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A Market Assessment Page 43.

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www.wasteadvantagemag.com January 2013 Vol.4, No.1

WasteAdvantage magazine

The Advantage in the Waste Industry and Recycling Industry

New York City Department of Sanitation's Bureau of Motor Equipment: Keeping Fleets On the Run

DETERMINING THE TIME FOR TARP REPLACEMENT

SPECIAL SECTION: WASTE CONVERSION TRENDS

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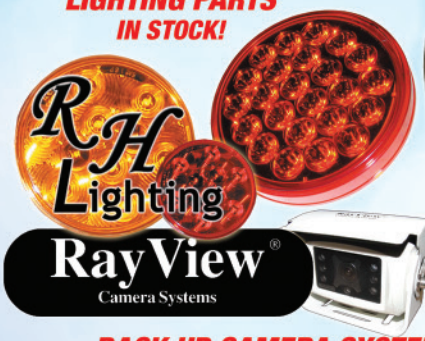

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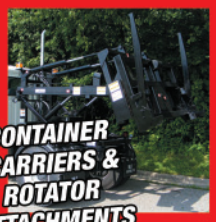

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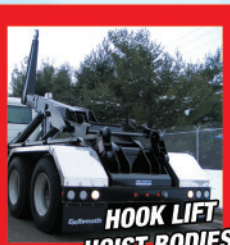

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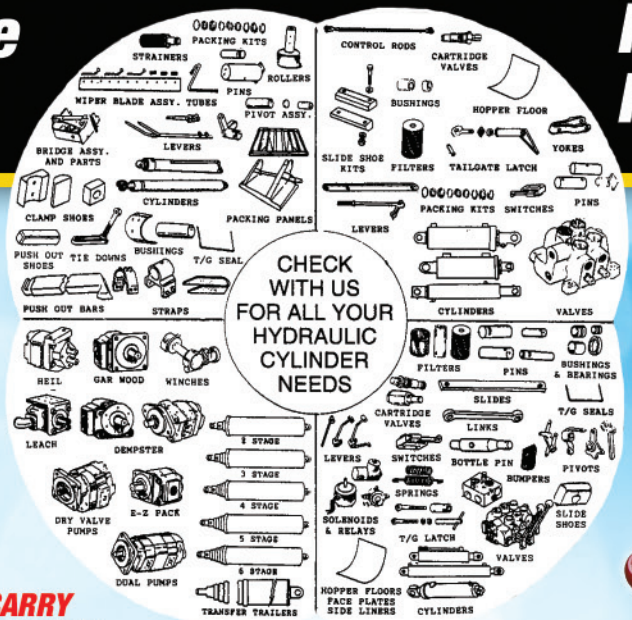

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SEE MORE OF OUR INVENTORY ON PAGES 84-87!

Editor's Note

HAPPY NEW YEAR! I HOPE ALL OF YOU HAD A GOOD HOLIDAY. I CAN'T BELIEVE it is 2013 and we are working on a whole new year of great issues covering pertinent news in the waste and recycling industries. It will be interesting to see where this year takes us regarding new technologies, trends and regulations. There are some important issues coming up and *Waste Advantage Magazine* will be there every step of the way.

To start off the year, we have a great issue for you. Our "In the Spotlight" (page 14) this month focuses on the New York Department of Sanitation's Bureau of Motor Equipment, a division that is not only dedicated to preventing breakdowns and major repairs before they happen through an innovative preventative maintenance program, but it is also responsible for implementing environmentally friendly technology on the city's fleets. Also check out, "Determining the Time for Tarp Replacement" (page 19) that discusses the types of tarps that are available and the factors you should consider when it comes time for replacement. "Optimizing Work Truck Performance with Biobased Hydraulic Fluids" (page 22) asks readers to consider using alternative chemicals in order to improve a vehicle's performance while enjoying the cost and environmental benefits. Don't miss our special section on waste conversion trends (starting on page 30), which features a series of articles that cover scalability, sustainability, biogas and opportunities for carbon offsets.

Like many, our thoughts are with the families in Newtown, CT and its terrible tragedy that took place last month. Many customers in Associated Refuse Haulers' core service areas, Newtown and Sandy Hook, CT, were affected. Associated Refuse Haulers' owner, Pat Caruso is past President of the Newtown Rotary Club, and a current member of the Board of Directors of the Newtown Rotary Foundation. This organization has set up a fund to help those in the community directly affected by this event. This fund is dedicated to the victims and their families and those in the Newtown community who have been affected, to help support both their short-term and long-term needs, including counseling, medical, funeral and supplemental expenses. Residual funds, if any, may be used to name scholarships in memory of the victims. For more information, visit www.wasteadvantagemag.com.

Best wishes for a great New Year.
Regards,

Angelina Ruiz
Editorial Director
angelina@wasteadvantagemag.com

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The Advantage in the Waste and Recycling Industry

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In This Issue

January 2013 Volume 4, Number 1

On the Cover:
A street sweeper under repair at DSNY's Richmond Borough Repair Shop.

Photo courtesy of Angelina Ruiz.

In Every Issue:

Photos courtesy of O'Brian Tarping Systems, Idaho Waste Systems and Eisenmann Corporation.

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City of Chicago Expanding Commitment to Electric and Alternative Fuel Vehicles for Its Own Fleet

Mayor Rahm Emanuel announces an expansion of the city of Chicago's commitment to green vehicles for its own fleet, including plans to add 20 electric vehicles to the fleet in the coming years. Says Mayor Emanuel, "By purchasing various types of all-electric vehicles for our fleet, the City of Chicago is maintaining its position as a leader in the use of alternative fuel vehicles while evaluating new ways of providing high-quality services more cost-effectively. This will save taxpayers money by reducing the reliance on diesel fuel and promote a cleaner, more efficient city." The City has entered into a contract with **MOTIV POWER SYSTEMS** (Foster, City, CA) to purchase all-electric refuse collection trucks. The City currently intends to purchase one all-electric refuse collection truck from Motiv, which will be the first of its kind, for real-world testing alongside the City's fleet of traditionally-fueled refuse collection trucks. The City may buy additional all-electric refuse collection trucks in the future based on the results of this testing and the availability of funding.

For more information, visit www.cityofchicago.org.

Wayne Engineering Hosts Successful Open House

WAYNE ENGINEERING (Cedar Falls, IA) hosted an open house at their new company-owned dealership in Phoenix, AZ that featured several live demonstration vehicles. This successful event had more than 100 customers in attendance as well as 20 vendor representatives that included Freightliner, International, Peterbilt, Mack trucks, Eaton Corporation, Perkins Tippers and O'Brian Tarping Systems. These companies were able to showcase some of their newest offerings alongside WAYNE's products. Mark Watje, Business Development Manager, says, "Many of our customers commented on how impressed they were with WAYNE's new presence in Phoenix. Our 4.5 acre property with 8 large service bays and a two-story office building showed them that we are serious about the Arizona market." For the event, the shop floor was set up like a small exposition center with vendor tables and a networking area for the attendees. Both vendors and customers were very happy with the event and more than a half a dozen demos were scheduled with customers. Says Watje, "I was very pleased with the support we received from our vendors and strategic partners. Their help and participation made the event a huge success."

For more information, call (602) 268-9200 or visit www.waynetrucks.com.

Advantage Funding Hires Four Sales Managers for Its Newly Created Vocational Truck Financing Division

ADVANTAGE FUNDING (Lake Success, NY) announces the appointment of four regional sales managers for its newly created vocational truck financing division. The division will focus its sales efforts on short haul vocational trucks used to transport finished goods and raw materials in the U.S. The four regional sales managers bring decades of experience and are strategically located in Washington State, southern California, Arizona and western Massachusetts. The sales managers are Thomas Dimmler, Washington State, Anne Eubanks, Southern California, Peter Basini, Arizona, and Ken Blackman, western Massachusetts. "I am excited to work for a national lender that has an appetite to expand into niche markets that I've supported my entire professional career," said Anne Eubanks.

For more information, call (866) 392-1300 or visit www.advantagefund.com.

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- Vehicle Routing Software and GPS Integration Fleet Management
- Solid Waste and Environmental Expert Witness Testimony
- Waste Diversion (disposal cost avoidance) and Material Recovery
- Transporting Waste-By-Rail
- Strategic Business Program Development and Implementation
- Equipment Sales and Leasing
- Effective Cost Control Management Systems
- Start Up Business Solutions - Business Plans, Financial Management, Sales and Marketing

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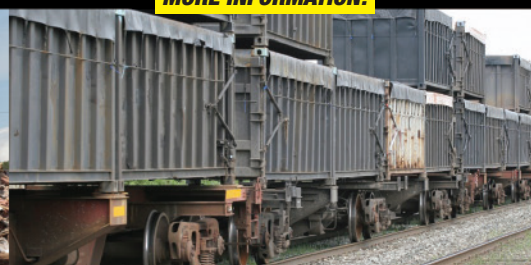

Mark Your Calendar

JANUARY 2013

22 – 23: 5th Annual Kuwait Waste Management Conference & Exhibition
Radisson Blu Hotel
Kuwait City, Kuwait
www.promediakw.com/2013/waste

28 – 30: Managing Recycling Systems Training
Florida Hotel and Conference Center
Orlando, FL
www.swanafl.org

28 – 31: U.S. Composting Council Annual Conference & Trade Show
Buena Vista Palace Hotel and Spa
Lake Buena Vista-Orlando, FL
www.compostingcouncil.org/conference

29 – 31: 16th Annual LMOP Conference and Project Expo
Hilton Baltimore
Baltimore, MD
www.epa.gov/lmop/workshops/16th.html

30 – 31: SWANA FL/RFT (Recycle Florida Today) Joint Summit
The Florida Hotel and Conference Center
Orlando, FL
www.swanafl.org

31 – February 1: Mia Green Expo and Conference
Miami Beach Convention Center
Miami Beach, FL
www.miagreen.com

FEBRUARY 2013

3 – 9: SeminarFest
The Flamingo
Las Vegas, NV
www.asse.org/education/seminarfest12

24 – 28: WM Symposia
Phoenix Convention Center
Phoenix, AZ
www.wmsym.org

25 – 26: Natural Gas Vehicle Infrastructure Conference & Exhibition
Renaissance Houston Greenway Plaza Hotel
Houston, TX
www.ngvevent.com

25 – 26: SWANA's Road to Zero Waste
Embassy Suites Atlanta at Centennial Olympic Park
Atlanta, GA
http://zerowaste.swana.org

27 – 28: 17th Annual Landfill Symposium
Embassy Suites Atlanta at Centennial Olympic Park
Atlanta, GA
http://landfill.swana.org

MARCH 2013

5 – 6: CALSTART-NTEA Green Truck Summit 2013
Indiana Convention Center
Indianapolis, IN
www.calstart.org

6 – 8: The Work Truck Show
Indiana Convention Center
Indianapolis, IN
www.ntea.com

10 – 13: 26th Southeast Recycling Conference & Trade Show
Hilton Sandestin Beach Golf Resort & Spa
Destin, FL
www.southeastrecycling.com

18 – 20: SWANA's 36th Landfill Gas Symposium
Rio Resort and Casino
Las Vegas, NV
http://lfg.swana.org

19 – 20: Plastics Recycling Conference
Sheraton New Orleans
New Orleans, LA
www.plasticsrecycling.com

19 – 21: 10th International Environmental Technology Trade Show and Conference
Palais Des Congres De Montreal
Montreal, QC
http://americana.org

Government Gossip

EIA Women's Council Scholarship Application Now Available

The Environmental Industry Associations (EIA) Women's Council (WC) has announced the application process for its 2013 to 2014 academic scholarships. This scholarship program assists qualified individuals in their pursuit of education that will lead to careers in the solid waste and recycling. Since the program's inception in 2007, the WC has awarded nearly $65,000 in scholarships to 21 students. In 2013, the WC plans to award three $5,000 scholarships. All employees of companies that are members of the National Solid Wastes Management Association (NSWMA) or Waste Technology and Equipment Association (WASTEC) or their spouses or dependents are eligible to apply. The submission deadline is March 1, 2013, and decisions will be announced on or about April 1, 2013.

EIA President and CEO Sharon H. Kneiss said that she applauds the great work of the WC, "These scholarships are an example of the important efforts of Women's Council members. It is wonderful that these NSWMA and WASTEC members have come together to provide educational opportunities for current and potential future industry employees. It demonstrates the forward-looking natures of the solid waste and recycling services industry."

For detailed application instructions and eligibility information, visit www.environmentalistseveryday.org/wc-scholarship-application.

New OSHA Web site Provides Information On Preventing Backover Incidents

According to the Bureau of Labor Statistics, more than 70 workers died from backover incidents in 2011. A backover incident occurs when a backing vehicle strikes a worker who is standing, walking or kneeling behind the vehicle. These incidents can be prevented. OSHA has published a new Preventing Backovers Web page that provides information about the hazards of backovers, solutions that can reduce the risk or frequency of these incidents, articles and resources, and references to existing regulations and letters of interpretation.

For more information, visit www.osha.gov/doc/topics/backover/index.html.

AF&PA 2013 Recycling Awards are Open

Paper recovery reached record heights in this country—more than 66 percent of what was consumed in the U.S. was recovered for recycling in 2011. Programs like those identified through the American Forest & Paper Association (AF&PA) Recycling Awards are crucial to continued success in this area and offer great resources for others interested in learning from best practices already in place around the country. Launching December 3rd, 2012, the 2013 AF&PA Recycling Awards program offers a great opportunity for solid waste industry professionals to be recognized for their outstanding paper recovery efforts. AF&PA's annual program awards cash prizes, features local and national visibility, and provides original framed art work for an outstanding school, business and community paper recycling program. Winners, runners-up, and unique programs will become prominent content on a redesigned www.PaperRecyclingAwards.com Web site and in printed AF&PA outreach materials in 2013. Deadline for entries is February 15.

For more information and entry, visit www.PaperRecyclingAwards.com.

New York City Department of Sanitation's Bureau of Motor Equipment: Keeping Fleets On the Run

Backed by an innovative preventative maintenance program, DSNY's Bureau of Motor Equipment is THE KEY TO KEEPING THE CITY'S VITAL SANITATION FLEET STRONG, RELIABLE AND ENVIRONMENTALLY FRIENDLY.

FOUNDED IN 1881 AS THE DEPARTMENT OF STREET Cleaning, the New York City Department of Sanitation's (DSNY) —including recycling, street sweeping and a dedicated uniformed cleaning and collection force—is now the largest U.S. municipal sanitation operation, collecting nearly 11,000 tons of residential and institutional refuse and 1,760 tons of recyclables each day. New York City's businesses, whose waste is collected by private carting companies, generate another 13,000 tons of refuse daily. To meet these challenges, DSNY employs more than 7,200 uniformed sanitation workers and supervisors as well as 1,835 civilian workers.

Serving the 59 Community Board Districts (CBD) throughout the five boroughs of NYC, every location is equipped with the manpower, equipment and resources (onsite fueling, etc.) to service (waste collection, recycling, street-cleaning, snow removal, salting, etc.) each community. Each refuse truck is capable of plowing snow which is a very unique part of our operation. The DSNY provides regularly scheduled curbside and containerized refuse collection services for every residential household, public school, public building and many large institutions in New York City. Rear-loading collection trucks service curbside refuse and recycling along with basket collection and can hold up to 12.5 tons of refuse each day.

DSNY's Division of Support Services provides the internal support required for the Department to perform its essential tasks. One of the organizations within the Support Services Division is the Bureau of Motor Equipment (BME), which provides a full range of services for the fleet, from design, research and development, procurement, maintenance, repair and ultimate disposal.

Staying On Top

In April 2012, in an effort to reduce spending, Mayor Bloomberg signed an Executive Order (161) that

The BME services approximately 5,700 vehicles, including:

- **2,230 collection trucks**
- **450 mechanical street sweepers**
- **275 specialized collection trucks**
- **365 salt/sand spreaders**
- **298 front end loaders**
- **2,360 various other support vehicles**

Rocky DiRico (left), DSNY's Deputy Commissioner of Support Services, and Spiro Kattan, DNSY's Supervisor of Mechanics. Photos courtesy of DSNY.

AWARDS

- 2005: Environmental Quality Award (EPA Region 2)
- 2009: Vocational Fleet of the Year (*Fleet Owner Magazine*)
- 2010: Clean Cities Success Stories (DOE / MotorWeek)
- 2010: #16 Government Green Fleet (*Gov't Fleet Magazine*)

requires the City's Mayoral fleet (Sanitation, Parks and Recreations, Environmental Protection, Police, Fire Department, etc.) to consolidate vehicle maintenance operations, share resources and standardize equipment specifications. Also under the Executive Order, the DSNY is designated as a "Center of Excellence" to facilitate maintenance and repairs of most medium and heavy-duty vehicles citywide. According to Rocky DiRico, DSNY's Deputy Commissioner of Support Services, some of the early savings (rent, utilities, etc.) came from termination of leased space in old buildings occupied by the city, and will also come through leveraging economies of scale.

The DSNY currently allocates weekly truck and tonnage operational targets to each of its 59 districts. These targets are closely monitored to ensure that productivity improvement goals are met. DSNY must constantly evaluate routes and tonnage in districts to achieve these targets. However, over the past few years the BME has had to deal with its share of budget cuts. "Each Bureau (within DSNY) is required to submit revised spending plans. Each plan had to be carefully assessed with respect to sustainability, its potential impact on the stability of the fleet and its overall impact on the operation," says DiRico.

An Environmentally Friendly Fleet Program

Over the past 10 to 15 years, the BME has been focused on mitigating poor air quality, says DiRico. "The BME was able to address this need by using cleaner diesel fuel, Ultra-Low Sulfur Diesel (ULSD) fuel (<15 ppm) in 2001, which was prior to Federal mandate in October 2006, incorporating electronically-controlled clean-diesel engines and retrofitting more than 1,000 On and Off-road equipment with advanced diesel exhaust after-treatment—Diesel Particulate Filter and Diesel Oxidation Catalyst."

