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RECYCLING MILITARY BATTERIES
NOW ON GSA

29th NDIA
ENVIRONMENTAL AND ENERGY SYMPOSIUM
RICHMOND, VA
APRIL 7-10, 2003

ToxCo Inc
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RECYCLING MILITARY BATTERIES
NOW ON GSA

TOXCO INC

THE MILITARY USES HUNDREDS OF THOUSANDS OF BATTERIES EACH YEAR
RECYCLING MILITARY BATTERIES
NOW ON GSA

TOXCO INC

There are many different types of batteries including:

Nickel Cadmium
Lead Acid, Magnesium,
Nickel Metal Hydride,
Lithium, Lithium Ion
Mercury, Silver,
TheMmal, and others
RECYCLING MILITARY BATTERIES
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EACH TYPE PROVIDES POWER
FOR DIVERSE APPLICATIONS:

Military
RECYCLING MILITARY BATTERIES
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BATTERY POWERED CONSUMER ITEMS
USED BY THE MILITARY ARE INCREASING
AT A PHENOMENAL RATE:

- COMPUTERS
- CAMCORDERS
- TOYS/GAMES
- PHONES
- RADIOS/CD PLAYERS
- CORDLESS TOOLS
- ELECTRIC VEHICLES
RECYCLING MILITARY BATTERIES
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Houshold Batteries
RECYCLING MILITARY BATTERIES
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EARLY METHODS OF DISPOSAL PROVIDED
NO RECYCLING AND ARE OBSOLETE
WITH CURRENT TECHNOLOGY

• LANDFILL - FIRES, TOXIC GAS, EXPLOSIONS
  AND GROUND CONTAMINATION

• INCINERATION - EMISSIONS, PLANT DAMAGE

• OPEN DETONATION - OBVIOUS DISADVANTAGES

• DISPOSAL AT SEA - ENVIRONMENTALLY INADEQUATE
RECYCLING MILITARY BATTERIES
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HAZARDOUS TO THE ENVIRONMENT

EMISSIONS ARE OXIDES, ACIDS, CAUSTICS, HEAVY METALS, ORGANICS, AND OTHER PARTICULATES

FLAMMABLE
RECYCLING MILITARY BATTERIES
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HAZARDOUS TO
THE ENVIRONMENT

SOIL AND WATER
CONTAMINATION

20 YEARS LATER
RECYCLING MILITARY BATTERIES
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• UNSAFE - FIRES, GASSES, EXPLOSIONS
• INCREASED PRESENT AND FUTURE LIABILITIES

RECYCLING MILITARY BATTERIES
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LITHIUM SULFUR DIOXIDE BATTERIES:
ARE THEY SAFE TO LANDFILL?
YOU DECIDE……

TOXICITY:

FAILS Due to 5.8 grams acetonitrile per discharged D cell
(LD50 orally 3800 MG/KG (40 CFR 261.24 allows 5000
MG/KG))
LITHIUM SULFUR DIOXIDE BATTERIES: ARE THEY SAFE TO LANDFILL? YOU DECIDE…….

• **ALSO FAILS** Due to sulfur dioxide gas (100 – 400 PPM IDLH (CFR 40 261.24 allows LC50 10,000 OR MORE) 2.5 Grams per discharged D cell)

NOTE: It is believed that lithium dithionite Li$_2$S$_2$O$_2$ (26.4 Grams per discharged D cell will also generate sulfur dioxide or sulfurous acid with water)
LITHIUM SULFUR DIOXIDE BATTERIES: ARE THEY SAFE TO LANDFILL?

You Decide….

• **IGNITABILITY:** FAILS

Due to 5.8 grams acetonitrile per discharged D cell (flash point 55 F (40 CFR 261.21 allows 140 F and above))
LITHIUM SULFUR DIOXIDE BATTERIES: ARE THEY SAFE TO LANDFILL?

You Decide….

- **BIO ASSAY- FAILS**

  pH Less than 2 will not sustain life (sulfurous acid 2.5 grams per discharged cell plus so2 from lithium dithionite)
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LITHIUM SULFUR DIOXIDE BATTERIES: ARE THEY SAFE TO LANDFILL?

You Decide….

CORROSIVITY – FAILS

Due to sulfurous acid (H2SO3) generation with water CFR 40 261.22 allows pH of 2-12.5
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LITHIUM SULFUR DIOXIDE BATTERIES:
ARE THEY SAFE TO LANDFILL?

YOU DECIDE…

REACTIVITY: When completely discharged they may pass in theory but are too reactive to perform routine TCLP due to pressurized gas, flammable liquid, residual lithium, and rigid cell cases
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LITHIUM SULFUR DIOXIDE BATTERIES: ARE THEY SAFE TO LANDFILL?

YOU DECIDE….

