Can Computer Technology Enhance Safety and Environmental Protection?

From the field: an operational perspective of technology in the solid waste industry

Computer technology is used to enhance much of what we do every day. Access to information, schedules, calendars, alarms and alerts, document storage and access, virtual meetings, data management, training remote monitoring and control, and the list goes on. How can these help us in the solid waste industry? It may be easier than you think!

When you think about the overall goal of Occupational Safety and Health Administration (OSHA) and EPA regulations, they boil down to two things: OSHA's goal is to protect workers, and EPA's goal is to protect public health and the environment. In the solid waste industry, protecting workers is a big job: The trash business is dangerous! Safety must be incorporated into the way we do business. At landfills, we face being run over or crushed by large vehicles; exposure to landfill gas; and contact with sharp, dirty, infectious, or even poisonous materials. Confined spaces can have deadly atmospheres; subsurface fires can create voids that could swallow a person without warning; snakes, spiders, wild dogs, alligators (yes, alligators), and bears create daily concerns for an individual's safety. The list goes on and on.

The Bureau of Labor Statistics (BLS) ranks sanitation workers as the fifth most dangerous job in the US today. Further, the BLS establishes two working groups that make up the waste industry: (1) refuse collection and disposal, and (2) recycling. These two work groups are spread over four Standard Industrial Classification codes and account for 499 (1.3%) of the 37,875 occupational fatalities reported in 2014 to the BLS Census of Fatal Occupational Injuries (CFOI). As discussed above, the BLS's 2014 CFOI ranked refuse and recyclable materials collection as the 5th highest fatality rate out of all occupations. Only logging workers, fishers, aircraft pilots, and roofers had higher fatality rates. The dangers are numerous; safety takes serious consideration. So how can technology help?

Consider access to information. In the days before the Internet, access to information came from other workers and books. While both of these sources continue to be available, and offer good information, in today's electronic and social media age there is so much more available. The Internet is a great place to quickly access information. Using a search engine to research any topic is as simple as a few keystrokes. Type in "landfill safety," for example, and safety training, safety issues, and safety rules all return as available resources. Refine your search to "solid waste regulations," and you will likely see a list of websites that include government sites like OSHA, Department of Transportation, EPA, and others. Articles about safety, vendors that offer safety training or products, virtually anything you desire, is there at the push of a button. How does this surplus of information help with safety? Obviously knowing what is dangerous or how to do something properly is a big step in the right direction. Simply capture the information and send it to those in need. Examples of important information and applicable safety information are identifying heat illness and prevention strategies before hot weather hits, hazards when driving during ice and snow events, the dangers of exposure to landfill gas . . . just pick a topic.

Let's take it up a notch and talk about smartphones. There are a variety of applications or "apps" designed for use with mobile devices. Some of these apps can be very helpful to your safety efforts. Begin by determining the type of mobile device you have; this is important because you need to target a compatible application. Apps are sometimes specifically designed for particular operating systems (i.e., Android or iPhone).

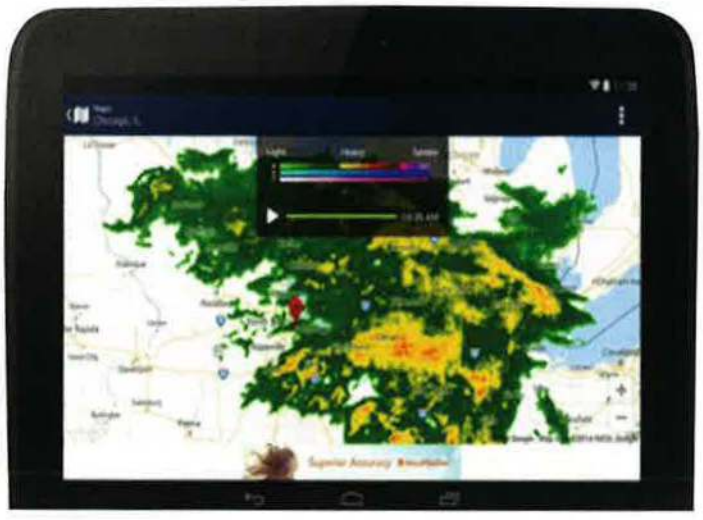

Figure 1. Radar view from a weather application on a cellphone

What type of application on a mobile device can help with safety? How about weather apps? We can all benefit from knowing what the weather forecast is, right? Did you know there are many different weather and storm tracker apps for mobile devices that are free? AccuWeather, Weather Live, Weather+ for iPhone, WeatherBug, Yahoo Weather, The Weather Channel for Android, the list goes on. These are all free apps that can be downloaded onto your mobile device and become useful immediately. The apps can be used to look at weather

forecasts, radar maps, lightning, wind and rain, and can be set up to alert the user when certain conditions exist, lightning within 5 miles, for example, or tornado sightings. It is easy to see how these reduce the risk of injury during any outdoor activity or operation.

