



The FORCEBEL Systems

Forcebel USA, Incorporated

ChiSun Lee 773.248.1182
773.771.3444

The simple truth is....

People create trash –

- about 236 million tons/year in the U.S.
- and the people must deal with that trash while minimizing the health, environmental, and social impacts



“Solid Waste” may consist of

- Garbage – primarily food wastes
- Rubbish/trash – paper, glass, wood, plastic, cans
- Ashes – residue from burning wood, coal
- Construction/demolition debris – stones, concrete, plaster
- Treatment plant wastes – sludge/residue from wastewater plants
- Special – metal wastes, street sweepings, dead animals from roadside, abandoned cars

Type of Trash Affects Disposal Options

- Municipal Waste – primarily household garbage and refuse
- Industrial Waste – some refuse, but primarily construction, treatment plant, ashes, metals, and special wastes

Waste Management

Reduction, Reuse, and Recycling Efforts can help reduce the volume, but the simple truth remains –

People create trash

- and it must be disposed of in an intelligent and safe manner

Currently, the two choices for disposal are

LANDFILLS and INCINERATION

Landfills

Simple Process – collect the trash, pile and (possibly) compact it, cover it with dirt, and repeat, for as long as there is room in the landfill. When capacity is reached, close the landfill, cover it with dirt and begin again at a new site

But –

Practically, the landfill has a limited life, and developing a new landfill is expensive

Environmentally, Gasses are generated during the trash decomposition in the landfill, and Rain Water passing through the landfill may become contaminated

Landfill Considerations

The landfill gas collection and storm water runoff/leachate collection/treatment systems must remain in place as long as the landfill exists – from 30 to perhaps as many as 100 years after closure

The unstable ground and potential for odorous/toxic gasses and runoff lessen potential development of the site and the surroundings

As landfills reach capacity, more landfills are needed;

To minimize public nuisance, landfills are sited away from metropolitan areas, increasing transportation and operation costs

As cities grow, they will encroach on the landfill site and nuisance issues may re-emerge

A landfill means a **LONG TERM RESPONSIBILITY** to protect the health and welfare of the population for the property owner, the local government, and the regulatory agencies

Florida Specifier, February 2009



- Will NOT mobilize arsenic
- Long-term immobilization of heavy metals
- Simultaneous treatment of many organics
- FDEP accepted

Contact us today to arrange a complementary Technology Transfer Session or Site Evaluation.



Potential contamination from former Tampa landfill sites under investigation

By PRAKASH GANDHI

Officials in Tampa are in the process of investigating potential contamination from former landfill sites around the city. State environmental regulators are putting pressure on the city to address possible contamination from many of the old landfill sites.

In a letter to the city last April, DEP identified nine of the city's historical landfills as priorities with "the potential to pose the greatest risks to public health and safety."

In the letter, department officials said they believed the city should conduct an in-depth investigation of the landfill locations that are most likely to impact public health and safety, and groundwater and/or soils, and to implement corrective actions where appropriate.

"DEP wants sufficient groundwater and soil investigations to be conducted to complete the delineation of contamination," the letter said.

The sites include three former landfills near public schools where previous tests revealed elevated levels of methane and other volatile contaminants.

Other sites include a golf course, parks

and apartment complexes.

Tampa officials say they are working diligently to deal with DEP's concerns.

"We are addressing each landfill and we are complying with the things that DEP has identified in the letter," said Tonja Brickhouse, director of the city's department of solid waste and environmental program management.

Environmental regulators say they are taking a new look at health risks posed by old landfills even though there have been no known cases of people who live near the old dump sites getting sick.

Last year, the state Department of Environmental Protection issued a mandate to the city to investigate potential contamination from old landfills and clean them up, or face enforcement action for violating environmental regulations.

Tests conducted by environmental consultants over the years have found higher-than-acceptable levels of methane, arsenic, cyanide, mercury and other toxic chemicals at the landfills. DEP wants more extensive testing to be conducted to figure out whether the waste should be removed.

