
Manufacturer of Industrial and Environmental Solutions

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# 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

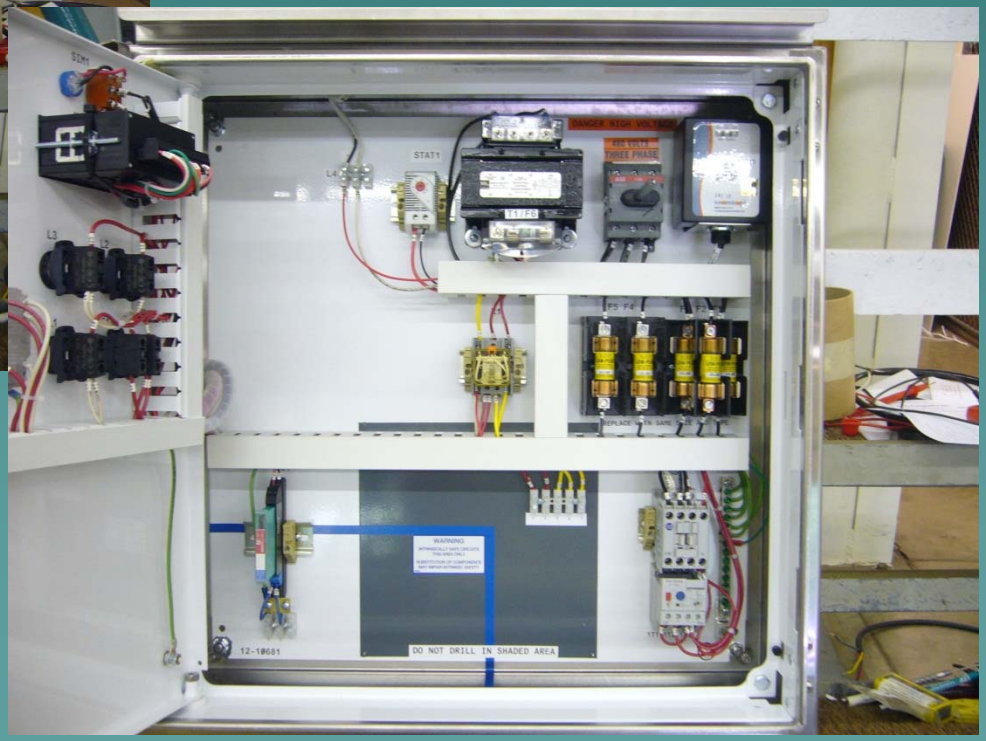

- Level Floats

- Submersible Level Sensors

