

Ivey International Inc.

“Today’s Environmental Solutions For A Better Tomorrow”



Provides state of the art
Metal stabilization technology
along with hazardous
waste management
solutions to environmental
consulting and environmental
contracting clients globally.

Services

- **Soil Stabilization (Atomisol[®])**
- **Hazardous Waste Site Clean Up ***
- **Generator Waste Management ***

ATOMISOL[®] STABILIZATION

- **We can take** heavy metals in soil, sludge or sediment and stabilized for 25 to 40 percent less \$ than conventional means.
- **We can perform the work with** little increase in weight or volume.
- **We can** treated not just one heavy metal type but multiple types, simultaneously.
- **We can allow** you to be certain of cost, scheduling, analytical results, and treatment longevity.

What is ATOMISOL[®] Stabilization?

A body of scientific knowledge combined with field experience applied in ambient conditions to convert leachable heavy metals to environmentally stable form (*i.e.*, *suphide*, *sulphate*, *phosphate* and *mineral combinations*) from leachable (toxic) metallic and oxide forms into environmentally stable mineral and other chemical forms. We also have the ability to liberate and remove certain heavy metals from soils as part of our Atomisol[®] processes.

Not all stabilization are created equal

Other forms of stabilization like pozzolonic (i.e., cement, fly-ash, and kiln dust) essentially encapsulates heavy metals. True ionic or anionic change (treatment) never takes place.

There are a number of pozzolonic variations on the market but fail in consistency, restrictive in application, and do not evoke a true chemical change.

Traditional stabilization techniques have often been confined to off site treatment facilities and do not lend to *complex waste types or small quantities*.

Advantages

Cost

Performance

Range of Application

Consistency

Materials Handling

Compliance

Economics



Standard Stabilization Associated Costs

Purchase of bulk additives, bulk delivery and storage systems, purchase of large bulk handling equipment and systems, time to process contaminated material and additives, site labor and off site transportation and disposal fees.



ATOMISOL Stabilization Associated Costs

Purchase of far less bulk additives, less bulk delivery and storage, singular purpose equipment systems, less site labor, and typically, due to longevity of treatment, far less and possibly no transportation and disposal costs.

Performance

mg/L TCLP

ARSENIC AS	LEAD PB	CHROME CR	ZINC ZN
Woodtreating 30 ↓ <0.5	Smelters 130 ↓ 0.3	Mining 55* ↓ <0.2**	Mining 30 ↓ 0.15
Military 85 ↓ <0.01	Mining 125 ↓ <0.12	Plating 65* ↓ <0.05**	Anodizing 430 ↓ <0.4
Mining 110 ↓ <0.1	Scrapyards 170 ↓ <0.12	Metalworks 70* ↓ <0.05**	Galvanizing 90 ↓ 0.2
		*Cr ⁺⁶ ** Total Cr	

Range of Application

ATOMISOL Stabilization can be applied in a variety of ways

- Reagents are added and mixed into an existing stockpiled (Ex-situ)
- Added to a materials process line prior to waste generation (On-going Waste Streams)
- Applied in either liquid or solid form over large surfaces areas for tilling or penetration
- Applied in one or more phases addressing single or multiple environmental or health related issues.
- Applied in liquid or slurry form for sub-surface injection (In-situ)

Processing Flexibility

Consistent Performance under any Condition



- In conjunction with excavation
- Effectively treats debris & oversize materials
- Effective on large surface areas with minimal disturbance.
- Works on wet or dry material with varying pH
- Not effected by the presence of other contaminants (e.g. hydrocarbons or chlorinated)

Treated Material Characteristic's

- Sampled immediately for confirmation testing.
- Safely staged for later use as fill, and site re-contouring.
- Repeated handling without chemical breakdown.
- Never becomes monolithic
- Amenable to future re-processing



Material Handling Advantage



Contaminated media can be processed in a dry non-monolithic form to minimize disposal costs or with higher moisture content to minimize dust and enhance material handling characteristics

Operational Advantages

- Rapid mobilization and demobilization
- Conductance without interference to ongoing production or operations.
- Minimum space requirements
- Minimum labor
- Single event or phased project approach