The BME's first biofuels experience was back in 2000 when they became the first NYC Mayoral agency to deploy a fleet of Flexible Fuel Vehicles with six E85 fueling stations citywide. As a result of a successful pilot, in 2007, the BME switched its entire diesel fleet to operate on B5 biodiesel (soy). B5 is 5 percent biodiesel and 95 percent ULSD. To date, the BME has dispensed well more than 40 million gallons of B5 through their current supplier, Sprague Energy and

HANDLING HURRICANE SANDY AND ITS AFTERMATH

Through the BME's regular PM program, DiRico stresses that by maintaining the steps they take to keep the trucks in commission; it leaves him in a very strong fleet status position. "It doesn't matter whether it is a hurricane or a sunny day, the way we are built and structured, we always have enough trucks." Through a detailed emergency preparedness plan, other preparations included knowing what facilities and equipment were in vulnerable areas based on flood zone maps. Anyone that was on low ground or in the line of the storm was moved to a higher place. "That allowed us to be in the best position we could possibly be. If we had not moved some of the equipment out of the flood zone areas, they may have been out of commission. Now, as a result of what happened with Sandy, we will be closer to perfection because we learned a lot. There were certain parts of the city, mainly around the water-front that became more vulnerable than what the 100-year flood maps indicated."

Another step that was taken involved protecting the ability to communicate between the facilities (phones, computers, etc.). DiRico explains that when you are preparing for something of this nature you expect to lose power in certain areas. Therefore, all of the facilities have portable generators that are assigned to different district locations for when it happens. The generator preparedness plan isolates circuits in each garage so that when something like that happens, the generator gets deployed at the location and the specific subpanel that would feed those essential circuits is going to keep operating. That way, the supervisor can report and communicate from his desk and trucks can be fueled. Essential circuits are; the fuel pumps, fire suppression and fire alarms, the lights above the fuel pumps, the computers, the office, etc. These circuits quickly return to service if the building loses power. Says DiRico, "Ultimately, sometime in the near future, we are hoping that our collection trucks will have auxiliary power built into them—meaning we will have a hybrid truck that provides 40 amps of shore power that you can use if you needed to. We are in the process of collaborating and partnering with different manufacturers and design groups to have our trucks modified so they can have that auxiliary power."

When it came to cleanup, the fleet worked around the clock for weeks to haul away more than 360,000 tons of debris and in these particular circumstances, the 40-day PM strategy goes out the window. "Since the vehicles were working 20 hours a day, in 5 days you are already at 100 hours and in 15 days you are at 300 hours. In a case like this, what you do is try to identify those vehicles that are working long and hard hours and have them relieved by another vehicle so that you can PM them before damage occurs. In this case, the vehicle's fueling record was used," says DiRico. In addition, when there were breakdowns on the street—flat tires, etc.—mobile repair trucks were deployed out to the field to make running repairs right on the ground.

DiRico thinks that by keeping DSNY's fleet well prepared and maintained, the Department was able to respond to the major cleanup effort the aftermath of Sandy required and still be able to respond to a snow event, which actually occurred during the hurricane cleanup.

Auto mechanic working under a refuse truck at the Queens Borough Command Repair Shop.

more recently Castle Oil Corporation. In the very near future, the BME will switch to seasonal use of B20 citywide (20 percent Biodiesel and 80 percent ULSD). The B20 pilot is currently ongoing. In addition, in 2009, DSNY participated in a DOE-sponsored "Hydrogen Fuel Cell Project" which included a one-year demonstration of a hydrogen fueling station and the use of a fuel cell vehicle. The H2 station was installed by Shell Hydrogen and the fuel cell vehicle (Chevy Equinox) was provided by General Motors via Project Driveway. This project concluded at the end of 2011 with success.

Not only has the BME reduced emissions, noise, and fuel consumption, but a number of years ago, they also adopted pack-at-idle technology (no speed-up during compaction cycle). Traditionally, engine speed-up was used to accelerate the compaction-cycle. Engine speed up consumes more fuel and tends to increase noise levels during the compaction cycle. Pack-at-idle technology mitigates these conditions and the BME wanted to take advantage of this for its fleets.

The BME has also helped pioneer the development of the nation's first heavy-duty rear-loading CNG- and diesel-powered hybrid-electric refuse trucks. In fact, in 2006, the BME joined the CalStart Hybrid Truck User's Forum (HTUF), Hybrid Refuse Truck Working Group. The goal of the HTUF is to advance the commercialization of advanced hybrid technologies. Since the BME has joined the working group, and by working with various suppliers, the HTUF Working Group has helped accelerate the commercialization of heavy-duty hybrid (electric and hydraulic) refuse-collection trucks. Not only has the BME attended and showcased hybrids, but they have also presented at various HTUF Conferences.

As the BME implements a vigilant, sustainable and environmentally friendly "Fleet Program", it does not come without its challenges. Says Supervisor of Mechanics, Spiro Kattan, "As a city, we now focus on reducing greenhouse gases. Heavy-duty vocational vehicles are much more challenging to 'green' due to performance and power requirements. The BME is predominantly a heavy-duty fleet and we definitely have our share of hurdles to overcome." Some of the challenges include identifying the best available environmentally friendly, sustainable, fuel efficient and cost-effective technology without compromising fleet reliability and productivity. "Our refuse trucks have very limited space to work with and the Department has very stringent operational requirements. To overcome some of the challenges, we work closely with the OEM (Original Equipment Manufacturers) and their engineers," says Kattan. "We must carefully consider each technology to make sure that it does not have a negative impact on the operation or the integrity of the entire vehicle. We are also examining the body-hydraulics to see if we can operate this system more efficiently (to try to reduce the parasitic loads of the body hydraulic system)."

Maintaining the Fleet

DiRico points out that he feels the BME was named the Center of Excellence because they have a very efficient and comprehensive Preventative Maintenance Program (with over 300 inspection items) which is aimed at reducing down time and improving the stability of operation. Working with almost

Auto mechanic working on a roll-off truck at the Queens Borough Command Repair Shop.

A DSNY auto mechanic completed rebuilding a diesel engine. Photo courtesy of Angelina Ruiz.

7,000 vehicles, BME's goal is to evaluate vehicles every 40 days. "That number of days represents the closest number of days to when the average vehicle will have 250 -300 hours of service on it. This schedule prompts the owner or garage supervisor to remove the vehicle from service on the 40th day.

He does point out that if a truck is scheduled for maintenance and it doesn't have 300 hours on it, the oil may not be changed but a safety check will be performed, which includes looking at the lights, brakes, tires, batteries, wipers, glass, etc. "We still get to see it, inspect it and make sure it is safe for the streets," says DiRico. Based on an algorithm associated with the average hours (miles consumed) in a given period, 40 days will generally bring a truck to the point where it's supposed to be serviced. However, stresses DiRico, if the truck happened to be parked and did not run, the truck would still be inspected for safety and maintenance—they just won't change the oil and filters.

The BME has an Oil Analysis Program that allows them to stretch oil change intervals If the oil analysis finds that the oil is still good, that may allow the truck to stretch the oil's life without voiding the warranty. By doing the PM and safety checks, it keeps the breakdowns at a minimum and missing any collection targets almost non-existent, something for which the BME is always striving.

Through the BME's PM program, on a typical day, over 100 trucks in the fleet are undergoing PM Service. However, there are planned spares that are still out on the street doing the job, allowing for a continuously operating fleet. When minor repairs (anything from a fan belt to body cylinder) are needed, they are generally completed within two days, while major repairs (such as an engine, transmission, body, etc.) take about five to seven days. "We strive to as much as possible to have our outages planned, instead of doing emergency repairs. I believe this approach, structure and strategy has, and remains the reason we are recognized as the center of excellence," says DiRico.

Looking Ahead

In 2007, Mayor Michael R. Bloomberg implemented PlaNYC, which mandates a 30 percent reduction in overall (buildings and fleet) greenhouse gases (GHG) by 2017. To meet PlaNYC's goals over the next five years, the BME will be continuously implementing strategies such as:

1. *Fleet GHG Reduction Plans*
   - Purchase the most fuel-efficient vehicles
   - Alternative technology/fuels: Carbon friendly fuels (i.e. CNG)
   - Fleet down-sizing: Less vehicles = less fuel
   - Fleet right-sizing: Perform work function with a smaller, fuel efficient vehicle
   - Less idling: Equals less fuel consumption
   - Reduce overall miles driven: Equals less fuel consumption
2. *Buildings GHG Reduction Plans*
   - HVAC Retrofits: Install energy-efficient (electronically controlled) heating and air-conditioning systems
   - Motion Sensors: Turn ON lights upon sensing motion in a room
   - Lighting Retrofits: Install energy efficient lighting (T12 to T10)
   - Steam Traps Replace: Allows the return of condensation without the loss of steam (heat)
   - Peak Load Management: Reduce building electrical load during peak demand
   - Solar PV Pilot Project: Reduce load on electric grid (use the sun's energy)

Says DiRico, "Pilot projects have helped us (manufacturers too) understand the dynamics (lessons-learned) of new technologies and alternative fuel. Pilot projects also help engineers go beyond pen and paper." | WA

For more information about the New York City Department of Sanitation's Bureau of Motor Equipment, contact Vito Turso, Deputy Commissioner of Public Information and Community Affairs at (646) 885-5020 or visit the DSNY Web site at www.nyc.gov/html/dsny/html/home/home.shtml


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Determining the Time for Tarp Replacement

Sean O'Brian

Truck downtime, mechanics labor, fasteners, etc. are all COSTS THAT NEED TO BE FACTORED INTO THE PRICE OF THE REPLACEMENT TARP.

TARPS, TARPS, TARPS. FOR SOME, TARPS ARE SIMPLY something that gets replaced—a consumable that gets charged against the operating expense of the truck. For others, tarps are a nagging reminder that the truck is in being serviced versus being out on the route making money, a litter notice has been received from the Department of Motor Vehicles that the load is not being contained due to inadequate tarp design, the tarp has worn out or the driver isn't using his flaps. Depending on which tarp material and tarp system model you have, replacing the tarp can be a yearly or a monthly event. Factors such as: tarp design, if the tarp is being drug out over the load versus being rolled out over the load, driver abuse and load contained will ultimately dictate how long the tarp lasts and how often the tarp gets replaced. You can maintain the life of your tarp efficiently while keeping the system running in smooth, working order with less downtime.

Tarp Styles

Tarps are consumables which can be the "cheap, keep you barely legal" variants up to the higher quality materials, extra/heavy reinforcement OEM variety. However, no matter the material of the tarps you use, ultimately, all tarps need to be replaced—it's just a matter of what you haul and the driver's attention to the load and tarp system placement that dictates how often. Typical, less expensive tarps don't have reinforcements, flaps for litter containment or additional webbing to give the tarp additional structure. Therefore, they don't last very long or offer the additional option of flap use for total waste containment.

The more expensive factory replacement tarps typically use superior materials or offer material choices for varying loads (rubbish versus scrap metal, for example) while also offering the side flaps for total waste containment. However, do the more expensive tarps last longer? Typically yes, but how much longer no one really knows. The route, material being covered and the driver are variables that are difficult to be accounted for. When determining what tarp style needs to be used, consider these cost factors: purchase price of the tarp, number of tarp replacements per year, labor to remove and replace the tarp, and truck down time.

12oz Mesh

A 12oz mesh is a good all around tarp material suited to refuse containment. It has decent abrasive resistance, an open weave to allow for more air movement and is a somewhat industry standard for tarp material. This material is good for all weather environments.

Gatormesh

This is a lighter weight, tighter weave material that has a much higher abrasion resistance than the 12oz mesh that is ideally suited for refuse containment. The lower weight of the tarp exerts less stress on the tarp spring, but the tradeoff is that the tighter weave allows the wind to potentially whip the tarp. Wind whip is not an issue on tarp systems where the tarp roller is mounted to the arms, but can be a nuisance problem with tarp systems that have the tarp roller mounted in the gantry and have spring loaded arms.

A container with a Diablo tarp system covering it.
Photos courtesy of O'Brian Tarping Systems.

Scrappie Mesh

This is an ultra-heavy weight, non-bonded mesh where the woven fibers are not bonded together like what is found in the 12oz mesh material. This allows for the fibers to be reoriented if small holes become present and is ideally suited for the scrap metal and high abrasion environments. A good benefit to this material is that it allows for a lot of air to pass through it, minimizing the wind whip that causes tarper arm problems on spring loaded tarp systems. A non-benefit to this material is that it allows the loose refuse in the containers to be blown around more, increasing the chances of material being blown out of the container if the sides are not strapped down.

Heavy-Duty Mesh

A heavy-duty mesh material is a close merger between the density of the scrappie material with the tighter bonded weave of the 12oz mesh. It is an excellent all around material suitable for refuse, scrap and high abrasion environments. A bonded weave doesn't allow for the strands to be re-oriented like the scrappy material but its heavy weight exceeds the abrasion resistance of the 12oz mesh.

Tarp Attachment

How the tarps are attached is another labor cost factor. Most, if not all, tarp system manufacturers use some form of a quick tarp attachment method. Some use a channel to slide the tarp into for tarp attachment, while others use an extruded bolt boss where the tarp is attached to the roller by bolts. Both methods remove the variable of a long screw digging into the spring that drastically shortens its life. The slide in method requires two people to install the tarp (one to hold and align the tarp while the other pulls it into the slot) and doesn't allow the tarp to be adjusted if the tarp is out of square. The bolt in method takes one person to install versus two and if the tarp is out of square, the tarp can be folded over and reattached to the tarp roller through the grommet.

Spring tension or, more accurately, how the spring tension is held when the tarp is replaced is another cost factor. If the tarp is removed from the tarp roller, the tarp tension must be removed or somehow held in place while the tarp is replaced. Some tarp rollers have a tarp tension retainment method where an optional tarp wrench can hold the tarp tension while the tarp is being replaced. This removes the safety factor of removing and reinstalling the tarp rollers tension while making tarp replacement a true one-person job. Time spent to replace the tarp is considerably lower using this method versus removing and replacing the tarp rollers tension for each and every tarp replacement.

Route Variables and Cost Studies

The route the driver takes is a constant daily variable. As much as we'd like to have all of our loads be consistent, hardly none ever are. Some will have construction debris sticking out the tops of the container, stumps, sticks or land clearing debris sticking out from the sides of the container, sharp scrap metal heaped up in the center, all of this will shorten the life of your tarp and are variables to the tarps longevity. Will a more expensive tarp last longer under these circumstances? Typically yes, but how much longer is a great unknown. Does the increased time between tarp replacements merit the increased price? That's really something that only you can answer.

In closing, the best advice is to look at your maintenance records to see just how often your tarps are having to be replaced. Is there a consistency between tarp changes? If so, you have an ideal candidate to see if the more expensive or less expensive tarps will increase the time between tarp changes, decrease the time or if no time changes. If you try out the more expensive tarp and see an increased time period between tarp changes, does the increased time period between changes justify the more expensive tarp? Bear in mind, there are more costs in tarp changes than just the purchase price of the tarp itself. Truck downtime, mechanics labor, fasteners, etc are all costs that need to be factored into the price of the replacement tarp. | **WA**

The tarp tension tool that holds the tarp tension while you are replacing your tarp.

The tarp replacement procedure.

Sean O'Brian *is President and Co-Owner of O'Brian Tarping Systems (Wilson, NC). He has designed, built, installed, sold and used tarps and tarping systems for more than 15 years. He has done design work in the home office, field supervision of tarp system installations in Singapore to handling national accounts and dealer sales. He can be reached at (252) 291-2141, via e-mail at sean@obriantarping.com or visit www.obriantarping.com.*

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Optimizing Work Truck Performance With Biobased Hydraulic Fluids

Lisa Owen

Biobased chemicals offer innovative solutions to improve work truck performance, WHILE DELIVERING UNIQUE COST AND ENVIRONMENTAL BENEFITS.

TODAY'S BIOBASED CHEMICAL SOLUTIONS HAVE succeeded in debunking the myth that "green" products fail to work effectively for work truck fleets in the waste management industry. Biobased hydraulic fluids not only meet or exceed the performance of conventional, petroleum-based fluids, but also help mitigate operating costs and improve environmental impacts. Biobased cleaners and functional fluids can prove to be a more cost-effective choice for waste management companies by lowering the threat of potential risks to employees and the environment, such as expensive spill response, remediation and fines a company incurs if hazardous fluids are spilled or leaked onto soil, pavement or water during use.

Of particular interest to fleet managers is outfitting waste management fleets with protective, long-wearing hydraulic fluids that optimize hydraulic system performance, help reduce downtime and improve productivity. The specific benefits that biobased products bring to the waste management industry (particularly hydraulic fluids) help managers achieve optimal work truck performance and boast unique advantages over their petroleum-based counterparts. Some of these benefits include:

- Improved equipment protection through superior oxidation stability
- Optimal performance and quick startup even in extreme temperatures
- Reduced wear and corrosion with strong hydrolytic stability and wear protection
- Reduced maintenance costs through increased change over intervals due to longer oil life compared to petroleum-based fluids
- Reduced spill remediation costs, fines due to improved environmental impact and alternative response options such fluids present

Environmentally Friendly Fluids

Municipalities and waste companies encounter a number of issues with their work truck hydraulic systems, such as hose ruptures and fittings failures, that often result in spills or leaks of hydraulic fluid. If accidentally released into the environment while in use, petroleum-based chemicals can cause immediate and lasting damage to the soil and surrounding ecosystem. Readily biodegradable products are defined by ASTM 5864 as those which degrade by at least 80 percent within 28 days. As a result, it is possible to respond to biobased spills differently, which can positively impact spill response times, costs, repairs and operational productivity.

Biobased work truck cleaners also bring substantial value to work truck fleets, as water quality standards continue to become more strict and regulated. Biobased cleaners incorporate demulsifying technologies to keep oil and grime from trucks separate from the water, which is increasingly becoming a strict requirement of municipal water treatment facilities. Biobased products can be used daily, are effective in small quantities and can perform alongside the best petroleum-based products, lifting and removing grease and dirt while leaving surfaces unharmed. Fleet managers looking to reinforce their companies' brands with a "green" focus certainly can look to biobased cleaners as a simple, cost-effective solution.

