For several years, the county of Allegheny in Pennsylvania, has been aware of problems involved with open abrasive blasting of buildings, structures and bridges. Hence the implementation of their first Abrasive Blasting Regulation, October 1986.

Problems ranged from improperly prepared surfaces that did not allow for long life of applied coatings to a lack of concern for the atmosphere and environment, allowing airborne contaminants such as silica and lead to enter the atmosphere as well as cover the ground, lawns, vehicles, etc.

Understandably, the regulation is a very important step toward controlling pollution and potential health problems related to open air abrasive blasting. Several other counties and states will follow suit.

But what about the contractor that has to bid on these jobs? What services, equipment, supplies, or ideas are available to help him comply while remaining competitive?

My research brings together ideas, both domestic and foreign, on equipment, and methods currently being used in open abrasive blasting of large structures. This equipment will allow contractors more capability to comply with environmental rules and regulations.

Information will be presented on:
A. Enclosing the Blast Area using plastic sheet or sandblast screens.
B. Portable Dust Collection Equipment
C. Abrasive Vacuums
D. Abrasive Reprocessing Equipment
E. Open Blast and Recovery System
F. Blast and Vacuum Systems
G. Blast Modules
H. Airless Shot Blast Equipment

Additionally I will be presenting some basic research that my company has been conducting to find a practical approach to reprocessing spent abrasive containing in excess of 5 PPM of lead paint. This research may, if successful, lead to development of a portable processing machine to reduce large volumes of stockpiled spent abrasive contaminated with lead.
CURRENT TECHNOLOGIES IN ABRASIVE BLASTING

Beginning With

RESEARCH ON CONCENTRATION AND REMOVAL OF LEAD PAINT CHIPS FROM SPENT ABRASIVE.

JOHN M. LUNARDINI

President, MICHAEL J. LUNARDINI, INC. a distributor of Abrasive Blasting and Sandblasting Equipment and Supplies.

Associate RICHARD UNDERWOOD - Chemist

Extensive expertise in Hazardous Waste management, testing procedures, and compliance with Environmental Regulations.

Research began over a year ago at the request of a client to determine the feasibility of separating lead paint chips from spent abrasive. The reason this was of concern to the client was because of high costs of abrasive and his desire to reuse the material.

During research, collection of samples, and talking to various contractors and equipment manufacturers, it became aware that not only was it difficult to separate this material, but collection methods, storage methods, sample processing, and containment were also problems. These were often the contractors' responsibilities and many times caused serious problems in performance of contracts.

This paper reflects research results we performed on processing spent abrasive to remove lead paint chips and also looks at current technologies and available equipment that could help the contractor better deal with increasing environmental regulations on open abrasive blasting and removal of lead base paint.
SAMPLE PROCESSING SYSTEM

The machine used to process abrasive samples was specially constructed at our facilities. While official design and operation procedure is proprietary information, the three basic particle separation methods used, are shown below.

ROTARY SCREEN SEPARATOR

AIR WASH SEPARATOR

CYCLONE SEPARATOR
BLOCK DIAGRAM OF SAMPLE PROCESSING PROCEDURE

Spent Abrasive, Lead
Paint Chips, Ground
Debris

1st Stage Separation

Large Ground Debris
Large Paint Chips

Note "A"

Processable
Material

Dryer

2nd Stage Separation

XXX Mesh and
Finer Material

XXX Mesh and
Coarser Material

NOTE "B"

TEST
RESULTS

Proposed
Additional
Research

3rd Stage Separation
To Separate Equal
Size and shape Paint
Chips from Spent
Abrasive

Paint Chips

NOTE "C"

Usable
Reprocessed
Abrasives

NOTE "D"

NOTES

"A" - This material could be considered hazardous waste because of lead paint chips. If tests below 5 PPM Leachable Lead and chips can be easily removed then ground clutter may be able to be returned to ground. Environmental approval would be required.

"B" - This material could be approximately 100 mesh and finer, may have high total and leachable lead. Due to the fact it is very fine and becomes easily airborne, it should be handled with care. Operators should wear respiratory protection, eye and face protection. Hence it may have to be handled as hazardous waste, if it contains more than 5 PPM Leachable Lead.