Comparison Summary

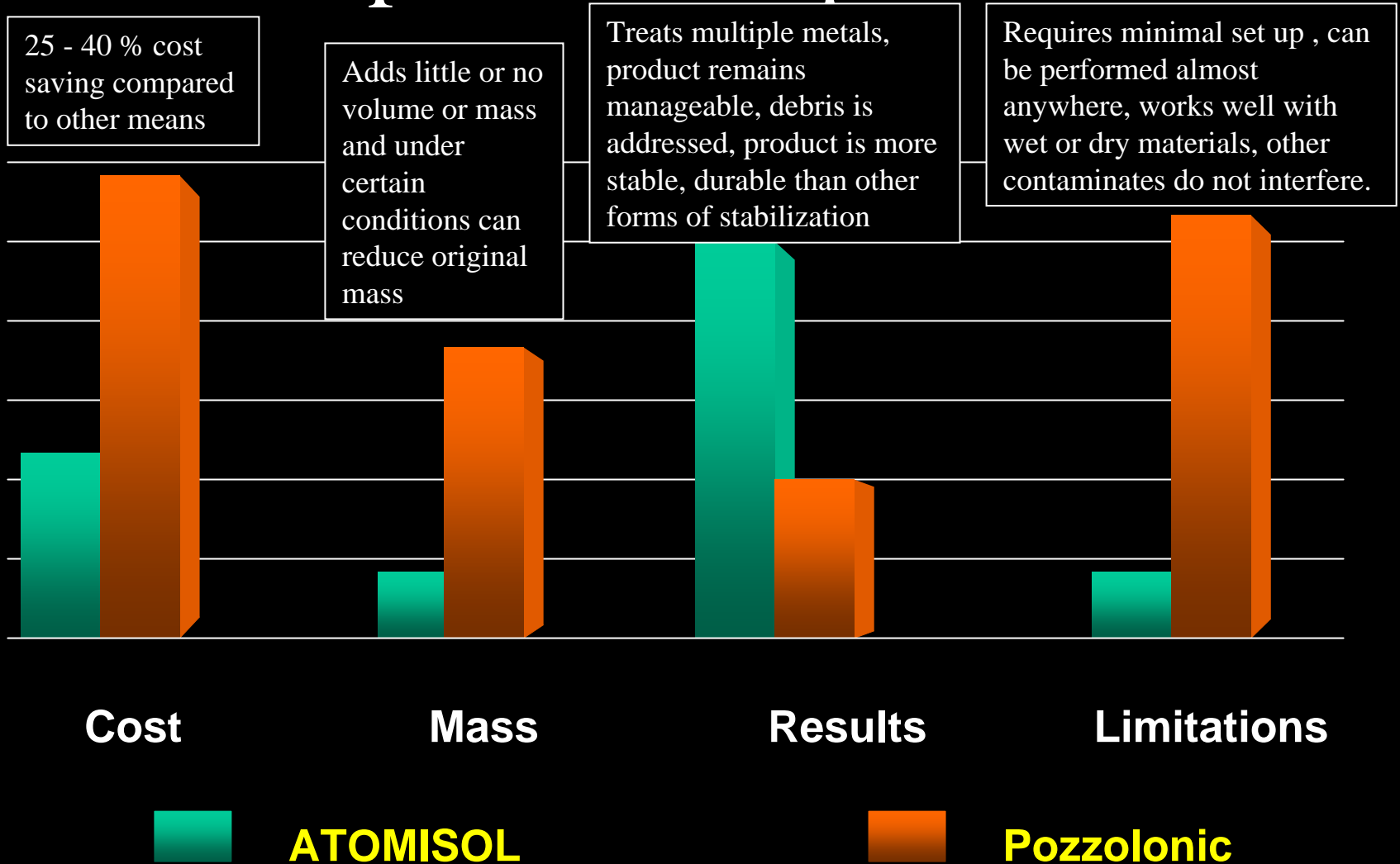
Pozzolanic Technology

- Restricted to ex-situ processing
- Multiple handling steps
- Mass and volume increased by 15-40% or more
- Co-treatment problematic in most situations
- Limited disposition choices
- 7+ day “curing” period
- Concern about longevity and regulatory compliance
- Additional transportation and disposal costs
- Formation of monolithic soils

ATOMISOL Technology

- In-situ, ex situ, in-line options
- Single step processing
- Additives represent < 5% original mass
- Co-treatment of ionic and anionic metal species
- Range of disposition options
- Treatment is instantaneous
- Real and permanent treatment has occurred
- Significant reduction or elimination of additional transportation or disposal issues

Graphical Comparisons



Why **ATOMISOL** Environmental Solutions

- Address short and long term environmental and human health issues.
- Work with local leaders to develop cost effective alternatives to high cost clean up.
- Minimize disturbance to eco-systems and wildlife habitats.
- Immediate corrective actions.
- Minimal federal involvement.

What it Takes to Make it all Work

- Awareness of the regulatory goals for each waste type.
- Good material characterization.
- Ability to achieve consistent results for small and large scale or complex projects.
- “Turnkey” project experience and approach.
- Skilled, knowledgeable personnel.

Getting Started

1. Owner . . . provides soil composition data & representative samples
2. Owner . . . provides info on site characteristics and conditions
3. Owner . . . specifies performance objectives
4. IVEY . . . performs bench scale simulation and analyzes treated samples
5. IVEY . . . provides duplicate samples for verification testing
6. IVEY . . . provides written reports/proposal for evaluation and discussion



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**If you have questions or wish to speak with
Ken or I (George), please approach us
during the breaks.**

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- **Project - Tampa Florida**

Project was located near Tampa, FL. We provided a proprietary Atomasol® stabilization mix, utilizing heavy equipment blending to render the soils non hazardous and suitable for non hazardous landfill disposal. Materials meet metal clean-up standards.

Raw Sample for TCLP Metals

Cadmium 27 – 30 ppm

- **Treated Sample for TCLP Metals**

Cadmium N.D. – 0.5 ppm

- **Project - Dallas, Texas**

Project consisted of soils with lead, arsenic and chrome. We were engaged to develop an Atomasol® mix design to reduce leachability of target metals to a non hazardous waste status and oversee the remedial activities. The Atomasol® mix design was developed by us to meet regulatory guidelines for the target metals rendering the materials acceptable to non hazardous landfill. The confirmation testing identified that all metals had been treated not only to non hazardous status but were acceptable for Class 2 disposal in TX saving the client additional funds.

- **Raw Sample for TCLP Metals**

Lead 20,000 ppm

- **Treated Sample for TCLP Metals**

Lead 0.0427 ppm

- **Project – Sarnia, Ontario**

Project consisted of soils with lead contamination. We were engaged to develop an Atomasol® mix design to reduce leachability of target metal to a non hazardous waste status. The Atomasol® mix design was developed (Bench Scale Pilot) by us to meet regulatory OME guidelines for the target metals. The confirmation testing identified that the lead had been treated to non hazardous non-leaching.

- **Raw Sample for TCLP Metals**

Lead 2,120 ppm (Average)

- **Treated Sample for TCLP Metals**

Lead < 0.05 ppm (Average)