Creating a Safer Environment

Fleet managers who incorporate biobased hydraulic fluids and cleaners into their work truck operations also have a unique opportunity to build goodwill and further their Corporate Social Responsibility (CSR) programs. Waste management companies can market their use of biobased cleaners, degreasers and hydraulic fluids as a crucial component of their commitment to reducing their operations' impact on the environment. Phasing out petroleum-based chemicals from fleet operations and replacing them with biobased, environmentally safe products reinforces a company's commitment to creating a safer environment for residents of municipalities, which can help fleet managers earn goodwill for their brand and positively differentiate themselves for future contract bids with many municipalities and companies.

Debunking Myths

Many professionals understand that biobased products are safer for the environment, but a great myth still exists that they represent a significantly higher cost. While many fleet managers are starting to see that safer options can work without a performance tradeoff, some still believe the cost is prohibitive. While it is difficult to generalize on comparative pricing and benefits because of the wide range of hydraulic fluid qualities in the marketplace today, we can say that the total operational benefits of biobased hydraulic fluids more than compensate for any difference on a cost per gallon basis.

Another misconception of some fleet managers is that biobased products don't work for their serious applications. Early forms of some vegetable-based fluids failed in extreme conditions like freezing temperatures and high pressures common in industrial hydraulic systems, but innovative base oils and additives have been commercial for years to overcome these early issues. The advanced formulas that make up biobased technology have proven today's safe, biodegradable alternatives do not have tradeoffs in performance. Formulators and raw material suppliers develop biobased products designed to improve safety and efficiency for users and, extensive lab tests and field demonstrations spanning years have proven these biobased options outperform traditional chemical products. For example, vegetable-based stocks offer superior lubricity and anti-wear characteristics, in addition to their being readily biodegradable and safer for employees. Today, biobased products are able to perform in some of the world's most demanding environments—operating equipment and fleets in the extreme cold of Alaska, offshore marine platforms and wind turbines—to name a few.

Waste management companies can think of safer, readily biodegradable technology as a new solution for operational productivity and risk management. For many companies, using hazardous, petroleum-based products brings along a list of risks and liabilities: fines associated with an accidental spill, workers' compensation claims for employee chemical exposure, and the time and cost to clean up materials that are not readily biodegradable. Plus, hazardous materials cost more to ship, store and handle and regulations increasingly restrict options. When considering the performance advantages of biobased products—for example, the anti-wear characteristics of biobased lubricants allowing for longer intervals between fluid changeovers and cleaning formulas that can be used in a lower concentration and without negative impact to effluent water—the additional benefits are considerable. Waste management companies thrive off of new efficiencies in their work truck fleet operations. Biobased chemicals offer innovative solutions to improve work truck performance, while delivering unique cost and environmental benefits. | **WA**

Lisa Owen *is RSC Bio Solutions' (Charlotte, NC) Business Development Director. She brings more than 16 years of industrial business to business commercial development experience including eight years with biobased solvents and renewable resource based plastics from her roles at NatureWorks LLC. Most recently, Lisa served as Business Director of Aftermarket Services for BAE Systems Global Combat Systems. Lisa can be reached at lowen@rscbrands.com.*

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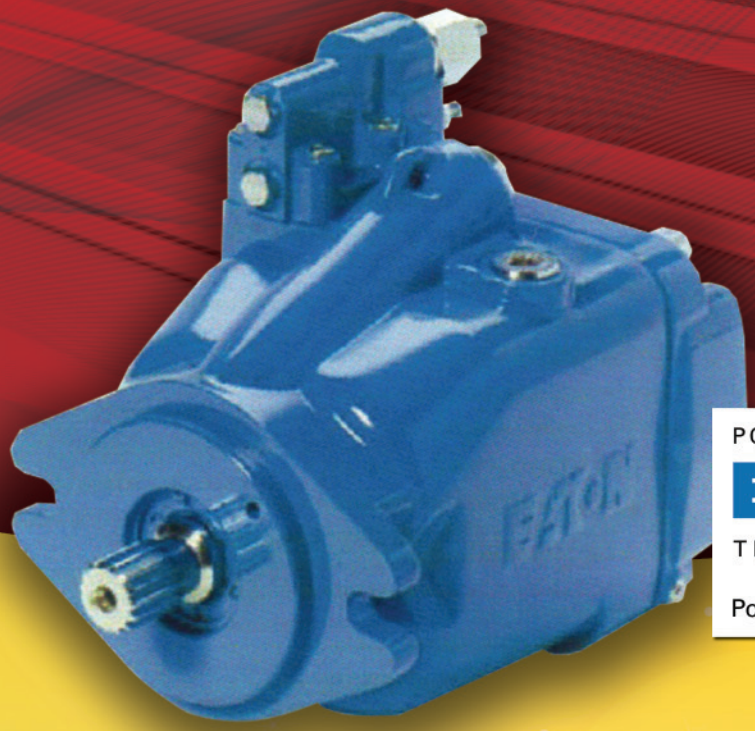

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Fourth of Four Parts

Maintaining Your Power Take-Off

Mikel E. Janitz

Keeping the equipment in GOOD RUNNING ORDER.

THIS ARTICLE IS THE LAST ONE IN A SERIES DESIGNED to help end users, owners and operators to plan the selection, installation, troubleshooting and maintenance of refuse vehicles equipped with power take-offs (PTO) coupled to hydraulic pumps. The series of articles covered the important, and often forgotten, topics mechanics and operators need to be familiar with, and understand, to get the most out of their PTO.

The first articles covered selecting a PTO and then how to troubleshoot the installation. Now that the PTO is selected and installed, it needs to operate correctly over the life of the vehicle. Proper maintenance as well as scheduled maintenance is required to ensure that the equipment will run virtually trouble free (**see Figure** 1).

Initial Maintenance

Maintenance can be divided into several distinct stages. There is the initial stage, short-term stage, duty cycle stages (normal vs. severe duty), and long-term and system stages. PTO maintenance coupled to axillary equipment (for example, extended shafts, pumps or drivelines) requires planning, operational expertise and system knowledge. Keep that in mind as you work to maintain the vehicle.

Prior to starting any maintenance tasks, ensure that the vehicle is stopped, the engine is off, the wheels chalked, and the keys are in a safe and secure place. Working under a vehicle near rotating components is very dangerous. Use safe practices before any work begins and adhere to all safety warnings and precautions.

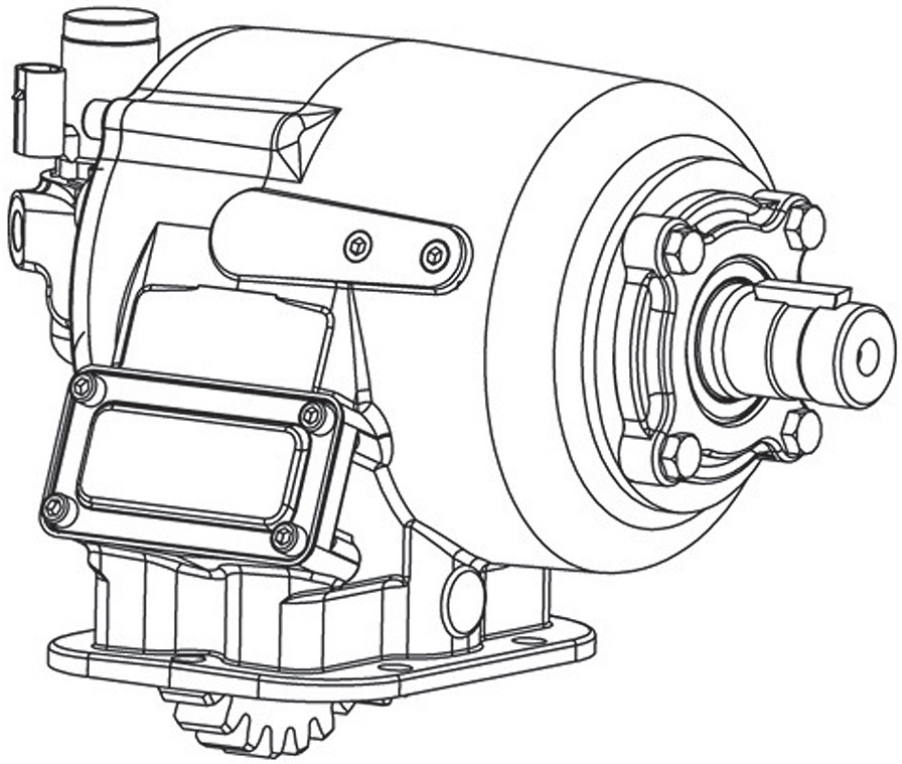

Figure 1 (Above)
A mechanic contemplating the maintenance on the auxiliary system.

Figure 2 (Right)
AA shot of a PTO with an access panel. By removing the fasteners, the inspection plate can be removed to see the internal gears. Good bright lighting is needed to inspect gears. Figures courtesy of Muncie Power Products.

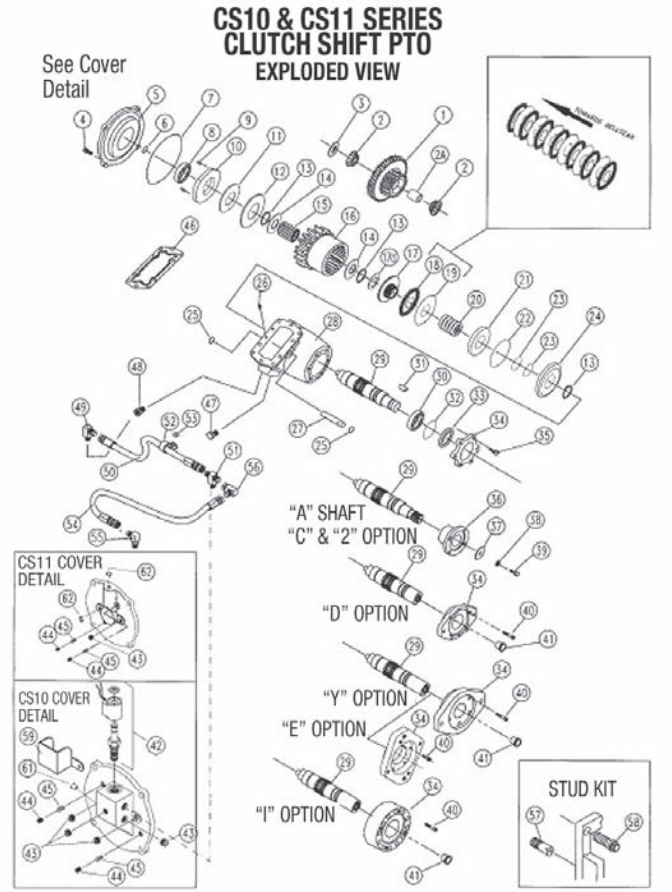

Figure 3
An example of an exploded illustrated parts sheet. These are great sources of information when replacing worn and damaged parts. They also show how parts go back together. Reputable manufactures have theirs up to date on their Web sites.

The initial maintenance can be carried out within the first 24 to 48 hours after first starting up the PTO. Once the PTO and pump have run a short period, they need to be inspected. Make note of the drive train sound; if it is too noisy, further investigation may be required. Let the engine cool down and look for leaks. Make sure to repair leaks if any are found. Re-torque or verify all hardware and fasteners are tight and to spec. Check the transmission fluid level and fill appropriately if low. Now verify that the hydraulic fluid is at appropriate levels at this time and adjust as required. If the equipment was running as expected then that pretty much covers the initial maintenance task.

The next stage of maintenance is the weekly review. The vehicle, at this point, has had the PTO and auxiliary equipment run for quite a while. The truck and hydraulic system has experienced its typical duty cycle multiple times. This is the ideal time to inspect the vehicle for leaks, noise and check hardware for proper torque again. By checking these things now, you can save on a lot of unexpected down time later. It is also important to listen to the PTO and transmission noise level. Listen for rattling, knocking and whining. Noise is a key indicator of maintenance needs. A loud knocking noise can be a sign of gear damage, which needs to be addressed as soon as possible.

Don't forget to look at the indicator lights. Use the indicator lights, if so equipped, logically. If lights are illuminating unexpectedly, read the manual to determine their meaning. Use the illustrated parts sheet to determine location and possible impact. Once you are familiar with the issues, address them at this time to minimize any possible damage to the

system. This is a proactive maintenance step and pays off. This will help with unexpected down time, which can be very costly.

Long-Term Maintenance

After a few months have passed and the early stages of maintenance are behind you, the equipment operator/driver needs to think about scheduling maintenance based on the duty cycle. Duty cycles are either normal duty or severe duty. Simply put, severe duty is defined as a PTO operating more than five minutes out of every 15 minutes. Anything less than that is considered normal duty. Basing your PTO maintenance requirements upon its duty cycle is the logical choice for long-term maintenance needs. The operator knows the equipment, how it functions, how it sounds and sees the results first hand. This knowledge is invaluable when establishing a schedule with the maintenance team.

Typically, normal duty maintenance tasks are established farther apart than severe duty. The harder you work the hydraulic system the more often it needs inspected. Furthermore, depending on the application and historical maintenance data, the work should be adjusted to accommodate changing needs and the overall results of previous maintenance. You may find that there are items needing to be replaced periodically or fluid levels adjusted or simply verifying that the hardware is tight and secure. Make a checklist for the vehicle to document and track the maintenance.

Long-term PTO maintenance should be tied to the regular maintenance suggested by the engine, transmission or vehicle manufacturer. The owner/operator should consider the PTO as an extension of the transmission. When fluid levels on the transmission are inspected, the PTO should be reviewed. If fluid is low, add to it. Then look for any leak source and fix it promptly. Verify fasteners are torqued correctly and the unit is not leaking around the seal. If there are leaks, replace seals as required. If the PTO has a cover which allows gear inspection, remove it and check the gears. Use a good bright light source for inspecting gears. Look for nicks, cracks and worn gear teeth. Replace nicked or damaged gears as soon possible **(see Figure 2, page 26)**. It is not recommended to run equipment with bad gears.

The PTO can also be removed to inspect gears and other components. If serious defects are found, replace the bad gears and contact the manufacturer for guidance if you are unsure how to proceed. Also look for shaft spline wear at the coupling of the PTO and pump. Inspect internal splines and external splines. If the splines are heavily worn it is a good idea to replace before further damage could occur. If a wet spline, look for contamination or leaking seals. Transmission fluid and hydraulic fluid should not mix. Anytime the PTO is rebuilt look at shaft surfaces for worn areas. Replace worn or scored parts immediately. It is a good practice to pack bearings with anti-seize grease if the PTO is disassembled for maintenance or repaired. First, clean the bearing and inspect it; then, grease it or replace the worn out bearing before reassembling.

Regular Maintenance

Lastly, as regular maintenance is carried out on the chassis (frame) it is a great time to inspect and maintain the PTO. In fact, anytime repairs are performed on the vehicle it is a great time to inspect the PTO and hydraulic system. At the time the chassis is being lubed, the PTO should also be lubed if so equipped. PTOs coupled directly to a pump should have their shaft cleaned, inspected and lubed to increase the life of the PTO and pump splines. Use an anti-seize grease or a high temperature, high pressure grease. About an ounce of grease will due in most cases. Clean off the zerk grease fitting after the lube is applied. This will help reduce the amount of dirt and grime collected on the equipment **(see Figure 3, page 27)**. Having clean equipment is a sign of good maintenance.

Keeping your PTO running and in top shape requires only simple maintenance. This can be carried out in short intervals, long term intervals, intervals based on duty cycles or based on manufacture's recommendations. Maintenance can also be based on vehicle performance. The key is, no matter which method picked, maintenance is conducted on a routine basis with good records. Always use OEM replacement parts. Manufacturers provide detailed exploded views with each item identified to ensure parts are easily identifiable and clearly noted allowing the correct part to be replaced. Lastly, keep detailed records of your maintenance. This will streamline future maintenance tasks, as well as improve scheduling and increasing uptime. Basic maintenance conducted at regular intervals will increase the useful life of the PTO and the axillary equipment. Basic maintenance can prevent costly unscheduled downtime and unnecessary replacement of components, in turn keeping your refuse equipment in top shape and in good working order. | **WA**

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The Business Case for Carbon Offsets from Waste Diversion: Waste Digestion and Composting

Scott Hernandez

FOR MORE THAN A DECADE IT HAS BEEN POSSIBLE FOR FARMERS TO generate carbon offsets for methane reduction when they replace their open manure lagoons with anaerobic digesters to capture and destroy methane emissions at dairy and swine farms. Building on this early success, protocols for emission reduction activities have emerged across the waste management sector, and today there are protocols to earn carbon offsets from organic waste digestion and organic waste composting.

Climate Action Reserve

Developing emission reduction project protocols is one of the main functions of the non-profit Climate Action Reserve (the Reserve). It does this by establishing regulatory-quality standards for the development, quantification and verification of greenhouse gas (GHG) emissions reduction projects in North America; issuing carbon offset credits known as Climate Reserve Tonnes (CRTs) generated from such projects; and tracking the transaction of credits over time in a transparent, publicly-accessible system. Adherence to the Reserve's high standards ensures that emissions reductions associated with projects are real, permanent and additional, thereby instilling confidence in the environmental benefit, credibility and efficiency of the U.S. carbon market. While integral to the offset market, the Reserve is not a trading exchange; rather it serves as infrastructure for the issuance and retirement of CRTs.

When the Reserve launched its offset project registry in May of 2008, it quickly became the premier source for voluntary carbon offsets in the U.S. The program has rapidly expanded to include new project types and new geographic areas, especially in the development of protocols that build upon best practices in reducing GHGs in waste management. The Reserve now boasts 11 offset project protocols for use in the U.S. and two for use in Mexico **(see Figure 1)**.

Offset Project Registry

Emissions that result from waste management have long been a focus for offset protocol development due to the potentially large volume of emissions reductions that can result from relatively low-cost, proven technologies and well-established management practices. Waste-related emissions account for 2 percent of U.S. GHG emissions, yet many sources, from farms, restaurants, grocery stores to even our homes and college campuses, remain uncontrolled by regulation and continue as common practice.[1] Therefore, these emissions are a prime target for GHG offset projects. Moreover, it is hoped that establishing offset protocols for the waste management sector will facilitate widespread acceptance of best management practices and standards that are broadly applicable to any place where there is waste.

