DEALING WITH RESIDUAL WASTES AT THE LANCASTER COUNTY RESOURCE RECOVERY FACILITY

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ABSTRACT

The Lancaster County Resource Recovery Facility (RRF) is a 1,200 ton per day mass burn waste-to-energy plant that has been in operation since 1991. The plant is owned by the Lancaster County Solid Waste Management Authority (LCSWMA), but is operated for the Authority by Covanta Lancaster. During the initial years of operation, only municipal solid wastes (MSW) were combusted. The picture has changed dramatically, however, since those early days.

The RRF has successfully processed hundreds of different residual waste streams since 1994. The list of residuals processed at the RRF is impressive: over-the-counter and bulk pharmaceuticals; off-spec toothpaste in cubic-yard totes; virgin oily debris; ink waste in fiber and steel drums; industrial waste waters; and confidential documents and controlled substances from local law enforcement agencies, pharmaceutical manufacturers, and the Drug Enforcement Administration.

This paper describes how residual wastes are managed at the facility, including a discussion of waste inspection activities on the tipping floor, and a description of the various methods by which these materials are fed to the boilers.

BACKGROUND

In 1986, Lancaster County was faced with a tough decision - should it continue to landfill the waste generated in the county, or should it try something new? The easy road would have been to continue to landfill the waste; after all, LCSWMA, the county’s waste disposal agency, had just received permission to expand its existing landfill onto an adjacent property.

But Lancaster County decided to take the road less traveled, and embarked on the creation of an integrated waste management system. The system was designed to have three components: recycling; resource recovery; and landfilling. All wastes that could be recycled would be; other wastes not suited for recycling would be processed at the proposed resource recovery facility; and those materials either not suited for recycling or resource recovery would be landfilled.

Considerable planning and citizen input resulted in the decision to build a plant capable of processing up to 1,200 tons of waste per day and generating 36 megawatts of electricity per hour. The real value of the plant, however, lay in the fact that it could reduce the volume of the waste it processed by 90%. This would not only considerably extend the life of the county’s landfill, but also save valuable farmland in the process. There were other advantages as well: the energy produced by the RRF could supply all of the power required to run the facility, while also providing energy to 10,000 - 15,000 homes. An additional benefit, and one that saved even more landfill space, was that roughly 600 tons of ferrous metal could be removed from the processed waste each month and recycled.

In September 1987, the Authority entered into a 20-year contract with Ogden Martin Systems of Lancaster (now known as Covanta Lancaster) for the design, construction, and operation of the RRF. Construction began in March 1989, and was completed approximately twenty months later. Start-up testing was conducted in early 1991, and on May 10, 1991, the LCSWMA officially accepted the facility, and full-scale operations got underway.

WASTE STREAM APPROVAL PROCESS

Generally speaking, Pennsylvania’s Department of Environmental Protection (PaDEP) considers “residual waste” to be garbage, refuse, or other wastes that result from industrial, mining, and agricultural operations [1]. The RRF processes non-hazardous residual wastes that are generated both in-county as well as out-of-county. Procurement of out-of-county residual wastes for processing at the RRF are done for the Authority by a company called Lancaster Enviroservices Corporation (LESCO).

The multi-tiered waste stream approval process begins once LCSWMA or LESCO identifies a potentially processible waste stream. One should not underestimate the
difficultly, or overemphasize the importance, of this initial step. Acceptable waste streams are hard to find. The RRF is designed to combust wastes having an average higher heating value (HHV) of 5,000 BTUs per pound, or the approximate heat content of household refuse. Most residual wastes, though, fall either well below or considerably above this value. Luckily, the RRF has successfully proven that it can process wastes ranging in HHV from 800 - 15,000 BTUs per pound. Additionally, there are strict limits on a potential waste stream's concentration of heavy metals and halogens (primarily chlorine, bromine, and iodine), and consideration is also given to product packaging, and whether or not a waste will present a dusting problem on the tipping floor.