"C" - If third stage separation is successful, this material would be mostly paint chips and should be considered hazardous if containing leachable lead, and handled accordingly.

"D" - If third stage separation is successful, this material should be relatively free of dust, dirt, paint chips, and leachable lead, with respect to original blasting abrasive. Size will be some what smaller than original however it could still be used as an abrasive, filler, or anti-skid material.
LEACHABLE LEAD RESULTS

Beginning Samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>Material</th>
<th>Contaminants</th>
<th>Total Lead</th>
<th>Leachable Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Spent Coal Dust, Slag</td>
<td>Dust, Paint Chips, Moisture</td>
<td>1700 PPM</td>
<td>2.16 PPM</td>
</tr>
<tr>
<td>B</td>
<td>Spent Coal Dust, Slag</td>
<td>Dust, Paint Chips, Moisture, Dirt, Rocks, Twigs, Paper ETC.</td>
<td>7050 PPM</td>
<td>.72 PPM</td>
</tr>
</tbody>
</table>

Each sample was processed, remixed then processed again. The reason for this was to see the effects that machine adjustment, clogs, and machine wear, has on samples and the leachable lead readings.

Sample A (Remember, was 2.16 PPM Leachable Lead)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Separation Stage</th>
<th>Approx. Mesh</th>
<th>Leachable Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1.3.1. 2nd(Coarser)</td>
<td>12/60</td>
<td>.78 PPM</td>
<td></td>
</tr>
<tr>
<td>A.1.4.1. 2nd(Finer)</td>
<td>60/325+</td>
<td>3.09 PPM</td>
<td></td>
</tr>
<tr>
<td>Remix of Sample A.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.2.3.3 2nd(Coarser)</td>
<td>12/100</td>
<td>2.07 PPM</td>
<td></td>
</tr>
<tr>
<td>A.2.4.3 2nd(Finer)</td>
<td>36/325+</td>
<td>3.01 PPM</td>
<td></td>
</tr>
</tbody>
</table>

Sample B (Remember, was .72 PPM Leachable Lead)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Separation Stage</th>
<th>Approx. Mesh</th>
<th>Leachable Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1.3.2 2nd(Coarser)</td>
<td>12/60</td>
<td>2.42 PPM</td>
<td></td>
</tr>
<tr>
<td>B.1.4.2 2nd(Finer)</td>
<td>100/325+</td>
<td>3.72 PPM</td>
<td></td>
</tr>
<tr>
<td>Remix of Sample B.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.2.3. 1 to 2 2nd(Coarser)</td>
<td>12/100</td>
<td>3.25 PPM</td>
<td></td>
</tr>
<tr>
<td>B.2.4. 1 to 2 2nd(Finer)</td>
<td>12/325+</td>
<td>8.96 PPM</td>
<td></td>
</tr>
</tbody>
</table>

Method of Taking Original Samples - No scientific method here. Just shoveled material into a bucket from 2 stock piles.

Method of Measuring Leachable Lead

We strictly followed EP Toxicity test keeping all samples at a 5 PH Level. Analysis of Leachate Extracts were made using a process called "ICP" (Inductively Coupled Plasma) Spectroanalysis. This method of measurement was selected over more popular "AA"(Atomic Absorbtion) Spectroanalysis, because it allowed freedom from interference.
SAMPLE PROCESSING CONCLUSIONS

1. There should be a standardized method used for collecting samples of spent abrasive and bridge paint samples to determine leachable lead. We feel there are too many variances in the way a sample can be taken and where it is taken from. Initial sample taking is critical because it governs the overall operation, performance, and costs of contract.

2. We feel that if any system is used to reprocess abrasive that contains lead paint chips, the system must be closely observed to see that it is doing its job. It may be necessary to periodically test the abrasive to determine if high levels of leachable lead is getting by separation stage. However we don't know if this material (Lead Paint Chips) causes a problem when reblasted onto surface.

3. All spent abrasive and paint chips should be contained as best possible to facilitate easy clean up. The more ground clutter collected along with spent abrasive the more problems there are in reprocessing the abrasive for reuse whether or not it contains lead paint chips. Hence higher disposal costs.

4. Even though we strictly adhered to EP Toxicity test procedures, we could not accurately reproduce readings per sample. Hence every time a sample was tested we would get a different reading.