Tampa officials began cataloging the landfills about two decades ago. They identified 49 sites that date back to the 1940s and possibly earlier.

Some sites were operated by the city, but most belonged to private landowners who gave the city and others permission to bury trash and debris on their properties.

The city has spent more than \$1 million on environmental studies at the landfills. Tampa-based HSA Engineers and Scientists, a private consulting firm hired by the city, has pulled together previous site studies and conducted field tests.

In 2005, DEP adopted strict rules giving the agency the power to force municipal and county governments to investigate and clean up inactive landfills.

Municipalities across Florida will be required to meet similar demands to conduct extensive testing on sites formerly occupied by landfills.

DEP officials say the responsibility for protecting the public from the impact of these landfills lies with local governments.

The department said it is working to help the city meet the environmental requirements.

"We are working with the city of Tampa to get the necessary information to make sure these sites are being addressed," said Pamala Vazquez, a DEP spokeswoman.

Terra Systems, Inc. Offers Solutions for Environmental Problems

148 "Aquifer Remediation Using Emulsified Oils"



remediation products or the remediation of

vegetable oil substrate, E and TCE to safe end n and eliminates the reduces cost. At sites present or are found is-1,2-dichloroethene, "Dehalococcoides" s greater than 10⁴ etc dechlorination of f dense non-aqueous ZVI (emulsified zero

valent iron) from NASA. SRS™, TSI DC™ and EZVI offer the 1-2-3 punch, which is often needed in order to reduce PCE to ethene.

Terra Systems Products	FL DEP Innovative Technology Letter
SRS™ emulsified vegetable oil substrate (EVO)	✓
TSI DC Bioaugmentation Culture™	✓
EZVI (Emulsified Zero Valent Iron), licensed from NASA	✓

The State of Florida Department of Environmental Protection has accepted both SRS™ and TSI-DC Bioaugmentation Culture™ under the State of Florida Innovative Technologies Program. These letters strengthen your client's remediation action plans and should help speed up their approval process.

Terra Systems has been developing and applying anaerobic bio-remediation since 1992 and as a result of the company's extensive field and laboratory experience developed the emulsified vegetable oil technology. For information contact:



Terra Systems, Inc.
1035 Philadelphia Pike, Suite E
Wilmington, Delaware 19809
Phone: 888-600-3500
www.terrasystems.net
info@terrasystems.net