Once the relevant criteria have been met, the approval process can proceed. The next step is the preparation of a waste acceptance package. For residual waste generators in Pennsylvania, this means that a "Form U" must be filled out. This form was developed by PaDEP to characterize residual wastes. The following information must be provided on the form: a general waste description, including the residual waste code, pH range, and physical state and appearance; anticipated annual tonnage generated, as well as the frequency of generation; whether or not the waste is a hazardous waste; and a chemical analysis, where applicable. The form must be notarized by the generator as well as by the Authority. Other information that must be supplied include a description of the process generating the waste.

Once the package is complete, it is sent to Covanta's corporate offices for review. The review by Covanta personnel is quite detailed and thorough. Issues they address include potential combustion problems; stack emissions and related environmental matters; health and safety considerations; and waste stream processing and packaging. If a material meets the approval criteria, it is assigned a four-digit approval number, and instructions are given on how the wastes must be fed into the boilers. Following this review, the approval paperwork is sent to Covanta's operations personnel at the RRF for their review. When and if they sign off on it, the information is then ready for submittal to the appropriate state regulatory agencies.

PaDEP's Bureau of Land Recycling & Waste Management and the Bureau of Air Quality are responsible for reviewing residual waste stream approval requests. Naturally, the regulators will examine the information to determine if the proposed waste stream could compromise compliance with the RRF's Title V permit or its waste management permit. Waste streams may be rejected due to their chemical make-up, since the RRF has stringent limits on sulfur dioxide, hydrogen chloride, and nitrogen dioxide, as well as restrictions on airborne heavy metal concentrations downwind of the facility. Once approval is given, however, deliveries can begin.

**SITE COMPLIANCE ACTIVITIES**

Generally speaking, all waste delivered to the RRF is inspected by the Authority's compliance officers. The Authority has two full-time compliance officers on the tipping floor during receiving hours, which are currently 6:30 a.m. until 4:00 p.m., Monday through Friday, and 7:00 a.m. until 11:00 a.m. on Saturdays. Approximately 52% of the wastes processed at the RRF are delivered in LCSWMA transfer trailers. Since this material has already been inspected by LCSWMA compliance officers at the transfer station, these trucks are permitted to dump directly into the waste storage pit after arriving at the RRF tipping floor. By permit, however, loads delivered directly to the RRF must be dumped on the floor and inspected so bulky, non-processible materials and other unacceptable wastes that are spotted can be removed.

The residual wastes of primary concern, from a compliance standpoint, are ones referred to as "special", or "supplemental", wastes. These materials need to be scrutinized more closely than other residual wastes due, in part, to their chemical content, but also because they need to be fed into the pit or boilers more carefully than other materials. Supplemental wastes in this category include over-the-counter off-spec/expired pharmaceuticals; bulk ink and adhesive wastes; bulk toothpaste and other healthcare products; filter cake; unused sharps; and food flavorings, to name a few.

Supplemental waste deliveries are listed on a weekly delivery schedule, which is updated daily and distributed, as needed, by LESCO. The LCSWMA compliance officers familiarize themselves with this schedule each morning. They will also review waste stream approval paperwork in the RRF’s files in order to verify waste stream feed rates and packaging requirements before the day’s deliveries begin.

When a supplemental waste is delivered to the RRF, the delivery vehicle is directed to the far end of the tipping floor. Here, the truck is backed into place, and a portable ramp is secured to the truck so its contents can be off-loaded with forklift trucks. The compliance officers will usually use both of the Authority’s forklift trucks to off-load a delivery truck; the wastes are then staged along the far wall of the tipping floor so they can be properly inspected.

Waste inspections are done by LCSWMA compliance officers and Covanta personnel responsible for this task. One thing RRF waste inspectors can attest to is that supplemental waste comes in all shapes and sizes, and all types of packaging. This is one of the reasons the tipping floor inspection is so important to operations at the plant. It is imperative that no unapproved wastes are processed at the facility.
Supplemental residual wastes are usually delivered in fiber, poly, or steel drums, or are packaged in cardboard boxes shrink-wrapped on pallets. One of the first items the compliance personnel will check is whether or not the delivered waste has the correct labeling. The waste-specific, four-digit Covanta approval number must either be on the container itself, or on a label attached to the container. Additionally, the label should have the three-digit G-code (short for generator code) assigned to it by LCSWMA; all supplemental wastes are given a G-code. Finally, the label should also have the generator name and a material description on it.