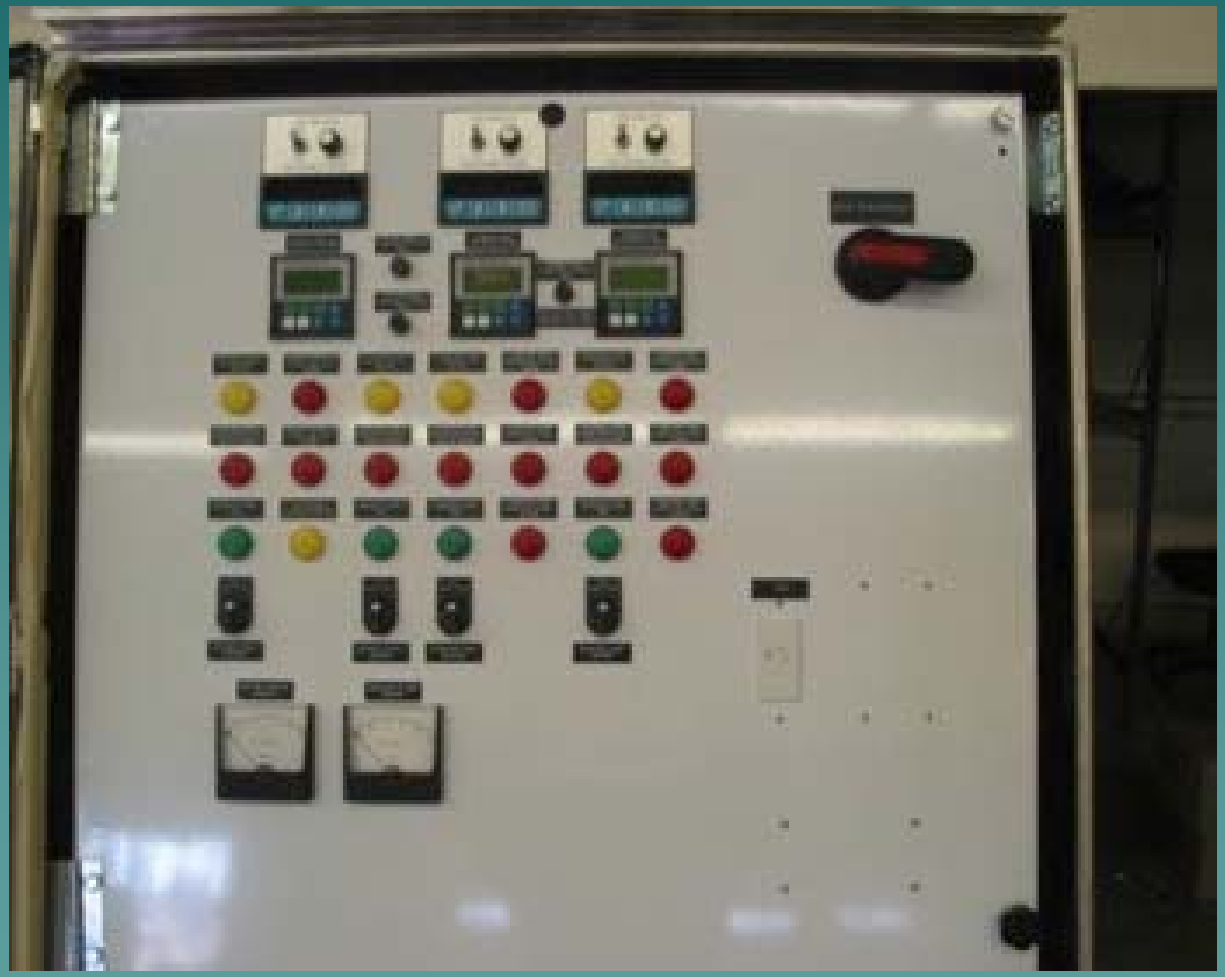
# Control Panel with Load Monitor

# 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 sites 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 compare 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