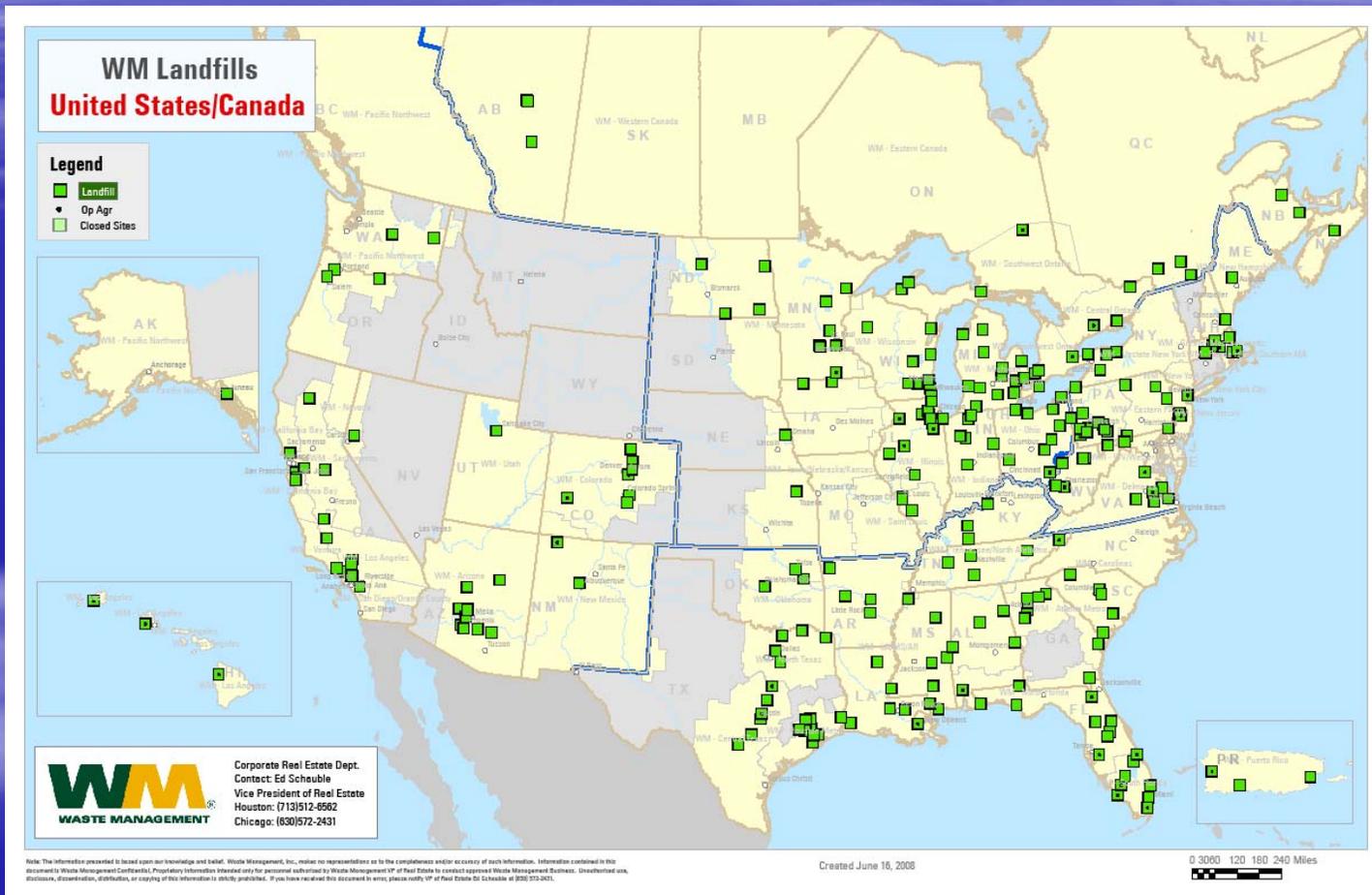
More Concerns from U.S. EPA

Landfills are identified for requiring evaluation of “residual risk” under Section 112(f) of the Clean Air Act

EPA has identified approximately 30 Hazardous Air Pollutants (HAPs), including Persistent Bioaccumulative Toxics (PBTs), in Landfill Gas

A landfill fire may cause concern for dioxin/furan emissions and other impacts to local air and watersheds, and may trigger liability under the General Duty clause of Section 112(r)

Landfills Managed by Waste Management



landfills

- Approximately 2,000 active landfills in the U.S.
- By some estimates over 10,000 closed or inactive landfills of varying sizes

By any account - A potential environmental liability, and a lot of acreage that could be put to better use!

Our Answer to the Waste Management Problem –



The FORCEBEL COMPANY

Since its beginnings in 1997, the FORCEBEL COMPANY has become a leader in the development of equipment and technologies to solve the mounting problems of MUNICIPAL SOLID WASTE

Every city and town produces large volumes of municipal solid waste which are inefficiently disposed of in landfills or sent to incinerators, resulting in unacceptable long term environmental consequences.

FORCEBEL has developed two real-world solutions to these problems: the SUPEX system for reclaiming municipal landfills and the MBT system for sorting municipal solid waste and recycling.



How can SUPEX help?