The next part of the inspection involves opening the drums and/or boxes to verify that the delivered materials match those listed on the waste stream approval paperwork. If the wastes pass inspection, they can be processed. However, if a discrepancy is discovered, the materials are set aside until they can be identified. If it is determined that the waste is not approved for processing, it is loaded back onto the delivery vehicle and returned to the generator or broker.

RESIDUAL WASTE PROCESSING METHODS

From 1991 through 1993, the RRF burned only MSW, reclaimed landfill waste (primarily MSW plus dirt), shredded railroad ties and telephone poles, and tire chips, which were used to help in the combustion of the dirt-laden reclaimed waste. However, the landfill reclamation project was concluded in 1994, so the Authority began to seek out other waste streams to fill the available capacity in the plant.

The RRF began processing significant quantities of residual waste in 1994, when over 27,000 tons were handled. Over the next two years, nearly 132,000 tons of residual waste were processed. Interest in the program continued to grow. From 1997 through 2000, the facility burned an average of 111,000 tons of residual waste each year. In 2001, the RRF combusted nearly 116,000 tons of residuals, which represented over 30% of the 383,600 tons processed that year. Of the residual wastes processed in 2001, approximately 17%, or roughly 20,000 tons, were supplemental wastes.

As discussed above, Covanta determines how, and at what rate, wastes are to be fed into the boilers. In general, there are four main methods for processing supplemental wastes: pit mix; modified hopper feed; hopper feed; and caddy feed.

The waste storage pit at the RRF is rather large. It is approximately 200 feet long, 55 feet from the front edge to the back wall, and 54 feet deep. It can store up to 8,000 tons of waste. The facility has two orange peel-type grapple cranes which are used for mixing pit wastes and for feeding these materials to the boilers. Thus, pit mix is self explanatory. For most materials, this means that they must be mixed at a 10:1 ratio with other wastes in the pit (10 parts pit waste with 1 part supplemental waste) before being charged to the boilers; this is what is called a “normal” mix ratio. Other mix ratios that might be specified are medium (20:1) or high (30:1). A high mix ratio would be specified for wastes containing minimal concentrations of sulfur or halogens.

Modified hopper feeding is the method most frequently used for processing pharmaceutical wastes and other supplemental materials having relatively high concentrations of compounds such as sulfur or chlorides. If materials such as these are not fed properly to the units, it may cause them to exceed air permit emissions limits. Thus, the modified hopper feed method is used, since this is the only way in which precise amounts (pounds) of waste can be metered into the boilers. The method works this way: the crane operator builds an “island” of waste in the waste storage pit until it is level with the tipping floor; using a forklift truck, an Authority compliance officer then picks up a pallet of the waste and places it on the “island”. The Covanta crane operator is then contacted by radio, and notified that the pallet is ready for feeding. The crane operator then uses the grapple to pick up the pallet and lift it up to the feed chute hopper. The pallet and drums are dumped into the hopper, and both eventually slide into the combustion chamber.

Hopper feeding is reserved for “witness burns”, or for other situations where a generator wants the material placed, by hand, directly into the feed chute hopper. Currently, the only wastes fed this way are from pharmaceutical companies and local police departments that request this type of disposal.

The caddy feed method is rarely used, but certain generators, from time to time, have sufficient amounts of confidential documents that require its use. This method uses a device made by an Authority maintenance mechanic; simply put, it is a square box, divided in half, that can hold four 55-gallon drums, two on each side. Each side has a mechanical release that, when activated, opens the bottom of the box and allows the drums to fall into the feed chute hopper. The caddy feed box has an attachment that allows it to be picked up by the facility’s grapple crane. After the box is loaded, the Authority compliance officer on the tipping floor notifies the crane operator, by radio, that the box is ready to be picked up. The crane is lowered to the tipping floor laydown area, the box is attached, and is taken up to the feed chute hopper. Once the box is staged over the hopper, another operator releases the bottom doors, and the wastes fall freely into the hopper.