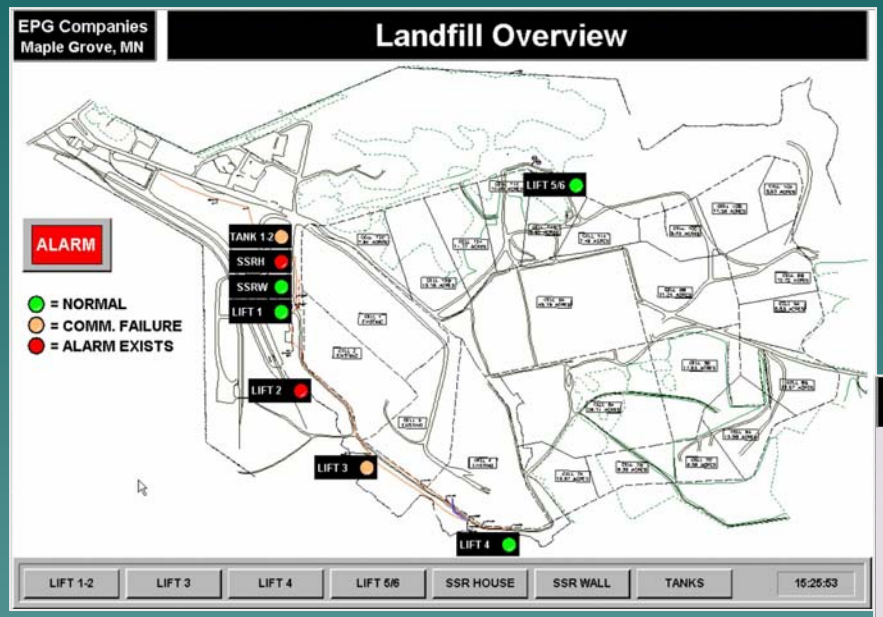

Radio

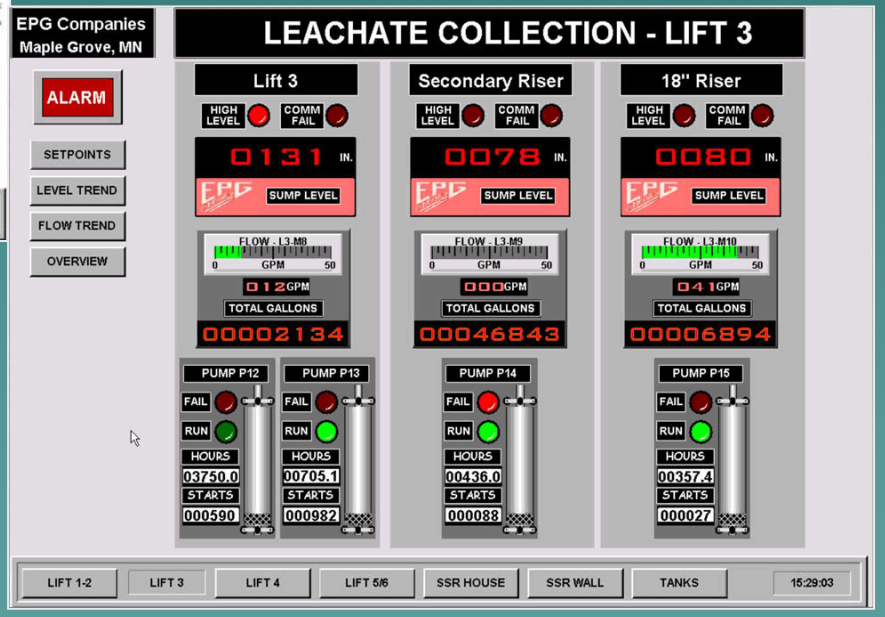

Cellular
Modem/Router

# 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

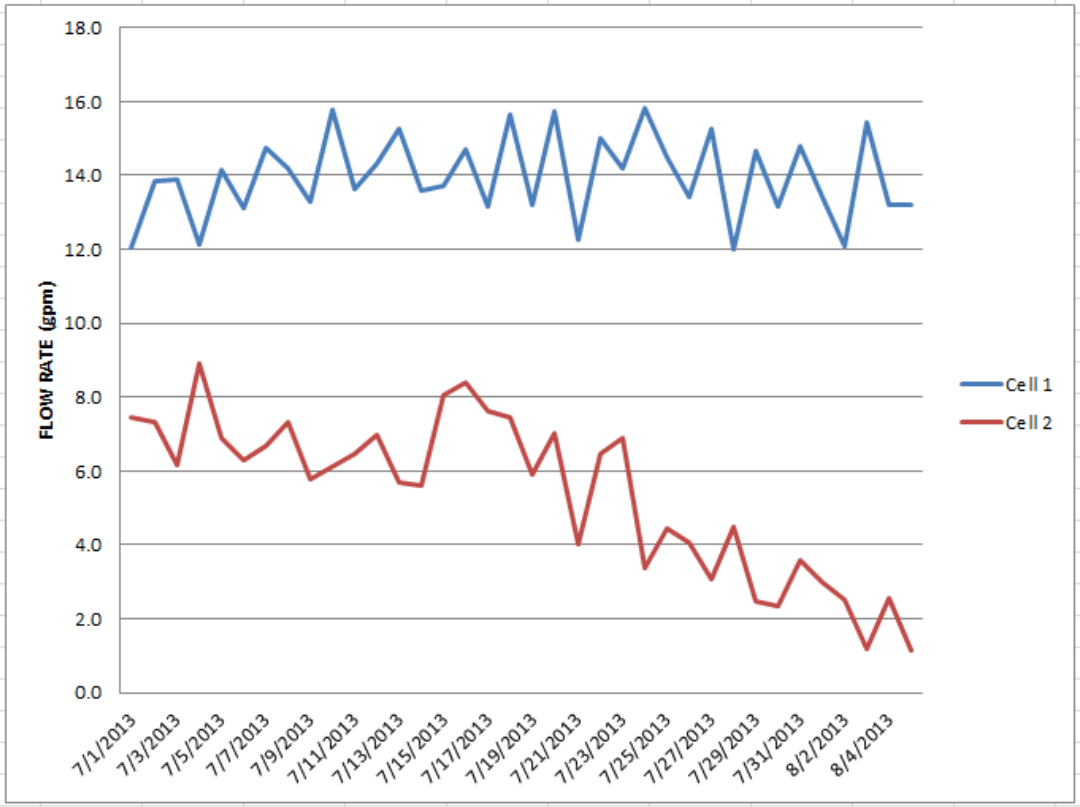
# Data Display Software



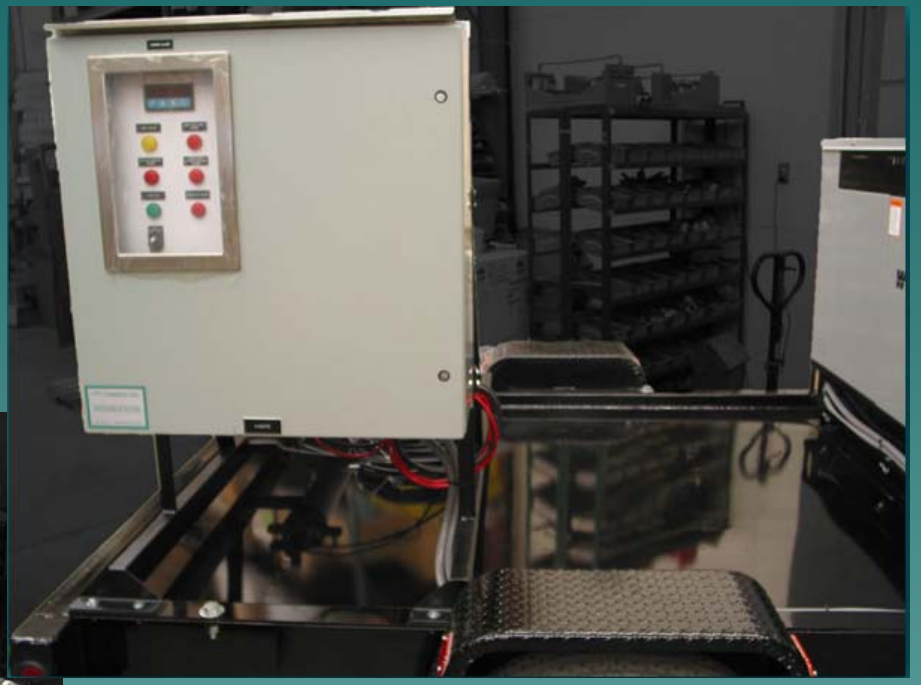
# Data Displays

| | DATE | Cell 1 | Cell 2 |
|---|---|---|---|
| 2 | | | |
| 3 | 7/1/2013 | 12.1 | 7.4 |
| 4 | 7/2/2013 | 13.8 | 7.3 |
| 5 | 7/3/2013 | 13.9 | 6.2 |
| 6 | 7/4/2013 | 12.1 | 8.9 |
| 7 | 7/5/2013 | 14.1 | 6.9 |
| 8 | 7/6/2013 | 13.1 | 6.3 |
| 9 | 7/7/2013 | 14.8 | 6.7 |
