21st Century Landfill Technology:

Telemetry, Automation, and Alternative Power Sources
Automation

- Automation provides for the starting and stopping of the operating system without the need of additional input from site personnel.

- It is achieved through the use of control logic and instrumentation.

- Automatic operation of leachate pumping systems saves both labor and expenses.
Pump Controls and Instrumentation

- Load Monitors
- Level Floats
- Submersible Level Sensors
Control Panel with Load Monitor
Control Panel with Float Control
Control Panel with Level Sensor
Sophisticated Control Panel
Operator Control Stations

- For more sophisticated control, PLCs or Operator Control Stations (OCS) are used.
Operator Control Stations

- An OCS can provide:
  - Touchscreen Display for level, flow, and alarms.
  - Configurable to operate the system to meet site requirements.
  - Simple way to modify pump start/stop or alarm set points.
  - Data logging.
  - Modbus communication for instrumentation or remote telemetry.
Telemetry Basics

Telemetry is the ability to monitor and/or control a site’s parameters & variables remotely.

Those parameters include pressure, temperature, flow, level, etc.

Telemetry allows for transmitting of results to a remote site to display/record the information or it can be used to control other systems.
Communication Options

- **Wire**
  - Direct signal wire
  - Phone lines
  - Ethernet cable
  - Fiber Optics

- **Radio**
  - Single Frequency Radio
  - Spread Spectrum Radio

- **Wireless**
  - Satellite
  - Cellular

- **Combinations**
Wire

**Advantages**
- Simple
- Components have built in ports for interconnection
- No additional devices needed for direct signal wiring
- Tried and true

**Disadvantages**
- Costly for large areas
- Difficult and costly to replace buried wire
- Costly to reconfigure system
- Susceptible to lightning and physical damage
Radio

**Advantages**
- Easy to Install
- Systems are easy to re-configure
- Can transmit data up to 6 miles
- Equipment can be easily replaced compared to buried cable
- Less expensive than installing long cable runs
- No site or user license is required to install or operate the radios.
- Multi-repeater networks are possible
- Built-in error detection and recovery, including re-transmission
Radio

◆ Disadvantages
  - Limited range
  - Potential Interference
  - Additional equipment is needed to provide the radio connection between the points
  - Need line-of-sight path
  - Technology changes may require system replacement
Cellular

◆ Advantages

- Equipment can be easily replaced
- Can transmit data anywhere there is a cellular signal
- Less expensive than installing long cable runs
- No line of sight limitations
- Small and compact
- Emerging technology
Cellular

Disadvantages

- More difficult to configure
- Require solid cellular signal at site
- Requires cellular service contract – additional costs
- Subject to cellular outages
- Emerging technology
Site Configuration Considerations

- Distances
- Line of sight
- Obstructions
- Repeaters
- What data is to be transmitted
- How is data to be used
- Future expansions
Telemetry Components

- **Data collection devices**
  - Operator Control Stations
  - Programmable Logic Controllers
  - Control Panels with Digital and Analog outputs

- **Transmitters**
  - Radios
  - Cellular modems
  - Autodialers
Telemetry Components

- Repeaters/Re-transmitters
- Receivers
- Data Display/Storage Station
  - PC/Laptop Computer
  - SCADA network
Examples of Telemetry Components

Operator
Control Station

Radio

Cellular Modem/Router
What can Telemetry do for me??

- Information, Information, Information
- Fast Access to Critical Process Data/Status
- Historical trending and logging of data
- Organized Data for regulatory reporting
- Alarm notification
Data Display Software
Alternate Power Sources

- Generator Powered Pumping System
Alternate Power Sources

- Generator Powered Pumping System
Alternate Power Sources

- Generator Powered Pumping System
  - Generators typically utilize diesel or LP/NG powered engines.
  - Can be set up to operate continuously or on demand with the appropriate control logic.
  - Batteries are typically used to power the control system.
  - Generator includes a charger to recharge the batteries.
Alternate Power Sources

- Solar
- Powered
- Level
- Monitoring
- System
Alternate Power Sources

- Solar
- Powered Control System
Alternate Power Sources

- Solar Powered Control System
  - Batteries are typically used to power the 12 or 24 VDC control system.
  - Solar panels used to provide the power to operate the control logic when there is sufficient light and to recharge the batteries.
  - Number and size of solar panels depends upon location.
Alternate Power Sources

- Solar Powered Pumping System
Alternate Power Sources

- **Solar Powered Pumping System**
  - Batteries are used to power the pumps and controls.
  - A power inverter is used to convert the DC power supply to AC to operate the motors.
  - Typically limited to ½ to ¾ HP motors.
  - Number and size of solar panels depends upon location.
Automation allows for unmanned operation of pumping system.

Can be as simple as On/Off switch with a load monitor, floats, or a level sensor.

Allows for complex controls for multiple pumps and operating scenarios, additional instrumentation, and data logging capabilities.
Remote Telemetry - Summary

- Telemetry is a way to gather and store valuable site data.

- Data can be transmitted by wire, radios, or cell between control panels and to the office.

- Data can be process data or status notifications.

- Aids in organizing and reporting of the data and to indicate potential problems before they cause damage or non-compliance.
Alternate Power Sources - Summary

- Generators and solar panels most common forms.
- Control systems to operate on 12 or 24 VDC power supplied by batteries.
- Batteries can be recharged by the generator or solar panels.
Questions?