- Supex can separate and “recover” the materials in an existing or closed landfill
- SUPEX is a series of processing units specifically chosen to separate the materials found in the individual landfill
- SUPEX sorts out combustibles, recoverable metals, compostable materials, and soils/sand/rocks which can be used for construction, leaving only about 5% to 10% of the original volume for landfill disposal

The SUPEX SYSTEM



TYPICAL SUPEX COMPONENTS

First – after feeding from a hopper, a TROMMEL SCREEN uses exterior brushes and interior blades to ensure CLOG FREE separation of soils, gravel and small rocks in the presence of the high water content of the remaining mixed wastes.

These collected materials may be directly used in the construction of roadbeds and foundations.

TYPICAL SUPEX COMPONENTS

Next - a ROTATING BRUSH/RAKE removes the light weight paper, plastics, rubber, textiles, and other COMBUSTIBLE “fluff” from the waste stream.

Unlike typical air classification, this proven method does not produce dust clouds or off-site odors

The “fluff” is compressed and compacted into blocks, with a typical volume reduction on compaction of approximately 50%.

TYPICAL SUPEX COMPONENTS

Next - The Metals Separator uses a rotating electromagnetic rake to separate Metals for Recycling and Reprocessing

This is followed by a series of Vibrating Screens each employing different sized openings

- The (typically) small fragments of organics – garbage, paper shreds, and similar materials - and the waste soils they have adhered to are separated for composting by the smaller openings in one set of screens
- A second set of screens with larger openings segregates the concrete, waste asphalt, rocks, and aggregate based on size; the larger pieces of concrete, rock and asphalt are crushed down in size to yield a range of materials useful in construction of roadways and buildings

SUPEX COMPONENTS

Are CUSTOM SELECTED to best fit the type of trash in the specific landfill

Components may be ADDED or SUBTRACTED from the process line if the landfill composition changes during processing

Components may be PARALLELED in the process line to increase the rate of volume processing for a particular waste segment

After Processing by SUPEX

- The COMBUSTIBLES have been removed and compressed to approximately 50% of the original volume. They may be returned to a landfill or transported to a Waste to Energy plant or approved industrial furnace for use as refuse derived fuel (RDF), where the high heat value of the materials generates electricity while reducing the plant's requirement for supplemental oil. The high combustibles content allows incineration overall volume reduction of up to 99+%.
- The FOOD WASTES have been removed can be sent for composting



After Processing by SUPEX

- The METALS have been removed and recovered for reprocessing
- The SOILS and AGGREGATE have been removed and may be used in the construction of roadways and buildings
- The REMAINING material – about 5% to 10% of the original volume - is returned to the landfill, or is sent to another landfill location



ADDITIONAL BENEFITS from SUPEX PROCESSING

- Fewer OPERATING landfills are required, as EXISTING landfills can be reduced to between 10% and 50% of the original volume; the “new” capacity available extends the useful life by a factor of 2 to 10 or more, depending on type of material received by the landfill
- CLOSED landfills can be completely excavated and the land returned to positive use in development of housing/commercial/industrial ventures without the potential for landfill “settling” and damage to roadways and structures
- Long term landfill management costs and potential future environmental liabilities are minimized or completely eliminated
- Potential for obtaining Greenhouse Gas Reduction/Carbon Credits

Cost/Benefit Analysis

- The COST - SUPEX processing costs per ton processed are competitive with most landfill tipping fees – and each cubic meter of volume recovered may be “re-sold” as available landfill space
- The BENEFIT - SUPEX can ELIMINATE the long term odor/health risks from the gasses and leachate and EXTEND the life of the landfill or RESTORE the value of the land

MOST IMPORTANTLY - SUPEX

- Is a DEMONSTRATED Technology, SUCCESSFULLY IMPLEMENTED in Korea (42 landfill recoveries completed or in process), Japan and Taiwan

A Case Study of the first Life Extension Project of Closed Sanitary Landfill in South Korea

