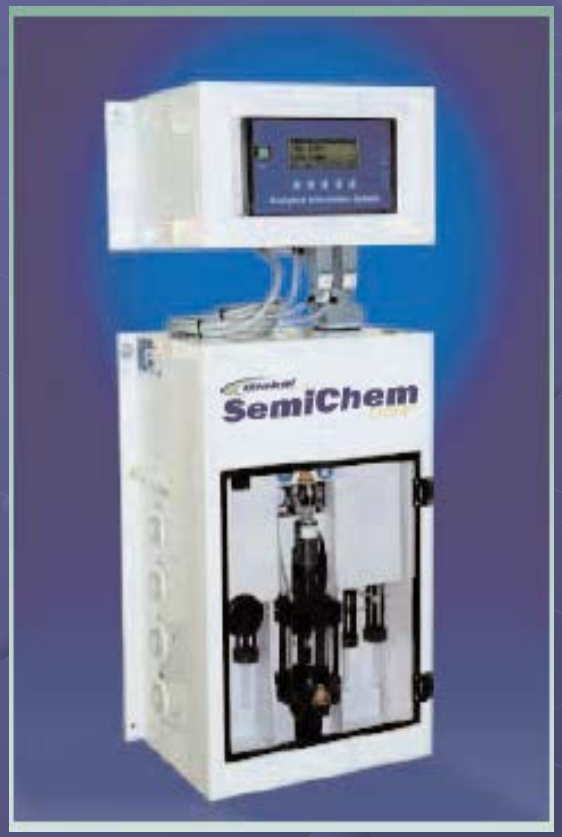
Opportunities

1. PRS – 1000 Photoresist Stripper
2. HF Contaminated Waste Stream
3. Acetone Contaminated Waste Streams
4. Water Reduction at Rinse Baths
5. Recycling Wafer Containers

PRS-1000 Photoresist Stripper

- Opportunities for evaluation
  - Recycle – Vendors through HWMF
  - Process Change – FEOL
  - Process Change - BEOL
  - Process Life Extension - Titration

