Pneumatic Waste Collection System

(Pneumatic Tube Network)
Smart City

This is an increasingly urban world. There is an urgent need to ensure that local governments have the infrastructure in place to tackle the inevitable demographic challenges.

There remains a great desire for change, and city management must act now to improve service delivery and streamline internal operations.

To compete effectively at an international level, cities will need to become more intelligent, innovative, and integrated.

A Smart City will increase efficiency, productivity, ecological awareness; it will reduce pollution and improve quality of life in a world of increasing urban complexity.
SMART CITY

- Smart Environment
- Smart Economy
- Smart Living
- Smart Mobility & Basic Services
- Smart Government
- Smart People
WASTE

The main objective is to make our cities SMART. As a step in that direction, it is proposed to first take up the **most visible & challenging issue** of waste management.

Waste has an impact on the

- Health & environment
- Tourism
- Economics
- Aesthetics, etc.
The Old Way of Collection

Manual collection is the most common way to collect and transport waste. It exposes the infection to humans to a large extent, odor in and outside the building. Very tedious system specially for larger infrastructure projects.
The Old Way of Collection

**Gravity Chutes (for inside the buildings)** is a conventional way Gravity chutes are available at all times, but create terrible odors, are open to the air at all times, are uncontained at the bottom of the chute at all times, materials get stuck easily.
Disadvantages

- Visible waste.
- Human contact.
- Odor.
- Rodents/insects, etc.
- Traffic of trucks in the facility.
- Carbon emissions.
- Exposure of waste to the environment.
- Unhygienic.
- Air pollution.
- Cross contamination.
- Man power required.
- Wastage of valuable space.
- Cross contamination.
- Infection.
- Air pollution.
- Waste gets stuck in the inner tube, etc.
PWLCS | Technology

THE FUTURE OF WASTE & LAUNDRY COLLECTION & TRANSPORTATION
Pneumatics

- **Pneumatics**: It is a section of technology that deals with the application of pressurized gas to produce mechanical motion.

- **Pneumatic System**: A power transmission system the force of flowing gases (AIR) to transit power.
Greenvac Pneumatic Transport System

Vertical pipes run down building(s), which is then connected to horizontal pipes, which run either underground or over ground connecting to a central collection point. Loading stations can be on every floor of the building(s) from where users can throw the waste, which will reach the central collection area via this sealed network of tubes through pneumatic pressure (suction). The suction takes place anywhere at 60 miles/hr. The entire system is controlled by a software.
Connecting the Dustbins

- The Dustbins of a facility can be connected with underground tubes.
- Sensors for auto empty.
• Control panel scan have graphical touch screens on the door face as an option for system operation, maintenance and troubleshooting.
A vent is required at the top of each building riser, usually on the roof. This will draw in a small amount of outside air during each material transportation transaction. Thereby cleaning the entire network of pipe with every transaction.
Using The System – Open Areas & Inside The Building
Collection Area Overview

The central collection area will house the majority of large equipment, including:

- Fans
- Cyclone Collectors
- Air Scrubbers
- Silencers
- Compactors
- Dumpsters
The majority of our pipe onsite will route through the provided utility tunnels. Compared to direct burial in earth or concrete, these utility tunnels will make installation and maintenance much easier.
Greenvac knows the Process

Providing Solutions Through Constant Consultation

- **Client**
  - Jointly analyze operations & alternatives.
  - Define capital & operational targets.

- **Project Manage and Coordinate**
  - Project management updates and coordination with relevant trades.
  - Make adjustments as necessary.

- **Contractor Operational Partner**
  - Provide contractors with necessary drawings.
  - Timely delivery within GC or Owner's schedule.

Greenvac solutions include:

- Client Consultation
- Proposal
- Concept
- Design Engineering
- Project Mgmt
- Installation
- Training
- Commissioning
- Operation
- Maintenance

Greenvac understands the process from start to finish.
## Comparison

<table>
<thead>
<tr>
<th>Movements and Storage of material</th>
<th>Conventional</th>
<th>Greenvac Pneumatic System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Storage on Floors</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Storage of Material at various levels</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Vertical Transport</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Elevator Wait &amp; Travel Time (Down)</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Storage at the Base</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Horizontal Transport on Ground Level to Final</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Unloading at Dock</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Carts (including returning, cleaning, etc.)</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>
Advantages