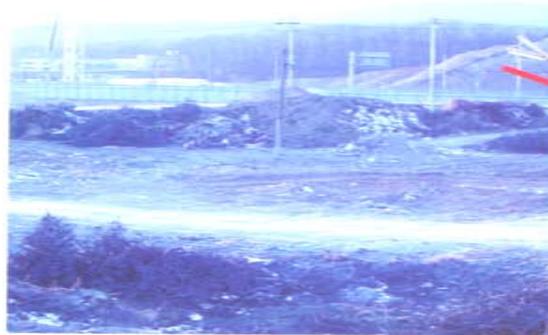
Byungsun. Lee, Kyungduk. Na, Kabseok Choi, Seungtaek Park**, Yoshikazu Otsuka***
Forcebel Co., Ltd.,* JoinTech Consulting Co., Ltd. ,** Okumuragumi Corporation***

- This research afford foundational data to manage running and closed landfills to several countries of Southeast Asia having the serious problems to make new landfill like South Korea through a case study of first life extension Project of Closed Sanitary landfill in South Korea. The needs (= the demand) of the life extension project was induced because of delayed construction of new alternative sanitary landfill to treat domestic wastes discharged from home in P-county, G-do. The difficulty of treating domestic wastes is felt more and more keenly. It led to the serious social problems. As effective Solution, P-county performed the life extension project for 5 months using the Supex-system. It's the amount of works is about 53,800m³ of whole landfilled waste, 133,000m³. Supex-system separated four different kinds of materials, these are soil, metal, combustibles and incombustibles. After Hazard Assessment and Recycling Evaluation (Recycling standard : (1) Organic/foreign material, less than 1(V/V)% (2) Size, Less than 100mm). Sorted Soil 12,665m³(23.54%) and 10,378m³(19.29%) Incombustibles was recycled as cover soil of landfill and construction filling material. Combustibles 30,757m³(57.17%) was refilled into part of landfill after compaction (compaction rate, about 50.00%) and bale with Compactor installed in project site to save the cost of incineration generally applied to combustibles. At the same time, the Old landfill facilities included with liner was mended to make the landfill conditions better. In result, P-county has secured enough space (about 53,800m³) of landfill to treat domestic wastes discharged from homes for 2 years.

Increasing Capacity of an Existing Landfill



Converting problem-ridden landfills to beneficial use



Before



After

(Apartment complex)



Before



After

(Sports complex)

From the Florida Specifier, September 2008

Hard postage paid at Orlando, FL.
2. **POSTMASTER:** Send address
changes to the FLORIDA SPECIFIER, P.O.
Box 2175, Goldenrod, FL 32733.

Copyright 2008 by National Technical
Communications Co., Inc. All rights re-
served. No part of this publication may be
reproduced or transmitted in any form with-
out the publisher's prior written permission.

ENVIRO-NET

Electronic access to the *Florida Specifier* is avail-
able at www.enviro-net.com.



National Technical
Communications
Company, Inc.

National Technical Communications Co., Inc.
P.O. Box 2175 • Goldenrod, FL 32733
(407) 671-7777 • Fax (407) 671-7757

Landfill redevelopment. Commission-
ers in Clearwater agreed to sell a 240-acre
landfill site to developers for \$10. Although
the old Toytown Landfill has not been ac-
cepting waste since the early 1980s, it is
not slated for closure for another three
years.