Utilize technology in the palm of your hand to enhance safety! Look for other mobile device apps that may help your operation —traffic, OSHA, EPA, NIOSH—look for applications the manufacturer of your equipment offers; these are all good starting points. Another technology that is available for computers, tablets, or mobile devices is Cloud storage.

Cloud storage is storage for any kind of digital information like documents such as contracts, texts, e-mails, graphs, and photos. The data storage is accessed through the Internet or by using an app and is provided by companies called hosts. Once a Cloud storage application is set up, you can save and access the information you place in the Cloud from virtually any location on different devices. Encryption technology protects data as it's transmitted to and from the Cloud and protects data stored by the host. Our company uses this technology to provide employee access to information vital to their job responsibilities. The phone requires a registered user and password; the data are encrypted while being transmitted and the host's storage is secured, but it all works in seconds. For example, our field staff travels to multiple landfill sites and access site-specific safety plans using an application on their cell phone. While at the client's site they select the correct safety plan shown on the screen and boom, an instant display of the site safety plan is shown. With a slide of their fingers and by rotating the mobile device sideways to make the screen wider, the image is enlarged to read clearly all details. Site-specific safety plans can be shared or referenced immediately. This use of technology is makes even this small task easier to use and more efficient than other methods with the data and contacts always updated.

Figure 2. Colorimetric overlays of wellfields show important data at a glance

Cloud storage can be used to access just about any file, document, or picture you use regularly. Imagine having stepped instructions, a site-specific safety plan, a copy of a permit, rules or regulations, only a button click away. Sometimes improving safety can be achieved by making access to needed information more readily available. With cloud storage, you can provide immediate access to specific information your staff may need, so they are set up for success.

How about all that recurring training we do? Do you have to complete the OSHA eight-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) refresher, Confined Space Entry, First Aid, Fire Extinguishers, and other training? Whatever your training needs may be computer technology can help there, too. In today's busy world, it is more difficult and more expensive to get everyone together for a training session. Online training sessions may be a viable solution. A variety of vendors provides online access to safety and other training. Often times the cost of this training is less than that to complete it in-house. The other benefit is flexibility. Many online courses can be accessed when it is convenient for the employee. Use a rainy day, unexpected downtime or schedule an extra 30 minutes at lunchtime to get that training done. You too can develop in-house training and make it available online. Our company launched its own online safety training system a couple of years ago. We developed the company and industry-specific training modules in-house, and used technology to make them available online. The success was immediate. The efficiency gained by allowing flexible scheduling to fit employee availability, coupled with not having to do makeup classes for missed training, more than paid for the cost of implementing the system and developing the training. The technology of online training can certainly enhance your safety training efforts. A word to the wise: to maintain an effective and meaningful training program, you should continue to include the people factor.

Another aspect of safety, protection of the human health, and the environment can also benefit from technology. Environmental data collection and evaluation in the solid waste industry are one of the primary ways we keep people safe and better protect the environment. Data measured and collected can not only help us control impacts to the environment, but ultimately better protects the public from potential exposure. Data-related groundwater quality, stormwater quality, air emissions, quantities of leachate or waste, flow meter reading, pump stroke counts—any of these, and many more examples—can be found in the solid waste industry.

Keeping track of this important data is directly related to public safety. The timely and accurate collection of data is typically step 1. Use technology to help with this task. Set up calendar reminders, alarms or alerts, automatic e-mails—use any number of these electronic tools to help you collect the needed data on time. Once data are collected, verify you have what you need, and store it in a secure location. This can be as simple as an electronic form or spreadsheet. There are many databases and other data management software platforms that can be used to store and manage data. Many of these offer an accurate and secure method of storing collected data. Think about it, if you lose that piece of paper or data file with those readings that were taken on the last day of the month and do not find out until the following month, you may have some explaining to do. Use technology to save data, to check that you have all the data needed and back up all files. You can streamline your data collection process and help eliminate oversights. This is smart business.

Once data are collected, it is important to organize it in secure storage. For simple files like MS Word documents, forms, or spreadsheets, create folders or file names that make it easy to locate the information. A good example is to name folders or file names using dates (e.g., Flare 2015 01, Flare 2015 02; Pump 1 Jan., Pump 1 Feb. . . . you get the idea). Using file names like these help the files to be automatically sequenced—this allows you, and others, to easily locate needed information. Always back up important data—having two copies is a sound practice. Any piece of information (document or electronic) can be lost or destroyed. For electronic technology, it is good practice to save additional copies of your data. Low-tech examples can be as simple as making hard copies, copying to a thumb drive or using an external hard drive. Whatever method you choose, frequently save your data. Make this an integral part of your data management.

Once you store the data, consider developing and using evaluation tools to let data tell a story. Microsoft Excel, Apple Numbers, or similar spreadsheets sort data quickly and accurately. Shuffle columns or rows of numbers into a sequence; highlight values above or below specified levels—all at the push of a button. Graphs and charts can be tied directly to spreadsheets, and be set up to generate trend lines, graphs, or charts. Each of these can turn large quantities of numbers (data) into a visual tool that helps show what is happening—it can tell a story.