| 10 | 7/8/2013 | 14.2 | 7.3 |
| 11 | 7/9/2013 | 13.3 | 5.8 |
| 12 | 7/10/2013 | 15.8 | 6.1 |
| 13 | 7/11/2013 | 13.6 | 6.5 |
| 14 | 7/12/2013 | 14.3 | 7.0 |
| 15 | 7/13/2013 | 15.3 | 5.7 |
| 16 | 7/14/2013 | 13.6 | 5.6 |
| 17 | 7/15/2013 | 13.7 | 8.1 |
| 18 | 7/16/2013 | 14.7 | 8.4 |
| 19 | 7/17/2013 | 13.2 | 7.6 |
| 20 | 7/18/2013 | 15.7 | 7.4 |
| 21 | 7/19/2013 | 13.2 | 5.9 |
| 22 | 7/20/2013 | 15.7 | 7.0 |
| 23 | 7/21/2013 | 12.2 | 4.0 |
| 24 | 7/22/2013 | 15.0 | 6.5 |
| 25 | 7/23/2013 | 14.2 | 6.9 |
| 26 | 7/24/2013 | 15.8 | 3.4 |
| 27 | 7/25/2013 | 14.5 | 4.4 |
| 28 | 7/26/2013 | 13.4 | 4.1 |
| 29 | 7/27/2013 | 15.3 | 3.1 |
| 30 | 7/28/2013 | 12.0 | 4.5 |
| 31 | 7/29/2013 | 14.7 | 2.5 |



# 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 - Summary

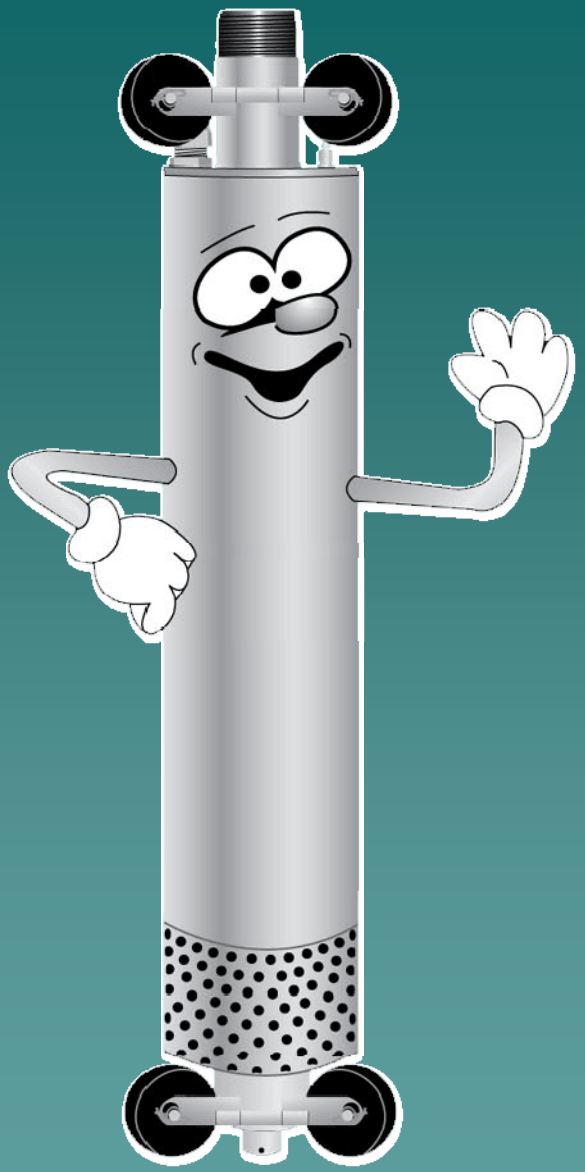
- Automation allows for unmanned operation of pumping system.
- Can be as simple as On/Off switch with a load monitor, floats, or a level sensor.
- Allows for complex controls for multiple pumps and operating scenarios, additional instrumentation, and data logging capabilities.

# 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?