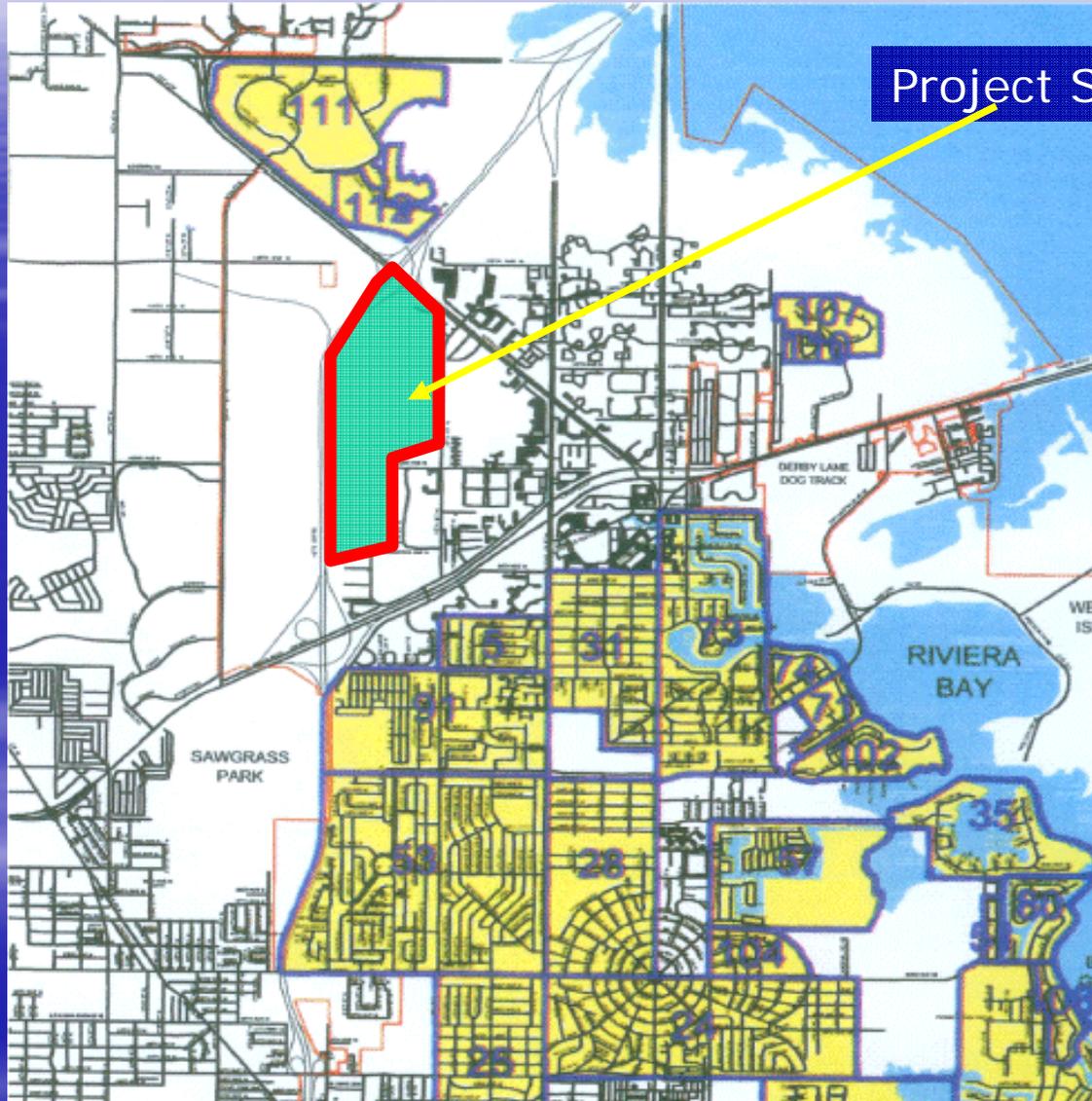
During that time, officials with Florida
Gateway Development LLC are expected
to study the feasibility of turning the prop-
erty into a community that includes resi-
dences, offices, retail space, recreation ar-
eas, a hotel and convention center, and
possibly a new stadium for the Tampa Bay
Rays. The Parks of Pinellas community
could happen by 2014.

**Wetland rules approved in Hillsbor-
ough.** The Environmental Protection Com-
mission in Hillsborough County recently
approved wetland rules that environmen-
talists said were neither weakened nor
strengthened.



Toytown Sanitary Landfill Clearwater, FL

FGD,LLC



Project Site

FGD, LLC Proposed Development will provide substantial economic benefit,
including employment and tax revenue



What is the MBT System?