PRS-1000 Photoresist Options

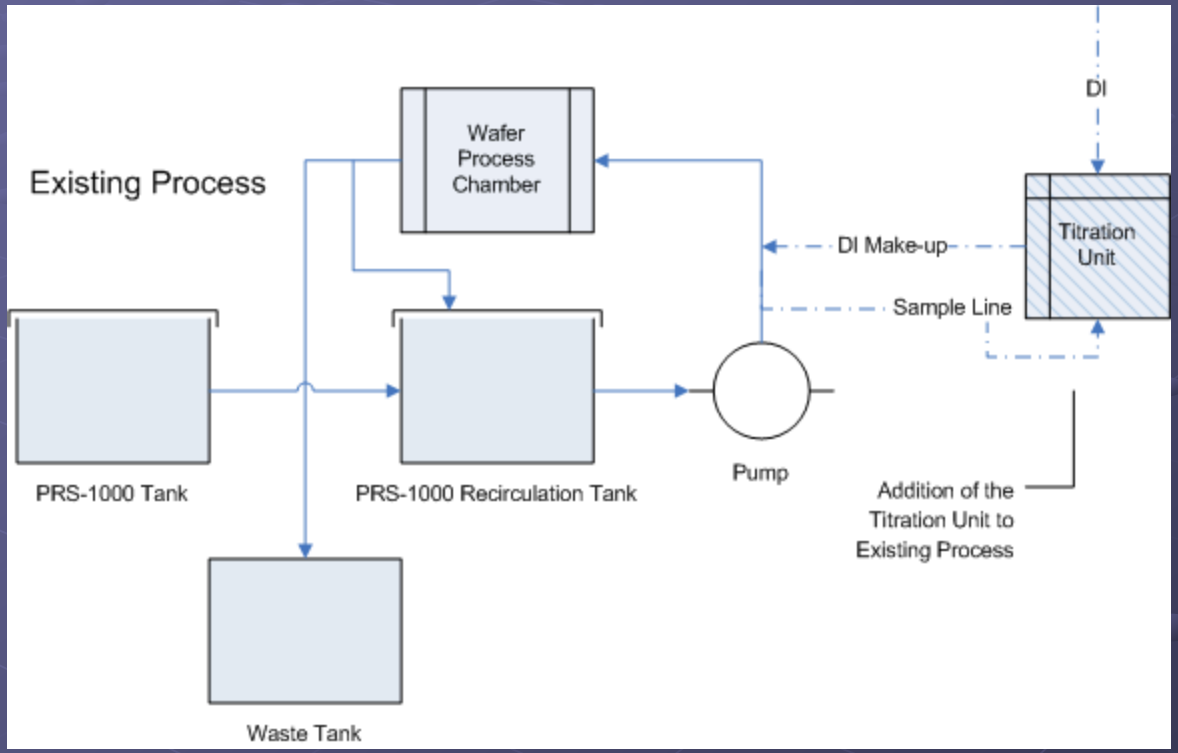


- Titration Unit Chemical Life Extension – 50% Reduction
- FEOL Piranha Solution – 20% Reduction
- BEOL Steps Reduction – 50%