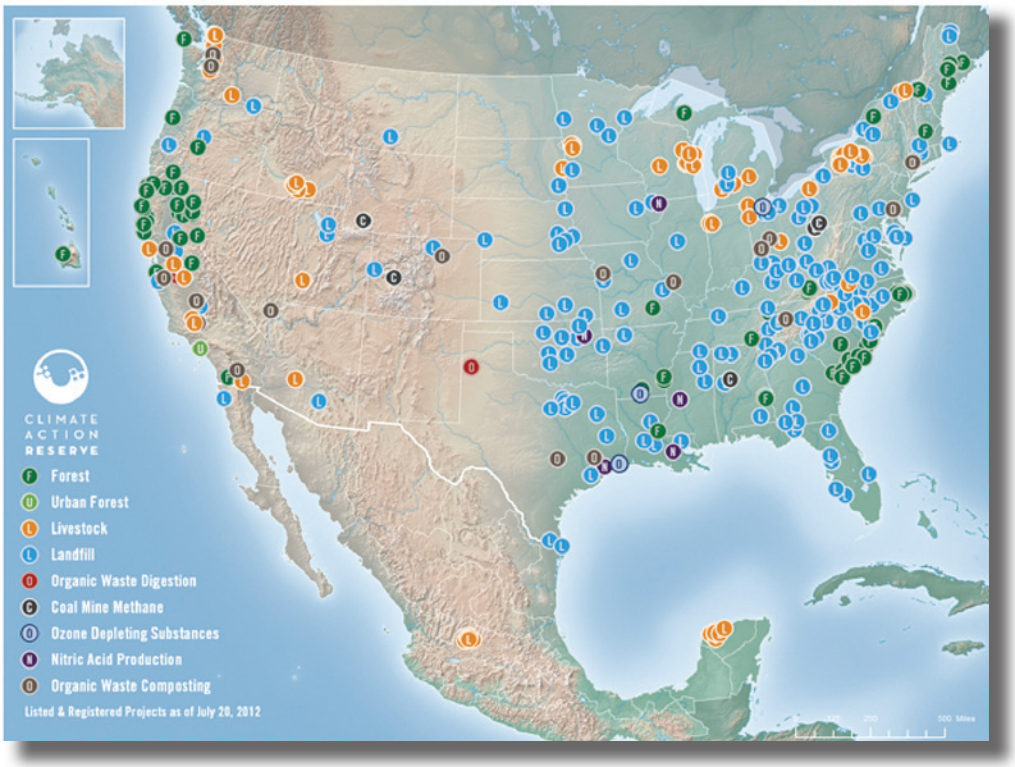

Figure 1: U.S.-Mexico project map.
Figures courtesy of the Climate Action Reserve.

Offsets from Waste Diversion

In addition to the Reserve's protocol for the management of livestock waste **(see Project Eligibility for Livestock, OWD and OWC sidebar, page 40)**, other protocols for waste management include the diversion of organic waste from landfills to either an anaerobic digester or an aerobic composting facility. In the U.S., landfills account for approximately 23 percent of anthropogenic emissions of methane. Many landfills already control their methane emissions, but most do not unless required by law. Yet, even landfills with gas collection and control systems (GCCS) are never unable to collect all of the gas. On average, landfill GCCS systems are only 75 percent efficient.[2] By diverting the waste before it reaches a landfill, the organics can be broken down in a closed digester system, whose collection efficiency is much higher. The credits from these projects are quantified based on the avoided emissions that would have occurred if they were sent to a

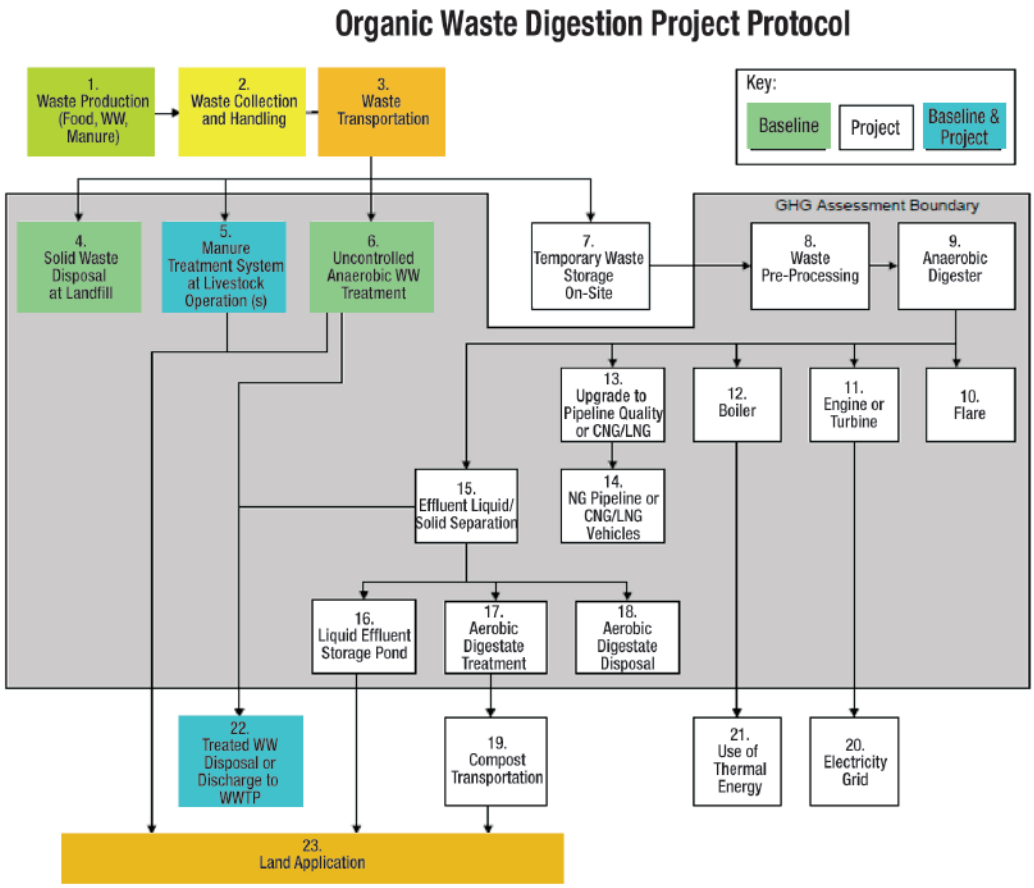

Figure 2: OWD Protocol GHG assessment boundary. Methodology: To quantify the amount of methane that would have occurred had the food waste gone to a landfill (the baseline emissions), a first order decay (FOD) model is used. For each reporting period, the FOD model calculates how much methane the diverted food waste would have produced in the first 10 years after being sent to a landfill. In addition, to create a widely-applicable performance standard, the conservative assumption is made that the landfill would have had a GCCS. It assumes that none of the methane is captured from the newly deposited food waste for a period of three years at the landfill, after which point gas is captured at a rate of 75 percent for the remaining seven years. This standardized approach, recommended by the Reserve's stakeholder work group, is a conservative assumption considering that it is assumed that all landfills have GCCS and are assumed to be operated as if they are regulated according to stringent federal NSPS regulations.

landfill. To this end, the Reserve has developed two protocols targeting the climate benefit of reducing greenhouse gas emissions by diverting organic waste from landfills: the Organic Waste Digestion and Composting Project Protocols.

Organic Waste Digestion Project Protocol, Version 2.0

Originally adopted in October 2009, the Climate Action Reserve released version 2.0 of its Organic Waste Digestion (OWD) Project Protocol in June of 2011. The OWD protocol is designed to give credit to projects that divert eligible organic wastes, including MSW food wastes and agro-industrial wastewater, from landfills and wastewater treatment plants and send the waste to facilities with anaerobic digesters. The digesters maximize the production of methane from the anaerobic decomposition of the organic waste, and capture the methane gas so that it can be destroyed. The methane destruction can occur onsite or offsite, using a flare, generator, fuel cell, pipeline or CNG vehicle.

As with all methane destruction protocols adopted by the Reserve, credits are given for the baseline avoided emissions, minus any emissions associated with the project itself, such as transportation emissions of delivering eligible waste streams to the digester. There are four main components involved in determining the eligibility of an OWD project:

1. *Location*: The project must be located in the U.S. or its territories (versions for Mexico and Canada may be developed at a later date)

2. *Project start date*: The project must be submitted no more than 6 months after their operational start date (i.e. the date in which the eligible feedstock is first loaded into the digester)

3. *Additionality*: The project must meet the performance standard (above and beyond business as usual) and not be required by any federal, State or local regulation.

4. *Environmental Compliance*: The project must be in compliance with any and all relevant environmental regulations.

Project Eligibility for Livestock, OWD and OWC

Each protocol outlines in detail the requirements for implementing successful project; credits are given for the baseline avoided emissions, minus any emissions associated with the project. There are four main common components involved in determining the eligibility of Livestock, OWD and OWC projects:

1. *Location*: The project must be located in the U.S. or its territories (versions for Mexico and Canada may be developed at a later date)
2. *Project start date*: The project must be submitted no more than 6 months after their operational start date (i.e. the date when the digester/composting facility begins to receive the eligible waste)
3. *Additionality*: The project must meet the performance standard (above and beyond business as usual) and not be required by any federal, state, or local regulation.
4. *Environmental Compliance*: The project must be in compliance with any and all relevant environmental regulations.

Crediting for Waste Diversion Protocols

Livestock, OWD, and OWC projects are all eligible to earn offset credits for a 10-year period beginning on the project's start date. Once completed, a project can apply for a second, 10-year crediting period. However, each project must meet the requirements of the most recent version of the protocol when applying for a second crediting period.

The Reserve's Livestock Project Protocol

The Reserve's Livestock Project Protocol, currently on Version 3.0, was developed in 2007, and has received periodic updates and revisions since that time. According to the protocol, a project can receive credits for installing an anaerobic digester, which serves as a biogas control system (BCS), at a dairy or swine farm where previously the manure waste was treated under anaerobic conditions in an uncontrolled pond or lagoon. Manure treated and stored under anaerobic conditions decomposes to produce methane, which, if uncontrolled is emitted to the atmosphere. So projects that capture and destroy this highly potent GHG can earn CRTs for the emissions that would have occurred in the absence of the BCS. One of the many benefits of using anaerobic digestion for management of livestock manure and organic waste is the destruction of methane (CH_4), a highly potent GHG with a global warming potential (GWP) of up to 25 times greater than that of carbon dioxide (CO_2).[1]

Currently, 74 dairy and swine manure digester projects have been submitted to the Reserve from 16 U.S. States, as well as another 21 from Mexico. Together these projects have generated more than 800,000 CRTs, each of which represent the reduction of 1 metric ton of carbon dioxide equivalent ($mtCO_2e$).

Note

1. Shindell, D. T.; Faluvegi, G; Koch, D. M.; Schmidt, G. A.; Unger, N.; Bauer, S.E. 2009. Improved Attribution of Climate Forcing to Emissions. Science 326 (5963): 716-8.

Compliance Period	Year	Allowance Budget (mt CO_2e)	Total Offset Demand
First (narrow scope)	2013	162,800,000	26,800,000
	2014	159,700,000	
Second (broad scope)	2015	394,500,000	91,784,000
	2016	382,400,000	
	2017	370,400,000	
Third	2018	358,300,000	83,104,000
	2019	346,300,000	
	2020	334,200,000	

Figure 3: Forecasted compliance offset demand (2013-2020).
Figure courtesy of CARB Final Cap-and-Trade Regulation, October 2011. California Code of Regulations. Subchapter 10 Climate Change, Article 5: California Cap on Greenhouse Gas.

See **Figure 2, page 31,** for a comprehensive chart outlining the activities that are included in a project.

The Protocol allows for multiple forms of biogas use as long as its ultimate fate is combustion in a form that can be independently verified. As a result, many project operators are able to displace grid electricity with renewable energy from biogas use. However, the Protocol does not quantify and give credit for any emissions reductions associated with the displacement of grid-connected electricity. Because electricity is already regulated for its embedded GHG emissions in California, and the mission of the Reserve is to develop protocols with the intent to serve into the California compliance market, such emissions reductions are not eligible for crediting under the Reserve program.

In cases where the digester facility is accepting waste as part of a State, local or federal mandate, the Reserve cannot issue credits for the resulting emissions reductions. In short, any legally-binding waste diversion mandate violates the protocol requirements for *additionality*. That is to say that if the project is required by law, then it would have occurred irrespective of the incentive provided by the carbon finance. Nevertheless, in such instances partial crediting is allowed for any additional emissions reductions that occur as a result of waste diversion that goes above and beyond that required by the mandate. For example, in jurisdictions that are under a mandatory organic waste diversion target, no credit will be given until that target is achieved. However, the project can earn credits for the waste diversion once the target has been achieved. For instance, under California's Assembly Bill 939, local jurisdictions must meet a target of 50 percent organic waste diversion. As a result, organic waste will only be credited if originating from jurisdictions that already meet this target without the diversion of the project waste. It is important to note, that projects located within jurisdictions that have waste diversion "goals" or "targets" are fully eligible to earn credits as long as the non-binding diversion goals do not impose any sort of penalty.

Moreover, opportunities for co-digestion of livestock manure and eligible organic waste exist as long as the project meets the requirements of the most recent versions of both respective Reserve protocols for each waste stream. Therefore, a facility such as a wastewater treatment plant that has the capacity to co-digest manure with other organic waste can do so and earn additional credits. However, in such a case, the project must satisfy the requirements of both the Livestock and Organic Waste Digestion Project Protocols in order to receive additional CRTs for co-digestion of livestock manure and organic waste and/or organic loaded wastewater.

Organic Waste Composting Project Protocol

Adopted in June 2010, the Reserve's Organic Waste Composting (OWC) Project Protocol builds upon the OWD protocol. It provides a standardized approach for quantifying and monitoring the GHG reductions from projects that avoid methane emissions to the atmosphere through the diversion and composting of municipal food waste and non-recyclable food soiled paper that would have otherwise been sent to a landfill.

Similar to the OWD protocol, wherein waste is diverted from landfills to an anaerobic digester to capture and destroy methane emissions, the OWC projects divert waste to an aerobic composting facility where the waste is composted in a system that complies with best management practices such as forced aeration and turned windrow composting, which consists of arranging the compost in long piles that are periodically aerated by driving along the row and turning it.[2] By treating the waste in this manner, it decomposes aerobically, thereby eliminating the production of methane gas. To date, just under 25 waste diversion projects have been submitted to the Reserve. Of these projects, only 1 OWD and 2 OWC projects have been registered accounting for just under 45,000 CRTs issued. Currently, the Reserve's Organic Waste Protocol is undergoing a revision. The Reserve will be soliciting public comments on the proposed protocol update, beginning in January, and plans to release Version 1.1 of the protocol in March or April of 2013. For more information, visit www.climateactionreserve.org/how/protocols/organic-waste-composting/rev.

Carbon Markets

Throughout its relatively brief history, the carbon market has been beset by significant price variability and instability, resulting in financial uncertainty for waste managers, farmers, project developers and investors. During the latter half of the past decade, however, new, more stringent standards have emerged, instilling greater confidence and environmental integrity. At the same time, buyers' preferences have shifted toward offset programs that use stringent standards and operate in an open and transparent manner. The Reserve has been instrumental in this "raising of the bar" for transparency, offset quality and integrity in the North American offset market.

In addition, there have been significant steps forward in the formal development and implementation of compliance markets for carbon offsets. In particular, the state of California finalized the regulations for its cap-and-trade program, creating a new market for carbon offsets to be used for compliance. For waste managers and dairy farmers this means significant increases in the growth and stability in the demand for their credits, resulting in upward pressure on prices. Prices for compliance-eligible offset credits have recently been trading in the range of $6 to $9/ton (as of late August 2012; this is subject to change). This price premium is especially pronounced in comparison to non-compliance offset credits, which are currently trading in the range of $1 to $4, reflecting perceived demand for offsets for use in compliance markets. Analysts expect the prices for offset credits that are eligible for use in California cap-and-trade program to rise steadily as the program matures and the "cap" on emissions comes down.

California Cap-and-Trade Program and the Role of Offsets

In 2006, the state of California adopted Assembly Bill 32 (AB32), the *California Global Warming Solutions Act*, which mandates the state to reduce statewide greenhouse gas emissions to 1990 levels by 2020 (a reduction of about 15 percent from current emissions). In order to achieve the ambitious emissions reductions targets mandated under AB32, the California Air Resources Board (CARB) developed a statewide cap-and-trade regulation, which was formally adopted in October of 2011. The program is scheduled to take effect in January 2013 and run through 2020.

The main component of California's compliance market will be tradable emissions permits known as allowances, each representing 1 metric ton of CO_2 equivalent ($mtCO_2e$). In addition, the regulation allows emitters to satisfy their annual compliance obligation with carbon offsets for up to 8 percent of their emissions. For example, a regulated entity in California that emits 1 million $mtCO_2e$, can use 80,000 offsets to meet their compliance obligation for that year, effectively reducing their cost of compliance. So far the CARB has adopted four of the Reserve's project protocols for use as compliance offsets: Livestock, Forestry, Urban Forestry and Ozone Depleting Substances. These projects may be located anywhere in the U.S. and its territories, which is important because it means that utility plant operators, farmers and waste facility managers across the country can develop and sell to regulated entities in California. Once the program has successfully launched, the CARB has indicated that it will consider additional protocols, including Organic Waste Digestion and Organic Waste Composting, for possible inclusion in the cap-and-trade regulation. However, currently, credits from organic waste digestion and composting projects are only bought and sold in the voluntary market.

The cap-and-trade program will consist of three compliance periods, the first running from 2013 to 2014. Beginning in January 2015, the "cap"

Additional Resources

There are a number of resources available to learn more about carbon offsets and the Project Protocols on the Reserve Web site at www.climateactionreserve.org. There you can download the protocol, as well as the Program Manual that outlines the processes and procedures that must be adhered to in order to successfully implement an emission reduction project according to the Reserve's standards.

For more information regarding past presentations and videos from previous workshops and Webinars related to livestock carbon projects, visit the Reserve's Web site at www.climateactionreserve.org and click on the Presentations link.