These are the methods for feeding various type of supplemental wastes into the RRF’s combustion units. What follows is a description of the ways these methods are used to process some of the RRF’s more unique residual waste streams.
Over-the-Counter Pharmaceuticals (expired or off-spec product)

The RRF has been processing pharmaceutical wastes since 1994. Pharmaceutical companies prefer having their wastes incinerated because facilities like the RRF can ensure complete product destruction. Most of the pharmaceuticals that are processed are consumer-packaged items being destroyed because they are either off-spec products, they have expired, or their packaging has been severely damaged during manufacture or transit.

These wastes are usually packaged in cardboard boxes shrink-wrapped on pallets, or are delivered in different sizes of fiber or poly drums. Most of the over-the-counter pharmaceutical wastes can be processed by simply dumping them into the refuse pit and mixing them thoroughly with the other wastes. On occasion, the modified hopper feed method has to be used.

Bulk Pharmaceuticals

The RRF typically receives bulk pharmaceuticals in the following forms: powders packaged in fiber or poly drums; bulk pills and tablets in fiber or poly drums; and creams, lotions, and shampoos delivered in fiber drums or, more frequently, in 5,000-gallon tanker trucks.

Bulk powders are always processed using the modified hopper feed method, because mixing these materials in the pit would cause the powders to become airborne, thus creating a health and safety problem for site employees and waste transporters. This feed method is also used for these products, since the majority of them will have a restrictive feed rate, such as 150 pounds of waste per unit every 15 minutes. The only way this feed rate can be assured, short of hand-placing all wastes in the hopper, is via the modified hopper feed method.

Bulk creams and lotions that are delivered in fiber or poly drums can normally be dumped into the pit, drum and all, and mixed with the other wastes. Creams and lotions delivered in 5,000 gallon tankers are handled as described below.

Liquids Delivered in 5,000 Gallon Tankers

During a typical week, the RRF will receive 5 to 10 tanker loads of various waste waters, most of which are 90-95% water. Each tanker holds approximately 5,000 gallons of fluid. Materials accepted in bulk liquid form include wash waters from a uniform manufacturer; water-based ink wash waters; rinse water produced from the cleaning of tanks containing food-grade products; and rinse water produced from the washing down of production lines by a manufacturer of hand creams and body lotions.

The compliance officers have found that the best way to handle liquid loads is to spray them into the pit using the “shooter”. This device is simple: a 3” diameter hose is connected to the outlet of the tanker, and the other end is attached to the base of the shooter; liquids can then flow from the truck into the shooter nozzle, as long as the tanker’s contents can be pressurized. The compliance officer stands on a small platform behind the nozzle, and uses the handle on the nozzle to spray the liquid over the wastes in the pit. It takes about 15 minutes to spray the truck’s contents into the pit.

The other method of handling liquids is to simply gravity-feed them into the pit. A hose is attached to the rear of the tanker, and the truck is drained directly into one location in the refuse pit. Gravity feeding takes roughly twice as long as the shooter method.

Unused Sharps

The RRF is not permitted to accept infectious waste, but it is allowed to process unused sharps. The handling method for these materials is as follows: the sharps, which typically arrive in consumer-packaged form in cardboard boxes or drums, are modified hopper fed into Unit #1 only. Covanta prefers that only one unit be used to process sharps.

Bulk Toothpaste

Bulk toothpaste is delivered to the RRF in cubic-yard plastic gaylords. These containers have a 6” diameter screw-on cap on top of them. Compliance officers, through much trial and error, discovered that the best way to handle these containers was by opening the screw-top and placing the gaylord in front of the pit. The Covanta front-load operator then forces the toothpaste out by pressing down on the container with the loader bucket. It’s almost the same as squeezing a tube of toothpaste.