5. Some leachate extracts while having low leachable lead readings, still showed visible paint chips. Consequently samples that may have had a high concentration of fines may not have showed high levels of leachable lead, while samples that showed some paint chips, some fines but what looked to be relatively good material tested higher levels of leachable lead.

We could not determine any common denominator between the samples and leachable lead readings. At this point we stopped all sample processing to determine next steps. We feel it is possible to separate and concentrate high levels of leachable lead material from usable abrasive, by incorporating a third stage of separation. If successful the higher leachable lead material may be utilized in other processes such as nuclear containment shielding, or mixed in substrate asphalt, while the reprocessed abrasive relatively free of leachable lead, dust, dirt, etc, could be reused for blasting. These are only assumptions. We cannot do any further research until we secure funding for prototype design of a field usable machine, and marketability of end products developed by the machine.

CURRENT TECHNOLOGIES IN ABRASIVE BLASTING

The following pages reflect equipment and ideas currently being used in performance of outside open blasting, where containment, collection, abrasive reprocessing, and dust free or vacuum blasting has been required.
BURLINGTON SKYWAY BRIDGE
Burlington, Ontario, Canada

Scaffolds, Lumber, Plastic
And tarps, used for enclosure.

Courtesy of Clara, LTD.
Industrial Services
SANDBLAST SCREENS
Used for partial containment of airborne abrasive & materials.
Courtesy of Eagle Industries.

USED TO DRAPE:
Bridges, water towers, storage tanks, swimming pools, commercial buildings, offshore oil rigs, refineries, etc.

BARRIER WALL FOR:
Separating paint yard from rest of facility, neighborhoods, roadways, parking lots, etc.
DUST COLLECTORS
For use at Job Sites where total enclosure is necessary.

DRY PORTABLE DUST COLLECTOR
Courtesy W.W. Sly Manufacturing.

WET STYLE LARGE VOLUME AIR HANDLER
Courtesy of C.A.B. Manufacturing.
ABRASIVE REPROCESSORS
(Not approved for removal of Leachable Lead or Lead Paint Chips)

MODEL 3 RECLAIMER
For reprocessing metal abrasive
Aluminum Oxide and Garnet
Courtesy of Pauli and Griffin corp.

VACUVEYOR
For reprocessing metal abrasive
Courtesy of Vacu-Blast International

SLAG ABRASIVE REPROCESSOR
For bulk reprocessing of slag abrasive
Courtesy of Apache Abrasives, Inc.
POWER DRIVEN VACUUMING EQUIPMENT
Does not clean or reprocess abrasive for reuse.

SUPER SUCKER and LITTLE SUCKER VACUUMS
Courtesy of Super Products, Inc.

LIQUID RING VACUUM PUMP
Courtesy C.A.B., Inc.
AIR OPERATED VACUUM EQUIPMENT
Does not clean or reprocess abrasive for reuse.

CAN VAC
Courtesy of Schmidt, Mfg.

VACU-TRANS
Courtesy of J.H.C. Corp.

Vacutrans with Free Exhaust.

Vacutrans with Drum Transfer
CONCEPT III BLAST ROOM MODULE
Contains dust collector, blaster, and operator gear.
You provide enclosure.
Courtesy Schmidt Mfg.

SCHEMATIC OF AIR OPERATED VACUUM EQUIPMENT

Vacuum Nozzle

Rolling Vacuum Head

Vacuum Hopper
BLAST AND VACUUM EQUIPMENT

BLAST-N-VAC
Courtesy of I.M.C. Corp.

BIG BOSS
Courtesy of Pauli & Griffin, I.
BLAST AND VACUUM EQUIPMENT

BLASTERS

CLOSED CIRCUIT BLASTERS
for use with metal abrasive.
(Courtesy of Vacu-Blast Int.)

BLASTRAC Wheelblast Machine
Courtesy of Wheelabrator, Inc.
PRODUCTION BLAST AND RECOVERY SYSTEMS
For use with metal abrasives.

SABAR SYSTEM
Courtesy C.A.B., Inc.

QUATES 183 VACUUM ATTACHMENT
To adapt standard bulk blaster into a vacuum.
Courtesy of Schmidt Mfg.