100x50%=50x50%=25x20% = 20

All Combined Reduces Waste by 80%

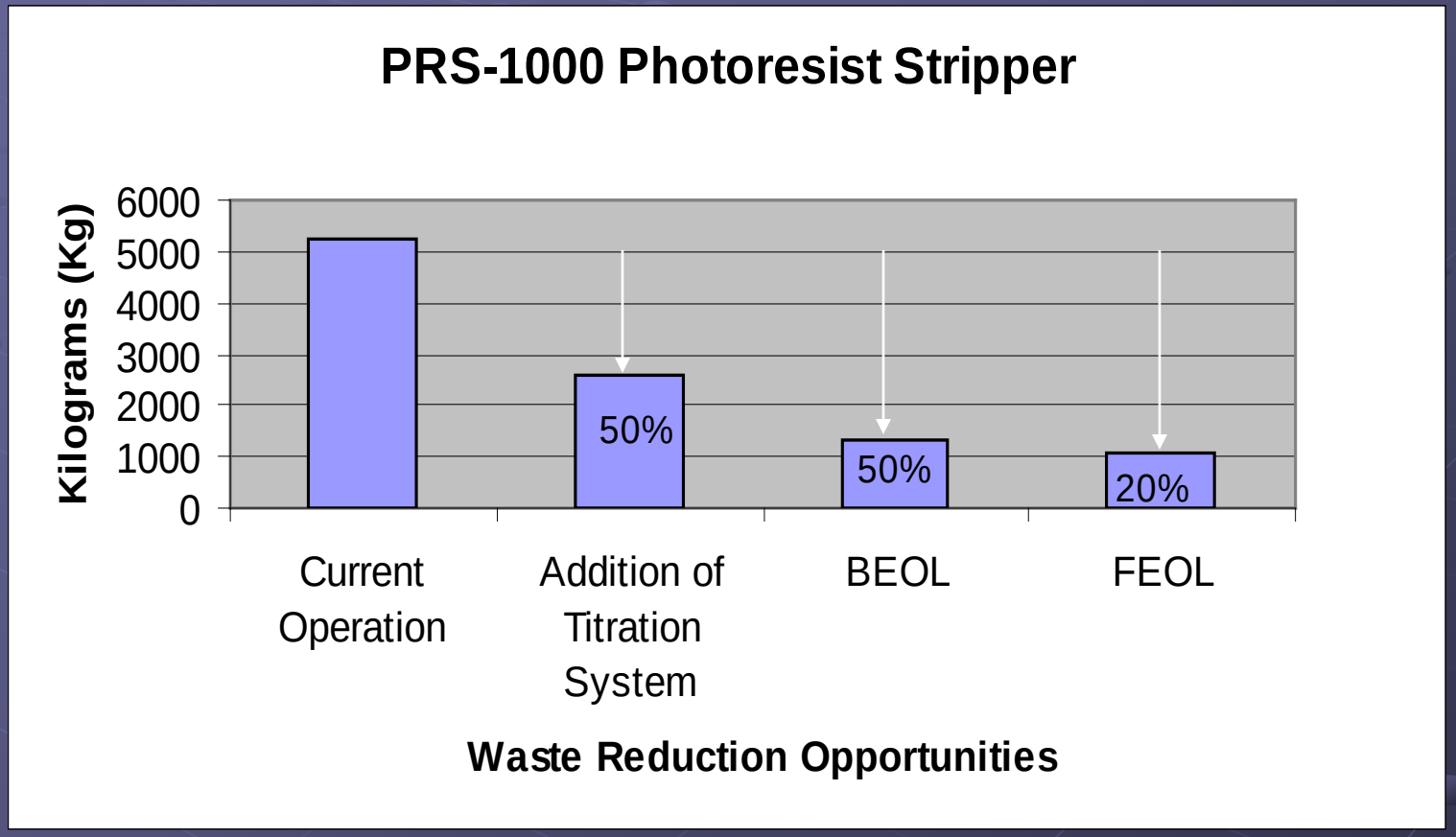
Titration Unit Process



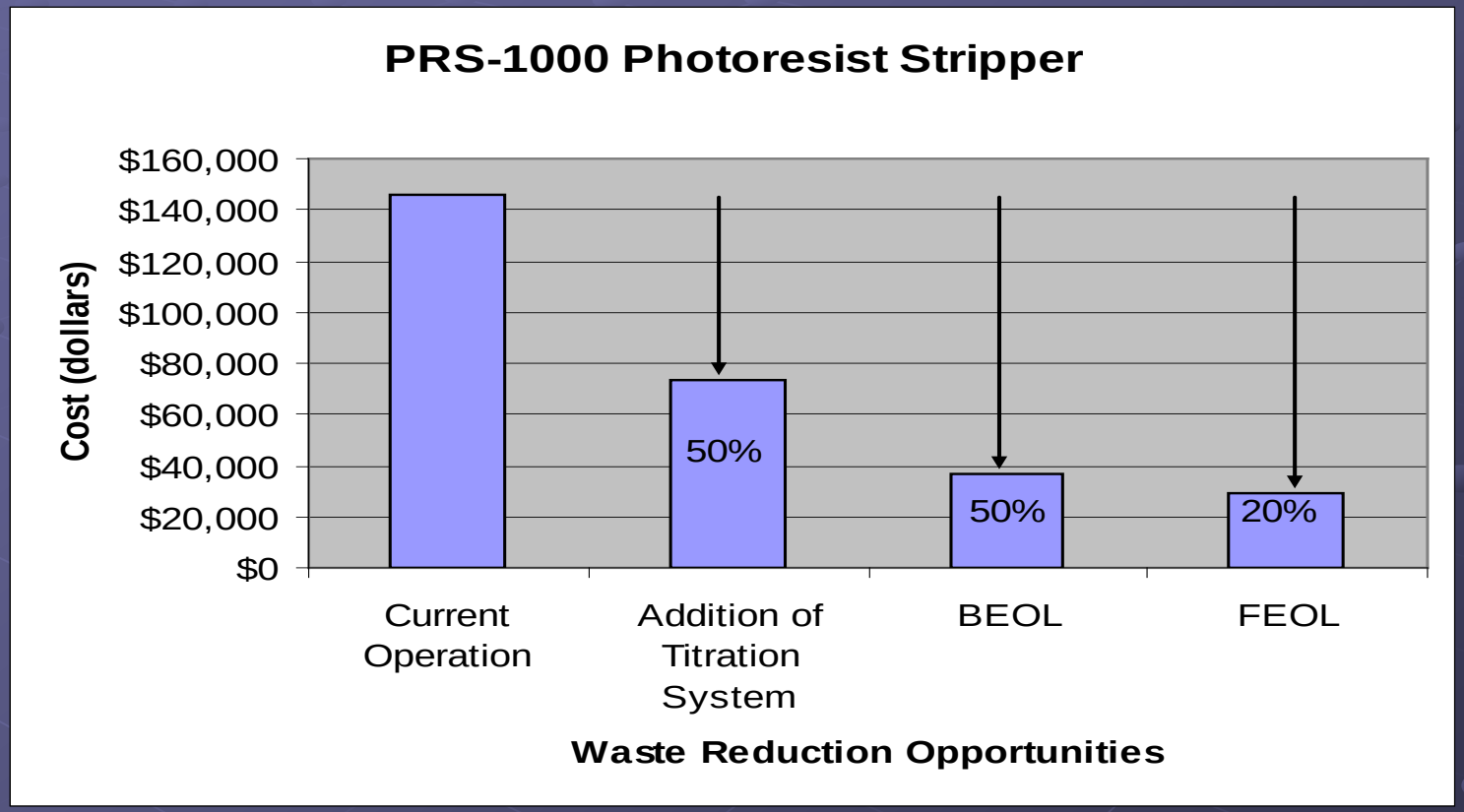
BEOL & FEOL Opportunities

- BEOL
  - 50 % Reduction in PRS-1000
  - Requires Process Change
  - Eliminates need for process steps (CMP, etc.)
- FEOL
  - 20% Reduction in PRS-1000
  - Requires Process Change
  - PRS-1000 is a BEOL chemistry not FEOL
  - Use Piranha strip – can also go to AWN

PRS-1000 Photoresist Opportunity Savings



PRS-1000 Photoresist Opportunity Savings




DANGER!!
MELTDOWN IMMINENT!