The US Army Communications Electronics Command at Ft Monmouth has the responsibility to buy, test, set policy, and manage lithium sulfur dioxide batteries used by all other services – THEY RECYCLE
PROCESS FOR DISCHARGE AND LANDFILL

- Place Batteries In Rows With 8”\” Between Each Battery
2. Depress CDD
3. Wait 5 Days
4. Load In Drums
5. Wait 5 Days To Ship
Fire Risks Higher, Dedicated Area, Time, Labor, Personnel Risks Higher
RECYCLING MILITARY BATTERIES NOW ON GSA

• PROCESS FOR RECYCLING LARGE VOLUMES OF BATTERIES FOR RECYCLING VIA GSA – LOAD DRUMS AND SHIP

• PROCESS FOR RECYCLING SMALL VOLUMES OF BATTERIES FOR RECYCLING VIA GSA AND THE BIG GREEN BOX – FILL IT, SEAL IT, AND CALL UPS FOR PREPAID SHIPPING
RECYCLING MILITARY BATTERIES
NOW ON GSA

UNIQUE FIRST EVER GSA CONTRACT:

- There has never been firm-fixed national costs to recycle any type battery
- There has never been a direct contracting method without a middle man/men
- There has never been a means to recycle small volumes of batteries cost effectively
- There has never been a recycling option for smaller facilities
Unique First Ever GSA Contract:

- GSA Contract GS-10F-0045N Awarded October 22, 2002 (valid for 5 years).
- Environmental Service Schedule 988-4
- 15 Types of batteries with a fixed cost to recycle
- Prepaid Container: The Big Green Box (recycling & transportation of any type battery up to 43 pounds)
Unique First Ever GSA Contract:

Per Pound Recycling Costs:

- Lithium Thionyl Chloride or Thermal - $2.16
- Lithium Sulfur Dioxide or MnO2 - $1.54
- Lithium Rechargeable - $0.32
- NiCd or Nickel Metal Hydride - $0.43
- Lead Acid (aircraft, tank, and absolyte) - $0.15
- Lead Acid - $0.02
RECYCLING MILITARY BATTERIES
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Unique First Ever GSA Contract:
Per Pound Recycling Costs:

- Mercury - $2.65
- Alkaline - $0.61
- Magnesium - $1.51
- Silver Zinc (reserve) $2.47
- Silver Zinc (except reserve) $0.25
DRMO Lithium Battery Disposal/Recycling Costs
As of 5/2002 (● denotes recycling CLIN)

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Cost</th>
<th>Cost Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>900 lbs LiSO2</td>
<td>$6.36</td>
<td>($1.54)</td>
</tr>
<tr>
<td>42,943 lbs LiSO2</td>
<td>$3.34</td>
<td>($1.54)</td>
</tr>
<tr>
<td>15,000 lbs LiSO2-</td>
<td>$4.05</td>
<td>($1.54)</td>
</tr>
<tr>
<td>15,000 lbs Lithium-</td>
<td>$2.50</td>
<td>($1.54)</td>
</tr>
<tr>
<td>6,800 lbs Lithium-</td>
<td>$7.49</td>
<td>($1.54)</td>
</tr>
<tr>
<td>166,000 lbs LiSO2-</td>
<td>$1.04</td>
<td>($1.35)</td>
</tr>
</tbody>
</table>
The Big Green Box Program:

- Unique all inclusive recycling program focused on small volumes of mixed batteries
- Allows satellite or smaller facilities ease in recycling
The Big Green Box Program:

- Provides the most efficient means to ensure recycling
- Provides a means to eliminate unnecessary costs by working directly with the recycling facility vs. brokers
RECYCLING MILITARY BATTERIES
NOW ON GSA

The Big Green Box:

- Recycle lithium, alkaline, NiCd, mercury, silver, sealed lead, and other types of sealed batteries

13”L x 13”W x 8.5”H
Capacity 43 pounds
RECYCLING MILITARY BATTERIES
NOW ON GSA

TOXCO INC

The Big Green Box:

- **Selling Price Includes:**
  - A United Nations approved, pre-labeled collection and shipping container
  - All shipping to customers
  - All shipping from customers
  - All sorting and handling fees
  - All recycling fees
  - All instructions
RECYCLING MILITARY BATTERIES
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TOXCO INC

DOD
DOE
State & Local
Brokers
Consumers
Industry
Battery Manufacturers
Toxco Customers
EV Manufacturers
RECYCLING MILITARY BATTERIES
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Lithium Recycling Trend

Year

Lithium
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NiCd Drained

1999  2000  2001

NiCd Drained
RECYCLING MILITARY BATTERIES
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![Bar chart showing recycling of different battery types (Lead Acid, Dry Alkaline, ZnC, ADZ) for years 1999, 2000, and 2001. The chart illustrates an increase in recycling efforts over the years.](chart.png)
RECYCLING MILITARY BATTERIES
NOW ON GSA

FOR ADDITIONAL INFORMATION PLEASE CONTACT

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Toxco Trail Facility