- Less visible Trash - Minimizes human contact.
- Less staff required for collection & segregation.
- Automated system in place
- Segregation a part of the system.
- No Odor.
- No exposure of waste to environment.
- No exposure of waste to the people.
- Less waste trucks - Less maintenance of waste trucks - Fewer accidents.
- Saves fuel (used by waste trucks) - Reduced carbon footprint.
- Green solution - Cleaner environment.
- Sealed automated solution for transportation.
- No labor required for collection.
- Eliminates cross contamination.
- Available on all days of years.
- No air pollution No noise pollution.
- No rodents, insects, cats, dogs or any animal trying to eat the waste, etc.
Advantages

Other quantifiable benefits of an automated system include:

- Vital part of the “green building” technology.
- Increased management tools via secure log-ins for system access.
- Detailed management, reporting, and control over the working of the staff and required areas.
- USP for the marketing team.
- Alignment with SWACH BHARAT mission.
- Alignment with SMART buildings/infrastructure projects.
Applications

Pneumatic Tube System can be used for:

- Waste.
- Linen.
- Documents/Books.
- Samples (hospitals).
- Blood bags (hospitals).
- Cash.
- Hot Samples (500 Degrees), etc.

Areas of Use:

- Housing Complexes.
- Commercial / High Rise buildings.
- Hospitals.
- Hotels.
- Stadium/Parks.
- Airports.
- Golf Course
- Railway/Metro Station
- City Centers.
- Super markets/ malls.
- Flight Catering Service.
- Industries.
- Libraries, etc.
CASE STUDY
San Francisco, California (USA)

- 11 towers
  - roughly 150 units each
  - 2 chutes in each tower
  - brick enclosure one floor below ground level
  - no basements

- 1538 garden units
  - townhome layout
  - waste put out on front porch (regular and recycling)
### Current Waste Generation Patterns

<table>
<thead>
<tr>
<th>Towers</th>
<th>Garden Apartments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monday - Tuesday</strong></td>
<td>• Trash collected 5 days per week</td>
</tr>
<tr>
<td>• Ten 96 gallon garbage carts per day</td>
<td>• 32 gallon carts</td>
</tr>
<tr>
<td>• Seven 96 gallon recycling carts per day</td>
<td>• one for garbage</td>
</tr>
<tr>
<td><strong>Wednesday – Saturday</strong></td>
<td>• one for recycling</td>
</tr>
<tr>
<td>• Seven 96 gallon garbage carts per day</td>
<td>• 200 - 500 stops per day</td>
</tr>
<tr>
<td>• Five 96 gallon recycling carts per day</td>
<td>• 1000 - 2500 stops per week</td>
</tr>
</tbody>
</table>

Today, 7,200-17,000 pounds of waste are collected per day, which will increase with redevelopment.
Today, trucks are on the property all day, everyday collecting from both towers and garden level apartments. The redevelopment of SFO California will double, and possibly, triple the amount of truck traffic at SFO California. This increased traffic will add cost, noise and emissions while detracting from the safety and aesthetics of the property.

Current Method - Manual Collection
Solution – TransVac Automated Collection

Never See the Waste
Site Overview

Potential Starting Point
Collection Points & Routing
Amount of Waste Collected - Towers

Gallons/day

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
The amount of waste collected is substantial today and will increase by almost 3 times once the redevelopment is complete.
Waste Truck Stops - Tower

Monday: Today - Conventional, Redvelopment - Conventional, TransVac
Tuesday: Today - Conventional, Redvelopment - Conventional, TransVac
Wednesday: Today - Conventional, Redvelopment - Conventional, TransVac
Thursday: Today - Conventional, Redvelopment - Conventional, TransVac
Friday: Today - Conventional, Redvelopment - Conventional, TransVac
Saturday: Today - Conventional, Redvelopment - Conventional, TransVac
Waste Truck Stops - Garden
An automated waste system would eliminate most of the pollution created by waste trucks traveling and idling on the property.
Example for Greenvac Pneumatic Waste Collection System

Automatic Solid Waste Transfer System

- Waste Inlets in Each Floor
- Pneumatic Pipeline Transfer System
- Powerful Vacuum Unit with Filter Solution
- Collection

Features:
- Fast
- Safe
- Easy On/Off
Vertical transfer pipe Ø500mm
Space requirement (recommended): 850 x 850 mm

Horizontal transfer pipe Ø500mm
Space requirement (recommended): 750 x 750 mm including the hangers

Centralized Waste Collection Area / Greenvac machine room

Example layout of buildings

- Two segregations of waste - dry and wet (touch screen selection at the loading station)
- One loading station per floor

Inlet
Size 300 x 300 mm
Space requirement: min 650 x 650 mm
Inlet Control Panel and process