Technology such as SCSeTools uses more advanced development and database software that provide the ability to organize and store compliance and operational data. This information is useful for generating analyses, graphs, and maps that allow you to predict, assess, and plan the operation and maintenance of your facility. The difference between using spreadsheets and advanced database software is that the analyses, graphs, and maps are more automated and algorithms provide greater insight in less time. Algorithms perform calculation, data processing, and automated reasoning using your specific data, and your specific information needs to help improve decision-making and your bottom line. For example, a dashboard is a screen that has a summary of relevant information and statistics pertinent to your operations. The dashboard can be set up so that the moment you log on, you are looking at what you need to see immediately. Want a list of landfill gas extraction wells that still need to be monitored for the month? The location of current exceedances, wells with over 5% oxygen, positive pressure, or high temperature, on a map? Do you need to look at fleet efficiency, maintenance trends, and waste quantities? Any key operational data can be shown at the push of a button. Colorimetric overlays of wellfields can be custom set with colors and value ranges of your choice. A picture is worth a thousand words, right?

Having accurate data and quick access is strategic. The ability to display and evaluate that data in different combinations, leads to operational excellence. Today's technology is amazing; what used to take hours to analyze can be accomplished in moments for multiple sites and data sets. The power of these databases and software platforms is being applied to the solid waste industry. Look for ways you can take advantage of it.

Just when you thought we had gone as far as we could, now there is remote monitoring and control technology. Did you know that you can have live access to monitor equipment and data in real time from your living room? You can see how fast pumps are running or what temperature or flow rate you have at your flare. You can access live video feeds from cameras and actually see inside your flare station or storage area. Notification of unplanned shut downs can be set up. You can be notified on your mobile device when something goes wrong. The technology exists to remotely start flares when they shut down. Imagine eliminating a three-hour drive to restart a flare. Not only do you save time and money, but you avoid a potential environmental impact or fine. This is cool stuff.

Remember, whatever technology you use or plan to use, make it user-friendly. Most people resist change, and the ability to use technology varies among employees. Generation X's (born 1965–1999) and Millennials (born from 2000 on) tend to understand and use computers and mobile devices more effectively than some of the older folks (i.e., Baby Boomers). Take a slow and defined approach to implementing the use of technology. Provide training to explain what the benefits are, and how to do things step by step. Develop written procedures that can be accessed when people become confused or forget how to do things. These measures will help others welcome the introduction of technology in the workplace. Set employees up for success. Identify employees that are well suited to use technology, and consider empowering them to assist others. As technology use grows, develop IT positions to support your efforts. Technology is continually improving; this is a good thing. Despite these advances, try to monitor the changes you make. Try not to fall victim to continually changing the way things are done. Allow time for people to understand and use the tools they have. Consider user abilities and develop updates that are necessary or enhance your process. Include end user employees in the technology development process. Keep in mind that technology, in most instances, solid waste industry included, should support workers and operations, and not the other way around.

Taking small steps to incorporate technology into the way you do business can make a big difference. Look for ways to eliminate errors, increase efficiency, or add tools that expand your abilities. Using technology to enhance safety and environmental protection is easy. Take advantage of information on the Internet. Search for topics that can help make your safety meetings interesting. Save regulatory and other information providing site addresses to your favorites. Access to, and use of, information is quick and easy. Take advantage of it. Use electronic calendars to remind you of important dates and times. Alarms and alerts can help you remember to attend conference calls or complete a report or take a sample, reading, or measurement. Use smartphones in these same ways. Having reminders when you are on the move, not just sitting behind your computer, is a huge step into the technology age. Take it up a notch and download apps. Start with weather or traffic. Use Cloud storage to store and access files. Having easy access to permits, safety plans, or checklists can make work easier and more efficient. Use spreadsheets, databases, and data evaluation tools to store and sort through data. Making trends or outliers stand out, and eliminating oversight or transposing errors can enhance compliance and prompt action where needed. Maps with colorimetric overlays can show locations of concern; they can turn numbers into a picture that makes sense, tells a story. Technology can turn data into actionable information. Taking action when needed is important; let technology help.

Technology is good, but communicating with others always remains in the mix. Questions, feedback, and positive reinforcement, a human contact perspective, adds value that cannot be ignored. Technology is a big help, but two-way communication in real time provides sincerity and validation. Keep in mind that there are challenges with adult learners. Explain why the topics you chose are important. Deliver information in interesting ways. Hold meetings in different places and times. Involve your staff in researching and preparing safety topics. You will find that the combination of presenting new and interesting information and doing it in different ways will result in achieving "buy in." Hopefully, you can build a more effective and successful program. By the way, the Internet has information on adult learning and preparing safety training and safety programs, too! The bottom line is that our prime source of technology—the Internet—can be a good starting point. **MSW**

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