HF Contaminated Waste Stream

- Opportunity
  - Rinse Gloves and Place in Solid Waste Stream
  - Modified Procedure and Training Required
  - Reduce hazardous waste and costs by approximately 50% (420kg).

May require a study to eliminate "treatment" concern

Assessment Stage Continues…

Why throw gloves in the solid waste?

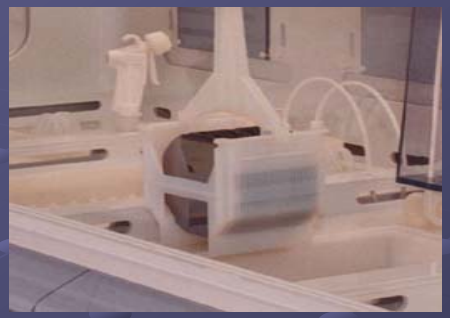
- Hazardous Waste Costs $28/kg, Solid Waste $0
- Hazardous Waste must be managed
  - Special Containers
  - Waste Logs, WDDR's
  - Subject to Regulation

- Time
- Most HW is incinerated – more resources than landfill

Acetone Contaminated Waste Stream

- Opportunity
  - Eliminate 400kg of Hazardous Waste
  - Modified Procedure and Training Required
  - Use wipes until dry

Water Reduction at Rinse Baths



- Water IS an Expensive Resource
- Excessive Bath Dumps Occur
  - Ex. Sulfuric-Nitric rinse bath changes out 10 times. Industry standard is a conservative 4-5.
  - Overall a 30% Reduction can be implemented
- Excessive Bypass Flow (Weeping)
  - Applying Industry Standards – 50% reduction
- Overall Savings – 500,000+ Gal./Year
- Sandia's Environmental Impact Statement Limits being reached (This facility uses ~ 15%)

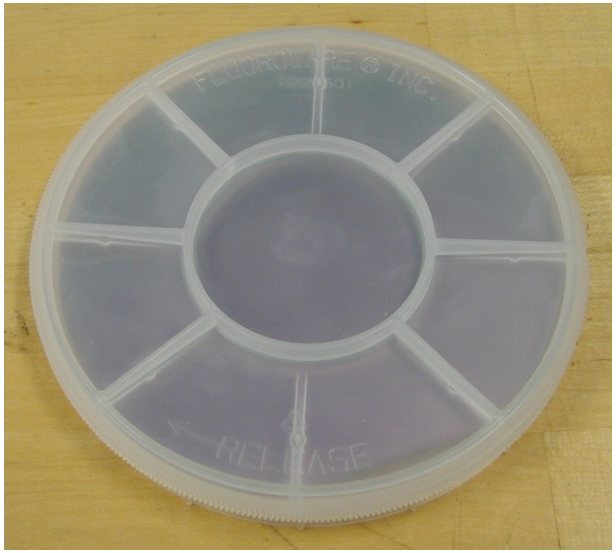
Please Recycle

This container is for recycling “Polypropylene”

End Lot Boxes & Cassettes

Single Wafer Trays

Look for this logo



At 100% Implementation

- PRS -1000
  - 80% Reduction in Waste Stream
    - Savings = $116,771 in Disposal Costs
- HF Contaminated Waste Stream
  - 50% Reduction in Waste Stream
    - Savings = $11,760 in Disposal Costs
- Acetone Contaminated Waste Stream
  - 100% Reduction in Waste Stream
    - Savings = $11,200 in Disposal Costs

100% Implementation Totals

- Costs Savings/Year
  - Disposal Costs = $139,731
  - Incoming Cost = $14,400
  - Total = $154,131
- Cost of Titration System = $(130,000)
- ROI < 1 Year (equip., not time/labor)
- Hazardous Waste Reduction = 5000kg/year
- Water Savings = 500,000 Gallons/Year!

Outlook

- ✓ Longevity – 6 Months
- ✓ Presented Information to Management
- Responses
  - Titration Unit with End-of-the-year $
  - Process Changes take time
  - Why the “dirty laundry”?
    - Information sterilization
- Division ES&H Coordinator has created a list of additional P2 Opportunities