For information related to the various participants in the carbon markets, visit www.climateactionreserve.org/how/crt-marketplace, which provides links to companies involved with buying and selling CRTs, who can help a project learn more about accessing the financial markets for their CRTs. It is important to note, that the Reserve is not a broker, retailer or otherwise a seller of CRTs. The Reserve simply acts as a publically-accessible ledger for registering projects and the emissions reductions they generate.

Climate Action Reserve: By the Numbers

- Total Projects: 487
- Registered: 152
- Listed: 211
- States with Projects: 45
- Total CRTs Issued: 28,255,035
- Account Holders: 385

OWD Protocol v 2.0: Eligible Waste Streams

Municipal Solid Waste (MSW) Food Waste: Non-industrial food waste commonly disposed of in a MSW system, consisting of uneaten food, food scraps, spoiled food and food preparation wastes from homes, restaurants, kitchens, grocery stores, campuses, cafeterias or similar institutions.

Food-Soiled Paper Waste: Non-recyclable paper items that are co-mingled with eligible food waste, consisting of paper napkins and tissues, paper plates, paper cups, fast food wrappers, used pizza boxes, wax-coated cardboard and other similar paper or compostable packaging items typically disposed of in a MSW system.

Agro-Industrial Wastewater: Organic loaded wastewater from industrial or agricultural processing operations that, prior to the project, was treated in an uncontrolled anaerobic lagoon, pond or tank at a privately-owned treatment facility. Excluded from eligibility based on the Reserve's performance standard analysis are wastewasters produced at breweries, ethanol plants, pharmaceutical production facilities, and pulp and paper plants.

Performance Standard

Rather than measuring emission reductions on a case-by-case basis, which would require tremendous time and effort, essentially reinventing the wheel with each project, the Reserve uses a standardized approach, developing performance standards that build on best practices in an entire industry such as dairy and swine farms or municipal waste management.

Once the "best practice" is developed, then businesses are rewarded credits for how much they reduce their own emissions relative to the performance standard for their industry.

on emissions will expand from a "narrow scope", covering only large, stationary-sources, to a "broad scope" when transportation fuels and electricity will be brought under the cap. At that point, 85 percent of economy-wide emissions in California will be covered under the cap.

As illustrated in **Figure 3, page 40**, CARB anticipates the market demand for offset credits to be used for compliance in California will be 13 million tons per year for the first two years, rising to approximately 27 million tons at the start of the second compliance period in 2015. The regulation includes a minimum price (price floor) of $10 per ton for allowances, so offset projects can expect similar prices when they sell their credits. That said, many market analysts predict robust demand for compliance offsets to drive prices to upwards of $70. For example, Barclay's Capital estimates that prices for compliance offsets will reach $68 during the third compliance period (2018 – 2020).[3] If such forecasts are realized, then the prices for compliance offsets, such as those generated by the Reserve's Livestock Project Protocol and potentially others, should provide ample incentive for waste managers and dairy farmers—not to mention cities and municipalities—to invest in proven technologies to capture and destroy greenhouse gas emissions.

Implementing a Project: The Reserve Process

The Reserve's project protocols each provide protocol-specific guidance regarding the monitoring, reporting and verification requirements. Every year, the project operator must submit project documentation—each individual project must go through verification by an independent third-party. It is only after this verification is successful that CRTs are issued. To this end, the Protocol should serve as a step-by-step guide to walk the developer through the process of listing, verifying and registering the project.

The process of submitting a project is very straightforward. The system is designed to streamline the complex process of carbon offset quantification, making it easier for project developers to make emissions reductions occur at a faster rate. Developers will open an account on the Reserve system, submit the documentation for their project, which is then reviewed by Reserve staff for completeness and general eligibility, and then the project is publicly listed in the Reserve system. Once the project has been operational and reductions have occurred and been quantified, the developer will hire an accredited verification body to verify their project. The verification documents are submitted to the Reserve and reviewed by the staff. Upon successful completion of verification the project attains the status of "Registered", and the appropriate number of CRTs are issued into the developer's account. At that point they are active credits which can be held, transferred or retired. The process, from the time a project is submitted to the time it begins earning CRTs, varies by project-type, and generally takes between 6 and 24 months.

Time to Get on Board

Despite a checkered past, carbon markets are strong and there is consistent demand for livestock CRTs, and digester technology has matured greatly in the past few years. There are many resources available to those who want to learn more and get involved. The timing has never been better for livestock and organic waste operations to install renewable energy technologies such as anaerobic digesters to begin managing their GHG emissions not only to benefit the environment, but also to enhance their bottom-line. By implementing innovative best practices for waste management outlined in the Reserve offset protocols for waste management, such as composting and anaerobic digestion, waste managers can diversify their balance sheets with the addition of carbon revenues. | WA

Scott Hernandez *is the Business Development Manager for the Climate Action Reserve (Los Angeles, CA). He works on the development and implementation of strategies to promote the Reserve and its protocols to a wide range of audiences, including project developers, regulated businesses and voluntary offset buyers. Prior to joining the Reserve, Scott worked as an Energy and Climate Change Specialist at the Association of California Water Agencies (ACWA) in Sacramento. In addition to advocating to California's State regulatory agencies on behalf of public water agencies, Scott led initiatives to facilitate the adoption and implementation of onsite renewable energy and water-and-energy efficiency technologies at water agencies throughout California. He can be reached at (213) 542-0295 or via e-mail at shernandez@climateactionreserve.org.*

*** In December 2012, the Climate Action Reserve was formally accredited by the State of California as an Offset Project Registry to provide registry services under the State's cap-and-trade program.*

Notes

1. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007. http://epa.gov/climatechange/emissions/usinventoryreport.html

2. Organic Waste Project Protocol, Version 1.0; The Climate Action Reserve: www.climateactionreserve.org/how/protocols/organic-waste-composting.

3. Brinson, J. P., S. Renas, and D. Firger. 2011. California's Cap-and-Trade Regulations: Design Elements and Outstanding Issues. J. BNA. Daily Env. Report. 245.

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Biogas 101: Making Biogas from Organic Wastes

Paul Greene

ORGANIC WASTES HAVE CONSIDERABLE POTENTIAL FOR CREATING clean, green renewable energy. By recycling food scraps, yard wastes, sludges and commercial kitchen wastes, valuable landfill space can be preserved. In spots in the U.S., disposal capacity is at a premium and there is momentum to restrict landfilling of organics and diverting them to higher uses.

The most common technique for generating energy from these wastes is called anaerobic digestion (AD). While quite established in Europe, AD is fairly new to the U.S. market for managing food wastes. The technique can be applied in two different approaches, wet digestion and dry digestion. A wet system runs at 3 to 10 percent solids slurry concentration in a mixed tank using wastes in a pumpable form. A dry system, on the other hand, digests wastes that are stackable where their solids levels are in the 15 to 30 percent range.

Gas Yield

In order to properly model digester performance, tip fee revenue and power generation revenue, it is important to start by characterizing the feedstocks available. The accepted industry standard test for calculating energy yield is called the Biomethane Potential Test. During this test a specific feedstock, or "substrate" as they are known, can be tested to show how much renewable gas, or biomethane, can be produced per ton of waste. Generally materials that are high in fats and proteins can give very high gas yield and produce more energy revenue.

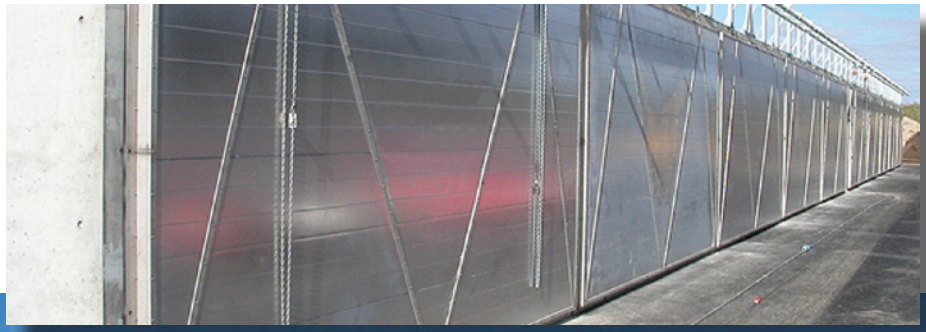
Contamination

It is critical to understand the level of packaging and contamination as well as what type of package or bag the organic waste streams will be shipped in. Generally pre-consumer wastes such as cafeteria food waste and food industry processing waste are easier to manage versus post-consumer wastes as there is less contamination and packaging. Curbside collected green wastes can contain significant contamination and undesirable components. While chicken bones and peach pits, for example, are indeed considered food waste it doesn't necessarily mean they are the best digester feed materials. While paper products can provide some buffering capacity in a digester, they have poor gas yield and are preferably removed ahead of a digester.

Taking in expired and damaged food products that are in a package can represent a significant differentiator for an AD facility. Technologies that can break or slice open a plastic or glass package and remove the contents are more commonly applied and can be very efficient. Macerators, grinders and chopper pumps are widely applied to convert solid foods into more readily digestible forms.

Wet Systems

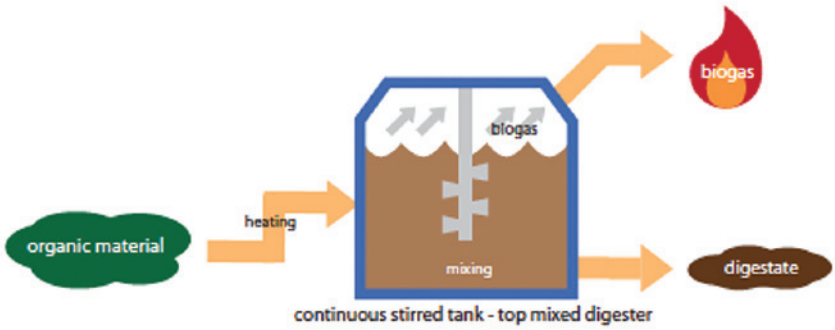
In order to provide proper operation conditions for the bacteria, wet AD systems typically run at 95°F. This temperature level is considered a mesophilic condition and sometimes warmer, "thermophilic" conditions are at roughly 140°F. Detention times range from 20 to 40 days to maximize



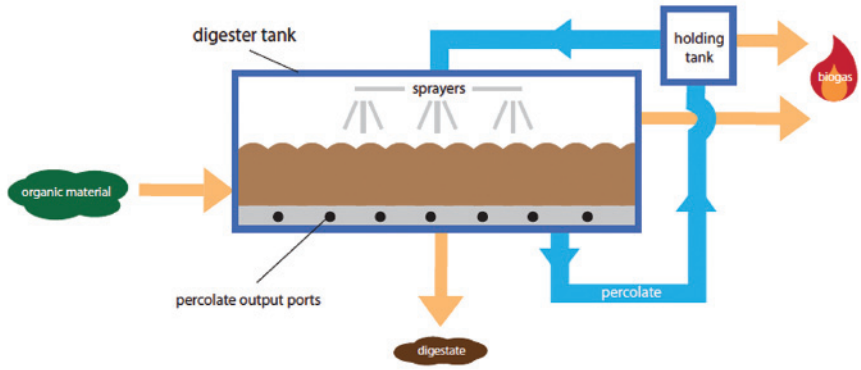
Left: Typical dry digester. Photo courtesy of Aikan/TurningEarth, LLK.
Bottom: Typical wet digester. Photo courtesy of Anaergia,Inc.

the amount of gas produced and the destruction conversion efficiencies. Some facilities will incorporate a short, hot heat treatment cycle of 170°F for an hour in order to more thoroughly pasteurize the material if pathogen considerations are an issue in the resulting solids. "Free" heat is captured from the onsite engine generator and recirculated in a hot water loop through the tank.

Resulting liquids and solids from the wet digester have high nutrient levels and are considered good fertilizers. Food waste digesters that partner with dairy farms can dewater the solids and return them to animal barns for bedding materials and use the liquid nutrients on their crop fields. Facilities in more urban settings will need to evaluate local standards and costs for discharge of the liquid digestate fraction as elevated organic levels (measured as Biochemical Oxygen Demand) and nutrient loadings can prove costly to dispose of. These urban digesters can be candidates for their own wastewater processing system or for nutrient purification technologies and can look at recovered nutrients as revenue generators. Liquid digestate is dewatered in a centrifuge and resulting solids can be excellent feed material for further composting and sale of pathogen-free produced compost.



Biogas systems, dry digesters.



Biogas systems, wet digesters.
Images courtesy of the American Biogas Council.

Dry System

Dry AD systems rely on being able to stack the wastes in a fixed pile. This can require a mix of 1:2 to 1:4 food waste to green waste to give waste piles needed structure and porosity. After a few days of being charged with wastes, the dry AD unit is sealed and the multi-week process of digesting the material begins. First, the pile is kept wet by spraying hot water on the stack. This liquid has been naturally seeded with innoculum bacteria over time and is collected at the bottom of the stack after its has percolated through the pile and leached out partly digested organics. Once collected, the material can be sent to a nearby mixed digester tank where biomethane generation occurs. Digester units are run at 95°F and are heated by capturing the waste heat from the onsite biogas engine generators.

Wastes are commonly digested in a dry reactor for three to four weeks. After such time they can be removed and further composted nearby or, depending on the reactor design, kept in place and operated as an aerated static pile composting unit.

Power Generation

AD units produce roughly eight cubic feet of methane for every pound of organic matter they digest on average, depending on the waste mix. This methane comes out of the digester at 50 to 70 percent purity. From there, many options for capturing the gas' Btu value can be exploited.

Commonly, digester gas is first dried as it comes out of the digester fully saturated with water vapor. Drying can be done with drying filters or by use of refrigeration units. Sometimes removal of hydrogen sulfide gas is required by media filters or by biological units that convert the H_2S to an innocuous form of sulfide.

The raw digester gas is at a very low pressure, expressed in inches of water column. Pressurization is needed to get it up to a higher pressure to properly filter it or send it to combustion or as vehicle fuel. As some utilities will pay a fair price of over 10 to 12 cents or higher per kwh for biogas generated power, the use of either an engine generator or fuel cell can be practical to introduce power onto the grid. With the current softness in natural gas prices more vehicle fleet operators are looking at CNG fueling of their hauling fleet. This trend lends itself to easy adoption of purified biomethane from digester gas for fueling fleet vehicles.

Policy

In some spots across the U.S., government policies are in place to encourage development of AD projects. Recently, the American Biogas Council was created to develop more equitable policy treatment for anaerobic digester projects and to educate the market on the technology's benefits. However, much work needs to be done. Historically, the renewable energy value of digesters has only been appreciated when these projects create electricity with their resulting biogas and the incentives have not been at parity with other renewable energy sources. With crude oil prices staying high, the future is bright for projects that create renewable natural gas. | WA

Paul Greene *is Vice President of O'Brien & Gere Engineers (Bridgewater, NJ), a top 100 Environmental Contractor and builder of Anaerobic Digesters. He is also a Director at the American Biogas Council and blogs at www.digester.com. Paul can be reached at paul.greene@obg.com.*

Much Ado About Scale

Rashael Parker

WASTE CONVERSION, AN INDUSTRY DECADES INTO ITS MATURITY AND widely adopted in Europe, has been struggling to find a foot-hold here in the U.S. This is the result of several influences, including: the U.S. is not yet experiencing a critical level of landfill scarcity; dark clouds of myth and misconception hang over the technologies; the investment community is painfully allergic to technical risk and has an aversion to the "serial number one"; and the industry's marked obsession with scale.

As the number of emerging conversion technologies grow, the quest to find the "holy grail" of scale intensifies. Communities and developers have shifted from whether they should implement waste conversion to the question "Which technology and what scale?" While industry leaders organize and set benchmarks for technologies to determine which should be considered as major players in the conversion space.

One such benchmark, set for waste-to-biofuel projects, defined success at approximately 400 tons per day capacity by stating fuel production would be expected at or above 5 million gallons, annually. The bar was set even higher, at the 500 to 1000 tons per day range, from a waste journalist who stated the benchmark should be set at tonnages similar to those received at a small landfill. It is not all that surprising that here in America where "size matters" and we "go big or go home." But for an industry that has been struggling for headway since the 1970s, is the "bigger is better" approach the best pathway to market penetration?

The temptation to achieve utility-scale commercial operation and successfully lock down the role of "first mover" is incredibly juicy. The media attention, investor interest, academic accolades and development opportunities that will open up for this "first-of-its-kind" facility will be vast and the companies behind the project will secure a substantial head start. With the recent climate legislations, rising energy costs and increased tipping fees, a waste conversion revival occurred with enough momentum to get several of these "first-of-its-kind" projects into the construction/planning phase. Yet, all of them have hit significant, time-killing, money-burning barriers in their efforts to get off the ground. Most of these barriers were a product of scale.

First, utility-scale projects are capitally intense ranging in the $150 to $300 million dollar range. Finding investors and financing options at this level, for a "serial number one" is no simple task. Coincidentally, these projects require massive waste and off-take agreements. The facility must be able to secure and contract a long, steady supply of waste. Without these waste guarantees the facility is at risk of falling short of its economic projections resulting in investors bailing and eventual closure. When the majority of waste fluctuates seasonally or is locked up in long-term contracts with waste management giants, finding this steady supply of waste is an arduous endeavor. Often a project finds itself on one of two sides: either competing directly with the waste giants or being dependent on their partnership.

Additionally, facilities at utility-scale are producing critical product quantities requiring complex power-purchase and off-take agreements. If the plant is producing electricity this requires connecting and meeting the regulations of the local utility grid. Utilities are in the business of consistent, stable energy and a plant producing 35 to 70 MW will not have room for error. Biofuels don't require plugging into the grid, but often still require refining, upgrading and/or blending by an established off-take customer.

Even when projects are able to get past these initial barriers, they tend to be more susceptible to the dark clouds of misconception. Nearby communities, environmental extremists, competitors and local legislatures may use general lack of awareness and confusion to build up uncertainty, fear and frenzy around the proposed facility, causing residents, permitting officers and other city boards to put the project on hold or even derail the project completely, prompting companies to abandon U.S. developments and look for international opportunities.