Ink Waste in Steel Drums

The facility handles ink waste very carefully; even minor ink spills on the tipping floor can lead to larger headaches if trucks accidentally drive through the ink and track it elsewhere. In 2001, the RRF processed over 1,250
tons of ink waste, which is typically delivered in 55-gallon steel drums.

The way that the compliance officers handle ink waste is as follows: if the ink is free-flowing, the compliance officers merely use the drum handler attachment on the forklift truck to empty the drum’s contents into the pit. However, it is an entirely different story if the ink has become fairly hardened.

To process drums having non-flowable ink, a semi-absorbent material is first spread out on the tipping floor in front of the pit. In the past, shredded wood from the Authority’s landfill was used to absorb any spills, but the current favorites are large pieces of scrap carpeting or cardboard. The carpet or cardboard pieces are spread out, and the drums are placed evenly on top of them, about four feet apart. The compliance officers use an air chisel to cut the drums in half. The Covanta loader operator brings the loader bucket down on top of the drum, separating it into two pieces, and then pushes it into the pit. The metal is later recovered from the ash and recycled.

Confidential Documents and Controlled Substances

For many generators, the preferred method of handling confidential documents is the caddy feed method described above. Although the caddy feed box was designed to hold four 55-gallon drums, it can just as easily be loaded with boxes filled with confidential documents. However, other generators are equally comfortable having their documents placed in the pit and fed via the modified hopper feed method. It should also be mentioned that the RRF accepts confidential documents free of charge from Lancaster County agencies and county law enforcement departments.

Controlled substances in small quantities will always be processed by the hopper feed method, meaning that the materials will be carried by hand up to a unit’s feed chute hopper and thrown directly into the hopper. Hopper feed disposals are also usually witnessed by the generator or by a representative of the agency requesting disposal.

Unacceptable Residual Wastes

Even though the RRF processes a considerable amount of residual wastes each year, there are certain materials that are unacceptable. Antiperspirants cannot be processed because the aluminum chlorohydrate in these products blinds the fabric filter bags in the baghouses. This causes an unacceptable pressure drop across the baghouses, and compromises their ability to remove particulates from the flue gas stream. The antiperspirants also cause elevated temperatures in the superheater and economizer sections of the boilers.

Paint powder in fiber drums, as well as copier toner in gaylords and supersacs, were processed at the RRF, but compliance officers and plant operators eventually found the materials to be too dusty and potentially explosive. The waste powder and toner were then sent to a processor so that they could be mixed with water to reduce the likelihood of a dust explosion, and to help the dusting problem. This worked, to a certain degree, but the RRF did not receive any of the hydrated material in 2001.

Silicone emulsion and liquid silicone were initially approved for processing at the RRF, but Covanta operators determined that processing the material resulted in elevated opacity and an increase in pressure drop across the baghouses. The fires in the furnace also became very cloudy.

Similar problems were discovered during the processing of several different types of cosmetics. Operators noticed, over time, that baghouse pressure drops increased whenever these materials were processed. It was also determined that the cosmetics were coating the boiler tubes, probably due to their bentonite content, causing a significant loss of heat transfer.

SUMMARY

The Lancaster County RRF has shown that a wide assortment of residual wastes can be successfully processed at a state-of-the-art mass burn resource recovery facility. The residual wastes that the RRF has processed, and continues to process, have been very beneficial to both the Authority and to Covanta Lancaster, due to the tipping fee revenues received for these materials. In turn, the generators are quite satisfied with the performance of the facility, since it offers complete destruction of their waste streams.

In 2001, the RRF processed the following amounts of supplemental waste:

- Pharmaceutical wastes - 3,164 tons
- Healthcare products/returned goods - 6,169 tons
- Waste waters/misc. liquids - 3,863 tons
- Industrial residues - 18,158 tons
- Ink, adhesives, and caulk - 5,820 tons
- Virgin oily debris - 1,836 tons

REFERENCES