Select dry waste or wet waste

Picture: Inlet Control Panel

Button System or Touch Screen Option

Bottom valve: dry waste

dry waste container

Bottom valve: wet waste

wet waste container

Ready
Reserved/Alarm
Mixed waste
Bio / wet waste
Example layout of
Greenvac Central Collection Area / Machine room
Success Stories
# Lai Chi Kok Estates
(Hong Kong)

<table>
<thead>
<tr>
<th>Basic Project Information</th>
<th>Basic System Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,400 residents (Approximately)</td>
<td>Pneumatic waste systems</td>
</tr>
<tr>
<td>4,000 apartments (Approximately)</td>
<td>13 tons per day (Avg.)</td>
</tr>
<tr>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>Basic Project Information</td>
<td>Basic System Information</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>7,000 residents (Approximately)</td>
<td>Pneumatic waste systems</td>
</tr>
<tr>
<td>1,400 apartments (Approximately)</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Basic Project Information</td>
<td>Basic System Information</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Seattle, Washington</td>
<td>Full vacuum technology for waste, linen and recycling</td>
</tr>
<tr>
<td>Opened in 1982</td>
<td>56 inlets</td>
</tr>
<tr>
<td>Expansions in 1990 &amp; 1994</td>
<td>7,425 pounds of waste moved per day (Avg.)</td>
</tr>
<tr>
<td>697 bed hospital</td>
<td>5,350 pounds of linen moved Avg.)</td>
</tr>
<tr>
<td>Basic Project Information</td>
<td>Basic System Information</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Chicago, Illinois</td>
<td>Automated waste and linen vacuum technology</td>
</tr>
<tr>
<td>800,000 + sf,</td>
<td>50 inlets</td>
</tr>
<tr>
<td>676-bed hospital</td>
<td>8,400 pounds of waste moved per day (Avg.)</td>
</tr>
<tr>
<td>Gold LEED Certified</td>
<td>4,600 pounds of linen moved (Avg.)</td>
</tr>
<tr>
<td>10 year expansion project ‘Rush Transformation’</td>
<td>“The TransVac System is the express lane, taking huge loads of trash, linen, and recycling out of the hospital at 60 miles per hour and to the loading dock”</td>
</tr>
</tbody>
</table>
# Shatin Estates
(Hong Kong)

<table>
<thead>
<tr>
<th>Basic Project Information</th>
<th>Basic System Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,000 residents (Approximately)</td>
<td>Pneumatic waste systems</td>
</tr>
<tr>
<td>2,000 apartments (Approximately)</td>
<td>10 tons per day (Avg.)</td>
</tr>
<tr>
<td>2001</td>
<td></td>
</tr>
</tbody>
</table>
## Aqua Casa
(Delhi-NCR)

<table>
<thead>
<tr>
<th>Basic Project Information</th>
<th>Basic System Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,500 residents (Approximately)</td>
<td>Pneumatic waste systems</td>
</tr>
<tr>
<td>1,300 apartments (Approximately)</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>Basic Project Information</td>
<td>Basic System Information</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>- Boston, Mass.</td>
<td>- Full vacuum technology for waste and linen</td>
</tr>
<tr>
<td>- 793-bed hospital</td>
<td>- 60 inlets</td>
</tr>
<tr>
<td>- 46,000 impatient admissions/year</td>
<td>- 7,137 pounds of waste moved per day (Avg.)</td>
</tr>
<tr>
<td>- US News &amp; World Report’s Best Hospitals</td>
<td>- 4,000 pounds of linen moved (Avg.)</td>
</tr>
<tr>
<td>- Installed in 1971</td>
<td>- Upgraded in 2005</td>
</tr>
<tr>
<td>Basic Project Information</td>
<td>Basic System Information</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>🌐 St. Mary’s Hospital Campus</td>
<td></td>
</tr>
<tr>
<td>🌐 1,265-bed hospital</td>
<td></td>
</tr>
<tr>
<td>🌐 55 operating rooms</td>
<td></td>
</tr>
<tr>
<td>🌐 Gravity vacuum technology for soiled linen</td>
<td></td>
</tr>
<tr>
<td>🌐 Five, ten story buildings</td>
<td></td>
</tr>
<tr>
<td>🌐 8,975 pounds of linen moved (Avg.)</td>
<td></td>
</tr>
</tbody>
</table>
Some More Installations

- Woo Sung Villas (Korea)
- Moscow World Trade Center (Russia)
- San Francisco City Center (California, USA)
- Causeway Hospital (Ireland)
- Tan Tock Seng Hospital (Singapore)
- Ichilov (Tel Aviv)
- Capital Health System, etc.

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