This track record has caused companies like Sierra Energy (Davis, CA) to seriously question the "bigger is better" approach. The waste gasification company acknowledges the allure that comes with economies of scale and first mover advantage. During their growth, Sierra Energy's gasifier, a modified blast furnace, has caused the company to consider several large-scale opportunities. However, on a white board at the company's headquarters, a quote from Albert Einstein is scrawled, "We cannot solve our problems with the same thinking we used when creating them." For Sierra Energy, this is especially relevant to how communities have historically viewed and managed waste, and has moved the company to follow a less traditional, community-scale, distributed approach to waste conversion. "The waste management model where cities are contracted to meet waste quotas, three different trucks drive down the same street for collection, then waste is hauled some 100 miles away to become a mountain of polluting trash just isn't sustainable," says Mike Hart, CEO of Sierra Energy. "Yet planting a huge waste conversion facility at the end of that scenario isn't the answer either."

Hart believes waste management should happen on the community level, creating a use for non-recyclable waste close to its source and creating jobs and energy right where they are needed and consumed. He sees the companies who either can only function economically at utility-scale or who are racing to build the first big system as having a long, hard road ahead of them. In the meantime, there is opportunity for waste conversion to broadly penetrate the market through small, affordable systems.

Projects at community-scales can be implemented in more places, even rural or geographically limited areas. They require significantly less capital investment which opens up more financing opportunities. Smaller systems also allow for the community to better understand the potential benefits of the system and for the developer to respond one-on-one with any questions or concerns about the solution. Plus, they wouldn't require direct competition with the waste giants, at least not initially. The challenge for small-scale systems has been getting the economics to pencil out and the lack of equipment resources for emission control, end-product upgrading and energy generation at their disposal. However, this is becoming less challenging as companies such as Velocys, GreyRock Energy, Kiverdi, Ballard Fuel Cells, Capstone Turbine, Fuel Cell Energy and Caterpillar are all developing processes and offering syngas compatible products at the community-scale. "People are excited about waste conversion and want to put it to application right now. Overall more companies are responding to that demand and, in the meantime, transforming the vision for successful waste conversion installations." Hart continues. "Building a giant facility is not the only way to reach success."

An Australian study "Review of Small Scale Waste to Energy Conversion Systems" agrees saying there is no technical reason why small-scale systems could not become more widespread and with the right logistics could be widely accepted as a measure to manage waste. That begs the question, is this scale obsession much ado about nothing? | **WA**

For more information, e-mail info@SierraEnergyCorp.com or visit www.SierraEnergyCorp.com.

Case Study: Sustainability in an Urban Environment Through Anaerobic Digestion

Amy Macaulay

THE RECENT REPURPOSING OF AN OLD, ABANDONED MEAT PACKING plant has brought new life to a distressed neighborhood while also providing solutions to common waste management issues. The Plant, an urban agriculture venture in Chicago, will be doing its part to divert 5,000 tons of organic waste, normally destined for landfills, to an onsite anaerobic digester. The digester, a horizontal plug-flow, high-solids system supplied by Eisenmann Corporation (Crystal Lake, IL), will process the waste into biogas to be converted to electric and thermal energy. The use of anaerobic digestion technology will help The Plant to achieve its goal of becoming a zero waste, zero net energy and completely self-sustaining facility.

The Plant

In July 2010, entrepreneur John Edel purchased an empty factory in south Chicago's historic Back of the Yards Neighborhood, which in the early 1900s was the world's biggest industrial complex for meat processing. However, Edel had very different plans for putting the historic structure to new use—plans that ultimately involve waste diversion and organic waste to energy through anaerobic digestion. In its crumbling halls he founded The Plant, an urban farm comprised of agricultural and various small food businesses.

The Plant is a new kind of non-profit organization housed in an old, 93,500 square foot building. The premise here is a truly self-sustainable system featuring repurposed building materials, food production, economic development and renewable energy created onsite. They are connecting outputs of one business to the inputs of another to harness the value from materials that most people would throw away. Driven by a desire to tackle environmental and social problems, The Plant's mission is to promote closed-loop food production and sustainable economic development through education and research. This will include fighting the food desert epidemic, creating green jobs, diverting waste from crowded landfills and providing renewable energy to reduce their carbon footprint.[1]

Many urban areas face a significant problem with distressed industrial neighborhoods like the south side of Chicago and the former stockyards. Today, these once-flourishing manufacturing districts often have become both visually and economically draining on a city. The U.S. Department of Agriculture has also determined most of these areas to be food deserts, defined as urban neighborhoods and rural towns without ready access to fresh, healthy and affordable food. People who live in these areas, estimated to be 23.5 million Americans, experience physical and economical barriers to accessing healthy foods, including the availability of nutritious foods, the affordability of foods or just a lack of access to food retailers.

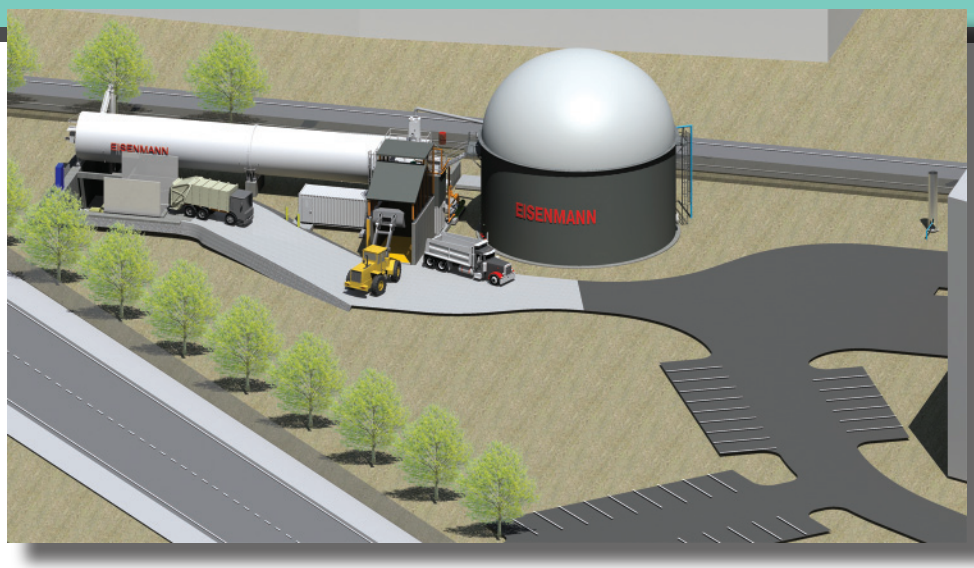
Urban farms like The Plant provide a way of addressing food deserts of this kind. Making full use of available space, including roofs, agricultural produce including vegetables, grains and fruit are cultivated on several floors. The Plant is also currently home to an aquaponics facility which combines food hydroponics with fish-farming. Projects like this are often made possible by current national and local government programs and efforts. There are numerous grants available and ordinances being developed and passed that support the development of sustainable programs and strategies seeking to eliminate food deserts.

A general image of a basic Eisenmann anaerobic digestion system. The one at The Plant will look very similar to this once completed. Image courtesy of Eisenmann Corporation.

Zero Waste Strategy

Edel's vision goes far beyond merely supplying the local population with nutritious food options. By offering low rent and low energy costs, The Plant plans to incubate small food-production and retail businesses (currently a bakery, kombucha brewery and shared commercial kitchen). This is projected to create 125 new, green jobs and startup opportunities, raising the area's economic growth potential.

To add even more benefit, the ecological principles underlying the project call for a zero waste and a zero net energy strategy. An additional goal to building the small food-production businesses is to establish a network of enterprises where the (waste) product of one serves as a resource for others. This self-sufficient, internal recycling system allows for the businesses to grow together while also successfully diverting waste. For example, grains from the brewery will feed the fish, solid waste from the fish will be used as nutrients for the plants and clean water provided by the plants will go back to the fish.



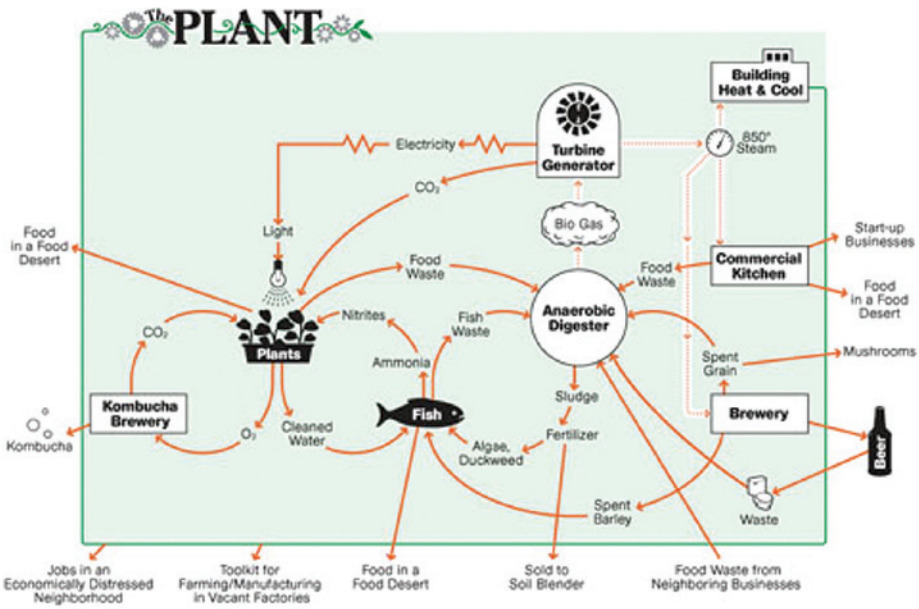
The Plant Rendering. The exact system will be onsite at The Plant. Image courtesy of Eisenmann Corporation.

At the center of this unique concept will be the biogas plant, provided by Eisenmann Corporation and due to be commissioned in summer 2013. The biogas plant will use anaerobic digestion to convert 13 tons of organic waste products per day, otherwise destined for landfills. The waste, which will come from The Plant's businesses and nearby food companies, will be turned into three by-products: compost-like solid fertilizer, non fossil-fuel based liquid fertilizer and up to 55 million cubic feet of energy-rich biogas. The gas will then be fed into the combined heat and power (CHP) system—in this case a repurposed jet engine, which will also be housed in the former factory. Its electric power yield of 200 kilowatt per hour (the equivalent needed to power 250 homes) will be made available to the businesses on site, while the heat produced will be used to heat the building.

Biogas Technology

Initiatives like The Plant present biogas plant manufacturers with a considerable challenge. Unlike digesters that use a low-solid, agricultural feedstock, the consistency and composition of this waste stream can vary greatly, much like that of food processing or municipal solid waste. The Eisenmann Biogas Green Waste Technology was selected for its versatile feeding system, capable of handling a wide range of waste material. The Plant will be able to turn a variety of organic wastes from a multitude of sources into renewable energy. The plug-flow digester is designed to handle materials with high solids content. During digestion, the feedstock is continuously fed to the horizontal digester where a horizontal agitator mixes the substrates to ensure a homogeneous mixture and guarantee an optimal biogas yield. After the main digester, the substrate is passed to the post digester for a second digestion stage. This vertical stirred tank offers a top-mounted double-membrane gasholder to store the biogas before use. The system, custom designed for The Plant, provides maximum output in the available footprint for an urban environment. This technology is a critical component to the success and sustainability goals at The Plant. | WA

Amy Macaulay is the Marketing Manager for Eisenmann Corporation. She can be reached at (815) 455-4100 or via e-mail at Amy.macaulay@eisenmann.com.



The Plant Diagram. It shows the complete workings of the sustainable system at The Plant. Image courtesy of www.plantchicago.com/about.

Notes

1. www.plantchicago.com

First of Three Parts

A Waste-by-Rail Market Assessment: Idaho Waste Systems

Darell Luther and Ronda Avery

MARKET STUDIES ARE INTERESTING AVENUES TO FIND OUT MORE ABOUT A COMPANY'S COMPETITIVE POSITION within an industrial or market segment. Idaho Waste Systems will be participating in a waste-by-rail study that assesses their position in being able to use the waste-by-rail option.

AT THE END OF 2012, TEALINC, LTD AND *WASTE* *Advantage Magazine* decided to jointly offer a high-level market study for a potential customer that has truck-rail, truck-rail-barge or truck-rail-truck logistics in place or that they are considering, compliments of Tealinc. The candidate company selected for the market study is Idaho Waste Systems, Inc. of Mountain Home, ID. The published market study is segregated into three consecutive articles. The first is this article, in which Idaho Waste Systems tells us about their current operations and described their perceived competitive situation. The second article will encompass the competitive market situation and detailed rail rate analysis from various origin points. Finally, the third article will encompass recommendations to strengthen Idaho Waste Systems' competitive position.

Introducing Idaho Waste Systems

Idaho Waste Systems (IWS) owns and operates the Simco Road Regional Landfill (SRRL), the only private, commercially licensed, Federal Subtitle D landfill in Idaho. SRRL is regulated by the Idaho Department of Environmental Quality and the Idaho Central District Health Department. IWS has owned and operated SRRL since it was permitted, constructed and began operations in 1999. The landfill currently receives waste materials generated mainly in the southwest portion of Idaho. IWS also has an agreement with Union Pacific Railroad to remove and dispose of site clean-up waste materials from their gondola cars. IWS is now exploring other opportunities to increase flow into the SRRL. The landfill has a tremendous amount of remaining capacity in its first phase estimated to be approximately 45 million tons with the ability to expand the capacity to over 210 million tons. The only item lacking is a steady flow of material into the facility.

IWS rail to truck container transfer.
Photos courtesy of Idaho Waste Systems.

The SRRL is approximately 25 miles east of Boise and just a few miles off of Interstate 84. It is located in a very rural area with less than 10 inches of annual rainfall. The landfill is also located adjacent to the Union Pacific main line and has more than 10,000 feet of rail spur that was constructed in 2003. SRRL has onsite a container handler and all equipment required to offload railcars and dispose of material that is delivered by rail. An all-weather access road to the working face and tipper is maintained year round. The landfill is permitted to accept RCRA non-hazardous residential, commercial and industrial waste streams including, but not limited to: municipal solid waste, construction and demolition, asbestos, liquids, sludge, contaminated soil and non-hazardous special wastes including automobile shredder residue (ASR) and naturally occurring radioactive material (NORM). In addition, IWS offers intermodal services to other companies in the area.

The waste market in Idaho, especially with the continued downturn in the economy, is extremely competitive. Idaho was recently named as the State with the lowest disposal fees in the nation, which should allow SRRL to aggressively compete for waste contracts nationwide. However, at this time, SRRL receives a very limited amount of product by rail. IWS has worked on securing waste streams for municipal solid waste out of both Washington State and Northern California, but has not been able to obtain competitive rail transportation rates. With the difficulty and opposition to permitting

IWS rail track layout.

IWS compacting waste.

and constructing landfills, the proximity to the Union Pacific Railway's main line, and the fact that the necessary infrastructure is already in place to receive waste-by-rail, the SRRL should be taking in material from across the U.S.

Initial Assessment

Market studies are interesting avenues to find out more about a company's competitive position within an industrial or market segment. High-level approaches are generally categorized as SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. A SWOT analysis can be as broad or narrow as need be as long as it provides a broad enough look at the competitive market situation to be of value and not mislead the conclusion(s). In this study, Tealinc will confine the review to rail and rail-related opportunities.

Idaho Waste Systems has a lot going for it. There are a number of items that fall in the Strengths category that indicates that IWS has competitively positioned itself for rail delivered waste. A short list of Strengths includes:

- Long rail spurs situated next to the Union Pacific Railroad (UP) mainline. IWS has two rail spurs, one that is 8,000 feet and another that is 2,000 feet in length for a combined capacity of 10,000 linear rail feet. That is enough capacity for a unit train of either intermodal railcars or high cube bulk commodity gondolas with room left over for consecutive handling of single or smaller rail carload quantities.
- A direct Class I connection with the UP that through interchanges gives IWS access to virtually any rail served origin in the U.S. or Canada.
- Direct unloading equipment access to the rail sidings that allow material or containers to be timely removed is a significant advantage. The design allows IWS to scale up with volume. IWS scalability will, in the long run, help negate railroad railcar demurrage charges and could help it win larger volume contracts.
- Ability as a private subtitle D landfill to act faster and respond quicker to market changes than a public entity.
- Idaho generally has some of the lowest disposal costs in the U.S., which will help offset some of the additional transportation costs required to haul waste streams farther than other states.

An initial review of Weaknesses primarily focuses on:

- Captive rail to the UP. Generally shippers and receivers that are captive to one railroad pay higher freight rates. In this case, IWS may or may not be paying the rail freight but the freight differential may be detrimental to some rail shipment receipts.
- Nearby competitive landfills that are vying for the same material IWS is hoping to receive by rail.

Taking the "glass half full" approach, IWS has several initial Opportunities:

- IWS has significant landfill capacity that is capable of receiving large cleanup jobs, particularly those that require all material go to the same landfill.
- The ability to offset some rail rate charges with lower disposal charges characteristic of Idaho disposal costs.
- Ability to take multiple waste streams via rail including liquids. IWS can handle intermodal shipments (containers), bulk rail (mill gondolas, high cube gondolas) and possibly tank railcars hauling liquids (with some landfill modifications).
- Alternative to large city MSW landfills, particularly those that are looking for alternatives pre-closure.

A market study would not be complete without an assessment of Threats. IWS' primary threats are:

- Captive destination rail service on the UP.
- Competitive nearby rail served landfills.

A Different Approach

IWS' situation is indicative of many companies that aren't familiar with the steps required to ship or receive product by rail. Face it, shipping by rail is much more complex than having a truck show up in a timely fashion. If the trucking company is continuously late you get a different trucking company to take on your business. If a train is late, you wait.

When dealing with rail transportation, the first order of business is to determine economically feasible shipment patterns that fit into the railroad's method of doing business. This is generally a portion of the market study conducted at a very high level. Upon finding out whether or not the product, in this case a waste stream, can economically move via rail from the source to the destination, one then delves into the finite detail to understand all aspects of the potential movement so as to encompass all the details to determine costs, revenue and profit of a movement. | WA

The second part of this study will encompass the competitive market situation and detailed rail rate analysis from various origin points.