- SUPEX was created to process the waste materials already IN an operating or closed landfill
- MBT was created to process the waste materials BEFORE entering the landfill or incinerator

Typical Municipal Waste

- is contained in non biodegradable plastic bags
- is composed (2003 data) of paper (35%), plastic (1%), food wastes (12%), glass (5%), metals (8%), yard wastes (12%), organics (textiles, wood, rubber – 12%), and miscellaneous other wastes (electronics, home repair/construction debris – 3%)

Typically only 8% of this stream – portions of the glass and some miscellaneous materials - cannot be recycled, reused, reprocessed, composted or incinerated

Typical Municipal Waste

BUT –

ALL of it goes to the landfill or incinerator!

WHY?

LANDFILLS

- The Main Problem with Operational Landfills is that they have a limited capacity; as landfills reach their design limits, more landfills are needed, but they are not necessarily readily available.

INCINERATION

- Waste Incineration Reduces the Volume of waste sent for disposal in the Landfill. This increases the capacity and operating life of the landfill.

Municipal Incinerators

- Mass Burn Plants – simple volume reduction (75% to 90%) - all incoming trash is incinerated, including non combustibles; ashes/residue are still sent to a landfill for disposal
- Waste to Energy Plants – some energy from the burning is used to produce electricity – 1 lb of waste may yield as much as 0.3 Kw of energy but the amount of energy generated is very dependant on the “quality” of the waste

HOWEVER

- a significant percentage of the waste is non- combustible materials. The low overall heat value of the trash often requires that the incineration facility use supplemental fuel oil to keep the fires going
- The ash and the non combustibles must still go to a landfill, and the non-combustible materials increase the volume of residue compared to that of the ash alone

Applying the principles of the SUPEX System, the MBT System

Receives the municipal or industrial trash before it enters the landfill or incinerator and separates -

- the high energy value combustibles such as paper and cardboard
- the recoverable/recyclable metals
- the compostable garbage
- the soils/sands/gravels
- the non combustible residue

The MBT System



The Typical MBT System consists of

- A primary rotating/secondary fixed knife segment which shreds the plastic bag and the paper, cardboard, and plastics in the trash
- A mechanical rake segment which removes the light weight, high energy value materials (fluff)
- An inertial separator which further segregates the materials by density
- A vibrating screen to separate the soils/sands/gravel and similar materials

After MBT Processing

- The fluff and other COMBUSTIBLES have been separated and compressed to approximately 50% of the original volume. They may be returned to a landfill or transported to an Incinerator, Waste to Energy plant or approved industrial furnace for use as refuse derived fuel (RDF), where the high heat value of the materials reduces the plant's requirement for supplemental oil. The high combustibles content allows incineration overall volume reduction of up to 99+%.
- The metals have been separated and are sent for recovery, recycling, or reprocessing
- The sands/soils have been separated are sent for use in the construction of new roads and buildings
- The food wastes have been separated and are sent for composting
- The non combustible/non recoverable materials, comprising only a small fraction of the original waste volume, have been separated and are sent to the landfill

Benefits of MBT Processing

To the Incinerator

Non combustibles are kept out of the incinerator, improving incinerator operation and minimizing residual ash volume, and the incinerator feed has a higher energy value, reducing the need for supplemental fuel oil

To the Landfill

Everything that can be reused, recycled, or reprocessed is separated and recovered, and the final volume sent for disposal in the landfill is reduced by factor of 2 to 10 or more, depending on the waste composition, extending landfill useful life

To the Environment

Fewer landfills required means fewer undeveloped areas disturbed, and the potential for greenhouse gas reduction/carbon credits benefits

SUPEX and MBT

- Are Proven Technologies
 - Provide Substantial Benefits
 - Are Cost Effective Solutions
- And -
- Are the Environmentally and Socio-Economically Right Things to do

The FORCEBELL Systems – SUPEX and MBT

For more information, to obtain a quotation for services or to discuss the services provided by Forcebel USA please contact

- ChiSun Lee, Forcebel USA, Incorporated
773.248.1182 office
773.771.3444 cellular

Or visit our website – ForcebelUSA.com