Darell Luther *is president of Forsyth, MT-based Tealinc Ltd., a rail transportation solutions and railcar leasing company. Darell's career includes positions as president of DTE Rail and DTE Transportation Services Inc., Fieldston Transportation Services LLC, managing director of coal and unit trains for Southern Pacific Railroad and directors positions in marketing, fleet management and integrated network management at Burlington Northern Railroad. Darell has more than 24 years of rail, truck, barge and vessel transportation experience concentrated in bulk commodity and containerized shipments. He can be reached at (406) 347-5237, via e-mail at darell@tealinc.com or visit www.tealinc.com.*

Ronda Avery *is president of Idaho Waste Systems, Inc. She has been with IWS since 2000, first as controller and then became president and CEO in March of 2011. Ronda has been a CPA for more than 30 years and when in private practice specialized in farming, real estate and small business. She is a member of the American Institute of CPA's and The Idaho Solid Waste Association. She can be reached at (208) 724-8943, via e-mail at ronda@idahowaste.com or visit www.idahowaste.com.*

Breakthroughs and Innovations

MICO, INCORPORATED (North Mankato, MN) introduces a new detailed training program for electrohydraulic braking systems that use MICO MOBEUS components and technology. MOBEUS training seminars feature a combination of classroom and hands-on sessions to provide participants with a better understanding of MICO MOBEUS brake components and implementation of electrohydraulic brake solutions including ABS, Traction Control and Electronic Stability Control. Training also includes use of the MOBEUS LINC (Local Interface Network Connection) Service and Diagnostic Tool. MOBEUS EH training is a module-based program designed for maximum flexibility to meet individual user needs. In addition to a Standard MOBEUS Training Package with set modules, MICO also offers Custom Tracks for OEMS and distributors who prefer to design their own MOBEUS training experience.

MOBEUS Training modules cover topics from the fundamentals of MOBEUS componentry including hydraulic valves, sensors and control hardware, through basic theory of ABS, Traction Control and Electronic Stability Control, to hands-on tuning and testing of ABS braking and Electronic Stability Control at a local test track. The standard training program lasts three days, including two classroom days and one track day. Classroom training is conducted at the MICO Electrohydraulic Braking Development Facility in Shakopee, MN and test track training takes place at Dakota County Technical College in nearby Rosemount, MN. MICO currently has available spaces for upcoming Standard Session Training:

- Wednesday, April 24 – Friday, April 26, 2013
- Monday, September 16 – Wednesday, September 18, 2013
- Custom programs are scheduled according to participant group request and track availability.

FOR MORE INFORMATION, CALL (507) 625-6426 OR VISIT WWW.MICO.COM.

FLAMING RIVER (Berea, OH) has expanded its operations and opened a powder coating facility at their headquarters. Powder coating services will be available for customers looking to customize a Flaming River product they have purchased for their specific project or build. Popular products available for powder coating include steering columns, rack and pinions, steering boxes, and steering column accessories like column drops and column mounts and steering wheel adapters. They have a wide array of colors and shades to choose from and have an RAL color book available to help you select a color that will complement your vehicle's interior or exterior.

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Genuine **ALLISON** (Indianapolis, IN) ReTran® automatic transmissions are meticulously remanufactured to precise factory tolerances with original and new, improved Allison parts. Factory-trained technicians using Allison-approved technologies and manufacturing processes literally remake a genuine Allison transmission from the ground up. Transmissions are torn down piece by piece, cleaned and screened for possible reuse of components. Torque converters are disassembled, cleaned, qualified, reassembled and then tested to make sure they adhere to original Allison specifications. Parts that meet original specs can be reused. Parts in good condition but outdated are machined to updated specs. And many of the components in an Allison ReTran are brand new parts. All of the components are Genuine Allison Parts. From the first part to the final bolt, our remanufacturing process assures quality control unparalleled in the remanufacturing industry. Every transmission undergoes rigorous testing, including dynamometer and pressure decay testing. No transmission is shipped until it passes all scheduled tests. Every Allison ReTran automatic transmission that comes off the line has the quality components and precision assembly that will yield Allison, legendary performance. You can count on it.

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- Infrared LED enables optimal viewing even at zero lux (total darkness), providing military grade night vision
- Shock and vibration resistant up to 10G
- Normal/mirror image option
- Waterproof IP68 with sun visor
- 1/3" Sony Super HAD color CCD for a vivid picture

FOR MORE INFORMATION, CALL (866) 804-2984 OR VISIT WWW.AWTI.NET.

EISENMANN biogas plants are based on a two-stage process, with a main and a post-digester. The main digester is of horizontal design that permits the use of materials with high solids content. During digestion, the feedstock is continuously transported through the digester where an agitator mixes the substrate to guarantee a satisfactory yield. The plug-flow process is a highly effective method of generating biogas from organic matter and ensures that the biological processes take place under ideal conditions, maximizing gas yield and providing a reliable, uninterrupted operation. After the main digester, substrate is passed to the post digester for a second digestion stage where the gas is stored in a vertical stirred tank with a top-mounted double-membrane gas storage containment. Features include:

- Robust, durable design to handle feedstock with maximum dry matter content
- Fully automated, continuous feed system, no need to slurry
- Small footprint and closed system for odor control
- Maximum gas yield with high process stability
- Technology proven in over 90 biogas plants to date, ranging in size from 12 tons to over 160 tons per day

FOR MORE INFORMATION, CALL (815) 477-2333 OR VISIT WWW.EISENMANN.COM.

WasteAdvantage magazine
The Advantage in the Waste and Recycling Industry
Recycling Transfer Stations Landfills

Contents

Waste Advantage Magazine's Recycling/Transfer Stations/Landfills (R/T/L) section has become a very important part of our readership. Our timely, relevant editorial in this section—products/services releases, statistics, short tips, etc.—provides you, our R/T/L professionals, with the useful information that you need when making that important purchasing decision. By making this important move, *Waste Advantage Magazine,* provides something for everyone in the waste and recycling industry and makes it the most complete one-stop-shop publication available today. We look forward to expanding our coverage of this segment of the industry and hearing your feedback.

Landfills

Entering Confined Spaces at Landfills

Chris Marlowe, CIH, CSP

LANDFILLS ALWAYS PUT WASTE INTO CONFINED SPACES. WHEN YOU put people into one, however, new dangers arise and OSHA's Permit Required Confined Space standard applies. Although the standards provide valuable protection, they can really slow down work progress. A good strategy can provide safety while conserving effort.

Confined Spaces at Landfills

Some of the confined spaces that exist at landfills include:

- Leachate manholes
- Vaults containing landfill gas wellheads
- Utility vaults
- Incinerator fire boxes
- Access/cleaning pits under waste conveying equipment
- Alternate cover material mix tanks
- Storage tanks at hazmat collection areas
  - Water wagon tanks
  - Fuel storage tanks
- Hoppers and containers on vehicles
- Waste processing hoppers
  - e.g., shredders and compactors/baler

Three Characteristics of a Confined Space

The OSHA standards impose safety procedures on entries into permit-required confined spaces (PRCSs). No space is *permit-required*, unless it's already a confined space. A confined space is any workspace that is 1) big enough to enter, 2) not designed for continuous employee occupancy and 3) hard to enter or exit. The preamble to OSHA's 1993 PRCS standard clearly stated that all three criteria must be met in order for a space to be considered "confined." (Federal Register Volume 58 No. 9 p 4477). Each of these elements is so important, that we will discuss them separately.

Figure 1: Pits into which trucks dump waste are not designed for employee occupancy. Check whether they are easy to enter or exit.

Figure 2: You might have to take measurements to verify that your stairway meets the standards. Figures courtesy of Christopher Marlowe.

Big Enough to Enter

A space is "big enough to enter" when your whole body fits both 1) inside the space and 2) through the opening. The first part of this definition indicates that no matter how bad the air is in a five-gallon pail, that pail is not a confined space because your body would not fit inside. The second part of the definition means that no space is "confined" if every opening into it is covered with a welded grate through which your body can't enter.

OSHA's definition that "Entry occurs as soon as any part of the entrant's body breaks the plane of an opening into the space," appears to conflict with this definition; however, the definition of confined space takes precedence. For example, if you often wash the inside of a compactor truck with a hose, you have to put your hand inside. According to the policy, that's entry. You need a permit for that work. If you weld rebar across the opening on 6" centers, the same behavior is not entry, and one person without a permit can do the task.

Not Designed for People

A space is "not designed for continuous employee occupancy," when it is:

- Designed to hold dense material (water, sludge, leachate or waste)
- Lacking heat, light and ventilation required by applicable building codes
- Too short to stand up in
- Too disgusting for you to put your desk in and work a whole day

One of our clients had a pump station, which met the other aspects of OSHA's definition, but had continuously operating heat, light and ventilation. It was also a very clean work area. We determined that the dry well was 1)

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designed for occupancy, and therefore, 2) not a confined space, and 3) not a permit-required confined space.

If you have underground vaults that house valves, gauges or electrical equipment, you should ask, "What would it take to make the vault, 'designed for occupancy?'" The second question you should ask is, "Would the savings on entry effort be worth the physical improvements?" The answer will often be, "No" **(see Figure 1, page 48)**.

Figure 3: Expect air contaminants in vaults with standing water

Figure 4: The author collects air measurements at a confined space

Hard to Enter and Exit

A space is "hard to enter and exit," when you can't walk normally on the way in and out. The preamble discussed previously establishes that "Doorways and other portals through which a person can walk are not limited means for entry or exit" (Federal Register Volume 58 No. 9 p 4477). When analyzed under this rule:

- Doorways are easy, if they are taller than the employee
- Stairs are easy, if they meet the OSHA standards
- Ladders, including ship ladders, are hard
- Hatches are hard
- Crouching is hard
- Crawling is hard

OSHA has determined (Interpretive Quip –Jmiles 951023) that "The use of a … stair meeting the specifications for a fixed industrial stair, securely installed, would provide an unrestricted means of entry or exit." OSHA Standard 29 CFR 1910.24, for Industrial Stairs, requires stairways to have:

- Steps at least 22" wide
- A slope between 30º and 50º above the horizontal
- At least 8" of slip resistant tread
- Vertical clearance of 7'
- Platforms or landings at least 30" on one side
- Railings between 30" and 34" high

At many landfills, the specific design of the stairway becomes an issue. At one plant we found that the stairs in a well vault had:

- Treads 30" wide and 10" deep
- A slope of 39"
- One landing 29.5" x 31"
- A handrail 33" high

Because the stairs on this well vault meet the OSHA standard, the well is not a confined space, and, therefore, not a permit-required confined space **(see Figure 2, page 48)**.

Note that a space that does not meet the definition as "confined" is not necessarily safe—it can still harbor hazards. Managers should still take appropriate action to control whatever hazards are present. Regulatory gymnastics should be used only to avoid regulation—driven efforts after practical safety is assured. We often use the OSHA procedures in hazardous spaces where the regulations don't literally apply, simply because they make sense.

Permit-Required (Hazardous) Confined Spaces (PRCS)

OSHA safety procedures apply only to permit-required confined spaces. A PRCS is a confined space that has hazards such as: dangerous air, entrapment, engulfment or unguarded machinery **(see Figure 3)**. Some confined spaces that have no demonstrable hazards include:

1. Many well vaults that house:
   - Continuous Pipe
   - Valves
   - Meters
   - Wells
2. Leachate manholes in new cells without:
   - Connection
   - Gassy soil
   - Concrete sealant
   - Standing water

"Hazard Evaluations" for Air-only Spaces

Careful reading of the OSHA definitions is not the only way to reduce the cost of confined space entry. Subparagraph 29 CFR 1910.146 (c)(5)(i) of the PRCS standard allows the use of "alternate procedures" when:

1. Bad air is the only hazard
2. Ventilation alone is sufficient to control that hazard
   - Monitoring and inspection proves that sufficiency
3. Entrants should show that they maintain:
   - Barriers to prevent accidental falls
   - Continuous forced air ventilation
   - Periodic testing of air quality
   - Certification of the lack of hazards

Because employer certifications must be backed up with facts that support the determination, you should produce an evaluation to show that all hazards are in control. In general, we have found few spaces where producing an air-only permit was worth the trouble. Consider the spaces at your landfill site **(see Figure 4)**. Would any qualify for an air-only permit? Would the effort saved repay the effort involved in making the decision to justify and certify the finding?

"Hazard Evaluations" for Physical Conditions

Subparagraph 29 CFR 1910.146 (c)(7)(i) of the PRCS standard also allows the use of these "alternate procedures" when 1) no actual or potential atmospheric hazards are present and 2) all hazards within the space have been eliminated. The hazards that normally drive this decision include potentials for flow, energy or mechanical motion. OSHA's definition of hazard elimination does not accept lockout of material or energy flow. The rule expects "double block and bleed," which usually involves disconnecting the feed lines, inserting obstacles to block flow, and draining the pipe. As is true for the air-only condition, you should produce an evaluation to show that all hazards are in control.

Use Alternate Procedures

Contrary to common belief:

- Many small spaces are not "confined" under OSHA's rules
- Many large, but sub-surface, spaces are
- Work in many confined spaces requires no permit
- Hazard evaluations will suffice for many confined spaces

Even when the exemptions we have discussed would allow one person to work in a confined space alone, it's rarely a good idea, because outsiders can't detect an injured employee inside the space. Use these alternate procedures if no single accident can befall more than one person at a time. That finding allows the use of a "buddy," instead of an "attendant." The buddy normally enters the space to work with the entrant, which often speeds the project. | WA

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Recycling

Third of Three Parts

Organics Diversion: What Will We Get for the Investment?

Noel Lyons and Lynn Lucas

ALL LIFE FORMS, WHETHER PLANT OR ANIMAL, RELY ON A HEALTHY SOIL and its inherent organic matter (OM) content to provide sustenance and purify water. Unfortunately, in many parts of the world (including the U.S.), the topsoil layer has been stripped and depleted by human activities and is but a fraction of its pre-development depth. Excessive erosion, heavy stormwater flows and a high requirement for chemical fertilizers are indicative of topsoil loss.

Organic matter is what gives topsoil vigor, not only ensuring the porosity required for good root development and air/water movement through the soil, but also providing a welcoming environment for the micro-organisms that plants depend on for efficient nutrient uptake and disease suppression. When soil organic matter content is raised to a recommended 3 to 5 percent, there are significant improvements in water retention and filtration, impacting stormwater management, erosion control, pollution abatement and water conservation.

The only practical way to repair the damage resulting from poor soil management is through the addition of compost, and the only practical (and sustainable) source of raw materials for compost manufacture is organic waste. Food, paper, wood, biosolids, cooking oil—all of these resources biodegrade, and all of them can be composted at the same facility using a modern, high-rate process.

Developing the required collection systems and processing facilities for topsoil replenishment in the U.S. is not a pie-in-the-sky goal. Provided all parties work together, a 100,000 tons per year operation—fully enclosed, environmentally-secure and capable of producing premium compost products—can be permitted and constructed in under two years through public-private collaborations.

In some communities, "enviropreneurs" are stepping in to offer collection and recycling for organics when the service is not offered through the municipality.
Photos courtesy of McGill Composting.

How Much Will It Cost?

Based on current construction costs, capital dollars for a modern, high-rate compost manufacturing facility will run $70 to $100 per capacity ton, which means owners of these operations will need to raise more than $6 billion to build the facilities required to compost the 88.3 million tons of paper, paperboard, wood, food waste and yard trimmings still to be recovered from our nation's landfills.

Yes, it is a hefty sum. But to put those dollars in perspective, $6 billion was the estimated cost of this year's presidential and congressional elections, a "purchase" that must be repeated every four years. The same amount bought a few weeks of games in London earlier this summer.

If weighing the relative worth of these expenditures versus the cost of the repair and restoration of the ecosystem responsible for food production and clean water, investing $6 billion in the soil seems a real bargain. It is a sizeable investment, however, and begs the question: what, exactly, can we expect to get for the money?

- We get jobs. At one job for every 3,000 tons processed at a modern, high-rate facility, nearly 30,000 new jobs paying above the average for most regions will be created when those 88.3 million tons are composted. These jobs offer full benefit packages, and because they provide a local service, the jobs cannot be outsourced.
- We get long-term, predictable management costs for the local governments hosting private-sector composting operations.
- We get a 100 percent reduction in methane generation (compared to landfilling).
- We get compost, about 44 million cubic yards more per year.

When used to raise soil organic matter to the recommended 3 to 5 percent, that compost will also buy us:

- An additional 16,000 gallons water-holding capacity per acre foot for every 1 percent increase in OM. (Source: USEPA)
- Improved downstream water quality resulting from compost's retention/degradation of sediment and pollutants like heavy metals, excess nutrients, oil and grease (Source: USEPA), and the possibility of no runoff following low-to-medium intensity/duration rain events (Persyn et al, 2004).
- Up to a 50 percent reduction in chemical fertilizer requirements (Source: University of Florida IFAS).

Monetizing Benefits, Facing Challenges

The U.S. Composting Council recently released a cost-benefit analysis comparing compost to other agricultural/horticultural products. Among the findings were the following:

Product	Compost Comparison Value
1-1-1 NPK commercial fertilizer	$28/ton
Slow-release nitrogen	$20/ton
Secondary and trace elements	$25/ton

Compost also trumps the competition when used to manufacture topsoil on site using native soils instead of buying topsoil—a typical dollar savings of about 50 percent. In erosion and stormwater management, the use of compost filter socks/blankets eliminates labor and landfill costs related to removal of control devices upon project completion, because compost controls are vegetated and become a permanent feature of the landscape.

Also in the plus column for compost, though not yet monetized, are avoided costs related to labor and equipment use, the reduced requirement for replacement plantings on landscaping projects, and reductions in stormwater infrastructure requirements.

Only 3 percent of food waste is recovered or recycled, representing the single largest fraction of the total municipal solid waste stream to be landfilled or incinerated.

Composting is a practical solution for both organic waste management and soil restoration. Both composting and compost products have environmental and economic value. But that doesn't mean converting all this ecologically/economically-beneficial material to highest use won't present an intimidating challenge, especially when considering that most MSW numbers do not include compostable water/wastewater treatment residuals, agricultural wastes and/or industrial by-products. In fact, the total volumes of biodegradable waste generation in the U.S. are largely unknown, and there are segments of the MSW waste stream like leather and natural-fiber textiles that are not grouped with compostables in MSW tallies, but will have some compostable content.

There are also logistical problems to work out. Not every composting facility will be able to find a suitable site close to a metropolitan core, necessitating a

transition in the makeup of transportation fleets, more transfer stations designed for organics (i.e., direct transfer to transport trailers so no food touches the ground or concrete floors), enclosed trailer bays and/or buildings equipped with biofilters, and fastidious attention to the frequent removal of putrescibles to outlying composting facilities.

But if there is any doubt about the growth potential of organics recycling, one need only look to California and Vermont, where organics recycling is now mandated, and to Denver, where a 2008 Soil Amendment Program requires property owners to provide proof of "proper" soil preparation before setting new meters, and to the number of private enterprises springing up across the country to collect and compost food waste outside of traditional management systems.

Restoring Balance

On its journey from farm to processing plant to grocery store to plate, more than half of the food produced is wasted. This fundamental problem must be addressed if the collective "we" are to feed a hungry planet on dwindling resources. However, cutting back on food waste and improving systems for food rescue won't eliminate yard waste or biosolids, which will only increase along with the population. Nor will it fix the soil.

The capture and composting of all organics is not only the most practical and cost-effective way to manage biodegradables; it is the only way to complete the soil cycle. The waste management industry must succeed in its transition from disposal manager to organics recycling facilitator, because it is the fulcrum, the pivotal point, upon which an entire ecosystem balances. | WA

Noel Lyons is president and co-founder of McGill Environmental Systems (Harrells, NC), a leader in the establishment of indoor, industrial-scale composting as a revenue-producing service and recycling technology for mainstream waste management.

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Public Education

Listening to the Community: Low-Cost Research Tools to Build Stakeholder Support and Manage Opposition

Mary-Jane Atwater

WHEN IT'S IMPORTANT TO UNDERSTAND YOUR TARGET AUDIENCE AND build support for new solid waste initiatives, online surveys, stakeholder interviews and focus groups can provide rich, nuanced information about community attitudes and opinions.

All too often, solid waste management leaders make difficult decisions based on careful data collection and lengthy planning meetings, only to encounter vocal community opposition to their plans. Planned changes that upend the status quo are especially likely to result in opposition by special interests or groups with hidden agendas. Siting a new facility, expanding a waste-to-energy plant, changing a trash collection schedule, or closing the market for collection services are just a few examples of the types of decisions that spur opposition and even anger in the community and among stakeholders.

Fortunately, solid waste decision makers have a number of efficient, yet relatively inexpensive, research tools at their disposal that enable them to listen to and better understand the community and key stakeholders. These tools, when used early in the planning process as well as during implementation of changes, enable public officials to gain a realistic assessment of community fears, opinions, assumptions, attitudes, questions and concerns. They help decision makers engage with the publics they serve, informing them of the problems they are trying to solve and why they have chosen a specific course of action. Often, when the public is informed and understands why the change is needed, officials can better manage opposition and marshal community support

What research tools are best and, in these days of tight budgets, cost the least? This article discusses three lower cost, effective research methods: online surveys, stakeholder interviews and focus groups. In considering these research tools, it is important to note that they are exploratory and qualitative in nature. They provide important insights and direction, rather than quantitatively precise measures that can be generalized to the entire targeted audience.[1]

Listening Tools in Action

GBB (Fairfax, VA), as part of their work to help communities address their solid waste management challenges, frequently conducts qualitative research using online surveys, in-depth stakeholder interviews and focus groups. For example, in one Texas town where solid waste officials proposed to close the market for trash collection and add recycling opportunities for the commercial and multifamily sectors, GBB used all three methods to better understand stakeholder opinions about the town's proposal and the types of hurdles the town would have to surmount to implement the new system. Online surveys gave baseline information about collection practices and opinions while stakeholder interviews enabled GBB to "dig deeper" and understand why target audiences felt the way they did about the proposal. With focus group research, GBB was able to obtain even richer, more nuanced information concerning participants' opinions about recycling and the town's proposal, as well as concerns and questions about the new system. The online survey showed that few businesses were recycling. The in-depth interviews explored why this was the case, revealing that some businesses were not aware they could recycle the materials they generated and others did not believe recycling collection would reduce their solid waste collection costs.

In another project in Guam, where in 2008 the U.S. District Court of Guam appointed GBB Receiver of the island's solid waste management system, the company used focus groups and stakeholder interviews to assess community attitudes about the implementation of a new cart-based trash collection system. These methods provided important information that helped guide the cart registration process, extra fees for bagged trash, promotional messages and the development of collateral materials. Online surveys would have been less useful, given the research questions and the less prevalent Internet use on the island.

The First Step: Defining Your Goals

Before undertaking any research project, it is important to define your research goals. Ask yourself: What do I hope to accomplish through research? What specific questions do I need to answer? What will I do with the data? Who can best provide the answers? Answers to these questions will determine which tools are most appropriate and which audiences you should involve in your research. Now, let's take a closer look at each research method and how solid waste managers can take advantage of these tools.

Online Surveys

Online survey research is a great tool when you need to collect a large amount of data in a relatively short time. Online surveys are flexible, allowing randomization of question order, complicated skip patterns and easy modification during the design phase. Also, people are more likely to respond, since the questionnaires are easy to complete and can be finished when respondents have time.

Online surveys are inexpensive and offer real time data analysis as well. Using online survey software packages such as Survey Monkey (www.surveymonkey.com) or SurveyGizmo (www.surveygizmo.com), you can create surveys with unlimited questions and a variety of question types (multiple choice, rating scales, open-ended, etc.) for about $20 to $25 per month for a "professional package." These packages offer assistance in questionnaire development, and real time collection and analysis of data, including filters, cross tabulations, and the ability to create charts and graphs.

The main disadvantage is that your results will not necessarily reflect a representative sample of the target population. Internet users tend to be younger and more urban and highly educated than the general U.S. population, and some ethnic groups may be poorly represented. Furthermore, those who respond are often a self-selecting group who have a special interest in your issue or project. Online surveys can also be subject to fraud by respondents who complete the questionnaire several times.[2]

Despite these disadvantages, the ease, low cost and flexibility of online surveys makes them a valuable tool for solid waste managers. Online surveys provide excellent baseline data, and online survey data can be used to refine questions for future research using in-depth interviews or focus groups. The following tips are important for developing a successful questionnaire:

- Keep your questionnaire short and simple. Your response and completion rates will be higher with a 10-minute survey than a 20-minute survey.
- In an introduction, tell respondents what group is conducting the survey, why the research is important and how they will benefit from the results. Reassure respondents that their answers will be confidential and grouped with those from other respondents.
- Ask only those questions that are relevant to the goals of your research.
- Put the least controversial questions at the beginning of the questionnaire, and group together questions on similar topics.
- Use clear, specific wording in your questions.
- Make minimal use of open-ended questions. They are time-consuming for respondents and more difficult to analyze.
- Include a comment section where respondents can explain their answers.
- Offer "Don't know" or "Not applicable" response options where appropriate.
- Be sure to pre-test the survey with a group of colleagues or friends, or work with a local university market research professor to pilot the survey with a group of students. Ask them to point out confusing questions or response options.

In-Depth Interviews

In-depth stakeholder interviewing involves conducting intensive, individual interviews with a select number of respondents. This methodology enables the researcher to explore perspectives, behaviors, attitudes and situations in greater depth

than in an online or written questionnaire. In the solid waste arena, this tool can be used to gauge the opinions of key stakeholders about an issue or proposal.

The primary disadvantage of in-depth interviews is their time-consuming nature. Interviews take time to conduct, can involve travel expenses, and the results must be transcribed and analyzed. In addition, results can reflect bias on the part of the respondent or the interviewer or both. The following are some tips for in-depth interviews:

- Identify the stakeholders who should be interviewed, including those who will provide a wide range of views and stand to gain or lose from the success or failure of the project.
- Develop a written interview protocol, including what is said to interviewees when inviting them to the interview, as well as what is said at the beginning and end of the interview.
- Develop the interview questions or issues to be explored. Interview questions should be open-ended with probes, or follow-up questions, for each topic.
- Ask factual questions before opinion questions.
- Organize a session to train interviewers. Brief them on the goals of the research and interview protocol. Using mock interviews, train them in how to record verbal as well a non-verbal responses.
- In analyzing the results, group trends, themes or patterns of comments together. Determine if responses can be grouped according to the type of interviewee (e.g., public official, solid waste manager, recycling coordinator).

Focus Groups

Focus groups are an excellent method to answer the "why" questions about a particular topic. For each group, you will want to include six to 10 people who are representative of the target audience in order to question them about an issue and elicit their opinions. When moderated well, participants interact with one another in a non-threatening environment, and rich new insights emerge. The chief value of focus groups is providing a window into the attitudes, behaviors and feelings of participants with the benefit of group dynamics. The groups are not a means to share information or persuade, nor are they designed to encourage group members to reach a consensus on an issue. It is possible to conduct a single-group study for $3,500 to $5,000.

The focus group should comprise a homogeneous group of participants people of similar age, socio-economic status or education levels so they will approach the discussion topic with shared experiences. Focus groups are typically conducted in a special facility that includes a discussion room and a separate client observation room with a one-way mirror. When group sessions are also audio and videotaped, the ethics of focus groups requires that the facilitator tell participants they are being taped as well as observed. Sometimes it is not possible to conduct focus groups in a focus group facility, which can charge $500 or more per session for room rental and taping. Effective focus groups can occur in other locations such as conference facilities and hotel meeting rooms.

A discussion guide is essential for conducting a well-run focus group. This guide lists the research topics to be covered, the questions that will be asked (including follow-up probes) and the time allocation for each segment of the discussion. The guide also includes any worksheets that will be completed

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by participants to record their reactions and opinions. To get the best results, you should arrange for the groups to be conducted by an objective, trained facilitator, preferably someone who is not part of the sponsoring organization. Trained facilitators have skills and training for thoughtful questioning and sharp listening as well as the ability to interpret non-verbal communications and group dynamics.

To conduct an effective focus group, the following steps should be taken:

- Recruit participants carefully. Develop a recruitment screening questionnaire that outlines the desired composition of the group, including age range, education level, job title or experience level. When recruiting, give recruits a general sense about the nature of the discussion but do not go into great detail, since it is important that group members provide their "fresh" reactions to the discussion topic, without prior preparation. An honorarium of $75 to $150 for each participant is customary.
- Recruit groups of seven to 10 participants with homogeneous characteristics. Plan to recruit three or four more participants than you need, since there will usually be a few who are unable to attend. Remind participants several times before the group meets.
- Secure a trained facilitator to conduct the groups.
- Work with the facilitator to prepare a detailed moderator's guide that spells out the questions to be asked and time allocated for discussion of each question.
- If observers are present, plan for a way for them to communicate with the facilitator during the session, to ask any clarifying questions. One option is for the facilitator to exit the room to speak with observers while group members complete a worksheet.
- Prepare a summary report that organizes the data by themes as well as concerns, questions and suggestions from the group members. Include verbatim comments to illustrate the themes.

Understand Your Target Audience

In short, when it's important to understand your target audience and build support for new solid waste initiatives, online surveys, stakeholder interviews and focus groups can provide rich, nuanced information about community attitudes and opinions. Using these research tools provides insight and direction that enables you to be responsive to community concerns and questions when difficult, sensitive issues are proposed. These research tools belong in the toolbox of every solid waste decision maker. | WA

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Notes

1. Quantitative research is best if you seek results that are representative of the entire population you are studying. In quantitative research, random sampling techniques are used to develop a probability sample of the target audience, so that any one member of the population has a known, nonzero chance of being selected. Qualitative research methods, such as those discussed in this article, are best for exploring issues, generating ideas and gaining insight and generally do not yield results that are representative of the entire target audience.
2. There are ways to get around fraudulent entries. If you are recruiting from a defined sample of subjects, the best way to avoid multiple entries from the same respondent is to assign each subject a unique ID and allow each ID to be used only once. If you are recruiting from the population at large, you can use the respondent's e-mail or IP address to track responses.

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The biodegradable RYDALL OE Odor Eliminator from **APEX ENGINEERING** (Aurora, IL) is an environmentally beneficial biocatalyst containing a complex mixture of nutrients, vitamins, and trace elements specifically designed to naturally eliminate odors and corrosion problems. Unlike similar odor control products, RYDALL OE does not contain masking agents, essential oils, bacteria or active enzymes. It eradicates odors by disallowing the formation of foul substances such as H_2S, ammonia, mercaptans and skatole by stimulating existing bacteria already prevalent in landfills, wastewater treatment and pre-treatment facilities, composting, recycling and solid waste facilities, food processing/manufacturing facilities and any place with odor issues. RYDALL OE is non-toxic to humans, animals and plants, as well as non-corrosive to metals, concrete and plastics.

FOR MORE INFORMATION, CALL (630) 820-8888, E-MAIL INFO@APEXENGINEERINGPRODUCTS.COM OR VISIT WWW.APEXENGINEERINGPRODUCTS.COM.

CLEARSPAN FABRIC STRUCTURES provides energy-efficient, economical structures ideal for recycling centers, composting facilities and more. State-of-the-art, USA-made ClearSpan Hercules Truss Arch Buildings feature abundant natural light and provide the perfect controlled environment for composting processes. The exceptional height and wide open space of Hercules Truss Arch Buildings allow easy access for equipment such as skid steers, conveyors, turning machines and pay loaders. Their USA-made, triple-galvanized steel frames are extremely durable, and hold up well in corrosive environments, while their all-weather fabric covers protect compost from the rain, reducing run-off.

Every Hercules Truss Arch Building is custom-engineered to fit the requirements of the specific location, such as snow load or foundation type. With minimal foundation requirements, the structures can be permanent or temporary, and are easy to relocate.

FOR MORE INFORMATION, CALL (866) 643-1010 OR VISIT WWW.CLEARSPAN.COM/ADWA.

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Caution/Notice Combo Decal

CAUTION — DO NOT PLAY IN, ON OR AROUND OR OCCUPY THIS CONTAINER FOR ANY PURPOSE

NOTICE — CONTAINER MUST BE PLACED ON HARD, LEVEL SURFACE LOAD UNIFORMLY

WD514101
Size: 5 X 14" *Price: .69 each*

MAXIMUM LOADING LEVEL

WS336102

MAXIMUM LOADING LEVEL

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Price: .59 each

WS912104
Commingled Recyclables
- Aluminum Cans
- Glass Bottles & Jars (Green, Brown, Clear)
- Metal Cans
- Plastic Beverage Containers

ONLY

WS912101
ALL CANS AND BOTTLES MUST BE EMPTIED AND RINSED BEFORE PLACING IN RECYCLING CONTAINERS

WS912102
CARDBOARD ONLY BREAKDOWN BOXES

WS91213
NO GARBAGE
RECYCLABLE ITEMS ONLY

WS912122
RECYCLE HERE

WS912110
Mixed Paper Recyclable Products Only
- Corrugated Cardboard
- Computer Paper
- Books
- Envelopes
- Spiral Notebooks
- File Folders
- Magazines
- Newspapers
- Office Paper
- Phone Books

Circle Recycling Decals

WS6X6101 6 X 6" *.59 each*
WS8X8101 8 X 8" *.69 each*
WS12I101 12 X 12" *.79 each*
WS18I101 18 X 18" *1.79 each*

Caution, Notice, & Danger Decals — Size: 5 X 7" — *Price: .38 each*

WDNOT101	WDNOT109	WDNOT103	WDNOT112	WDNOT113	WDNOT106	WDNOT116
NOTICE: DO NOT FILL ABOVE TOP OF CONTAINER	NOTICE: NO RECYCLABLES ALLOWED	NOTICE: CONTAINER MUST BE PLACED ON HARD, LEVEL SURFACE LOAD UNIFORMLY	NOTICE: IT IS AGAINST THE LAW TO PUT HAZARDOUS OR TOXIC WASTE IN THIS CONTAINER	NOTICE: ALL TRASH MUST BE PUT IN THE CONTAINER	NOTICE: PLEASE CLOSE COVERS	NOTICE: NOT FOR PUBLIC USE VIOLATORS WILL BE PROSECUTED
WDCAU101	WDCAU106	WDCAU111	WDCAU114	WDCAU115	WDCAU116	WDCAU122
CAUTION: DO NOT PLAY IN, ON OR AROUND OR OCCUPY THIS CONTAINER FOR ANY PURPOSE	CAUTION: KEEP HANDS CLEAR OF THE HOPPER	CAUTION: KEEP OUT	CAUTION: THIS COMPACTOR STARTS AUTOMATICALLY	CAUTION: BEFORE OPENING DOOR TURN CONTROL PANEL KEY SWITCH TO OFF POSITION, REMOVE KEY AND BLOCK OFF TRASH CHUTE	CAUTION: THIS BALER STARTS AUTOMATICALLY	CAUTION: DO NOT PLAY IN OR AROUND
WDDAN103	WDDAN102	WDDAN104	WDDAN105	WDDAN107	WDDAN112	WDDAN115
DANGER: STAND CLEAR WHEN TAILGATE IS OPEN	DANGER: STAND CLEAR WHEN CONTAINER IS OFF GROUND	DANGER: FREQUENT STOPS AND BACKING	DANGER: DO NOT ENTER	DANGER: DO NOT PARK IN FRONT OF THIS CONTAINER	DANGER: STAND CLEAR WHEN REAR DOORS ARE OPENED	DANGER: 220 VOLTS

Recycling Message Decals — Size: 3 X 18" — *Price: .49 each*

WD318107 ALUMINUM CANS ONLY	WD318117 CANS, PLASTICS & BOTTLES ONLY	WD318118 CARDBOARD ONLY	WD318131 FLATTEN BOXES
WD318132 GARBAGE ONLY	WD318133 GLASS ONLY	WD318134 GLASS, PLASTIC, ALUMINUM	WD318140 MIXED PAPER ONLY
WD318150 PAPER ONLY	WD318159 PLASTICS ONLY	WD318160 RECYCLE	WD318165 TRASH ONLY

800.331.9061

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