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ADVANCED MATERIALS RECOVERY

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Advanced Materials Recovery

Is this the next step towards achieving zero waste? BY JAMES R. MILLER

Materials Recovery Facilities (MRFs) continue to become larger and more complex with more unit processes performed by sophisticated equipment employing advanced technologies. Understanding this trend requires a brief look at the history of materials recovery, where the industry is today, and what remains in the waste disposal stream.

Waste reduction and recycling programs have been an important part of almost every solid waste system throughout the country for the last 30 years. Some communities have achieved diversion and recycling rates of over 60%, but the national average hovers around 35%. Although some jurisdictions will continue to experience increased diversion and recycling as their existing programs and systems mature, many others are looking for the next step towards achieving higher rates.

Municipalities that are looking for ways to increase recycling rates are considering mixed-waste processing in an Advanced MRF, or "dirty" MRF as they are often called. With proper management, equipment systems and materials selections, mixed-waste processing can produce recovered goods of high quality that can be sold at the upper end of the price scale on the increasingly competitive global commodity markets. The information and data from existing MRFs presented in this article will provide insight on increasing recovery through mixed-waste processing using Advanced Materials Recovery technologies.

Why Consider an Advanced MRF?

Most communities have instituted curbside collection of commingled recyclable materials from residences. These collection programs are mature and generally well supported by a high percentage of households that participate. In addition, MRFs that process residential commingled wastestreams typically recover very high percentages of the recyclable materials.

Once collection and processing of the residential commingled wastestream was well established, the next step for some municipalities and processors was to collect and process source-separated recyclable materials from commercial and institutional customers. Often,

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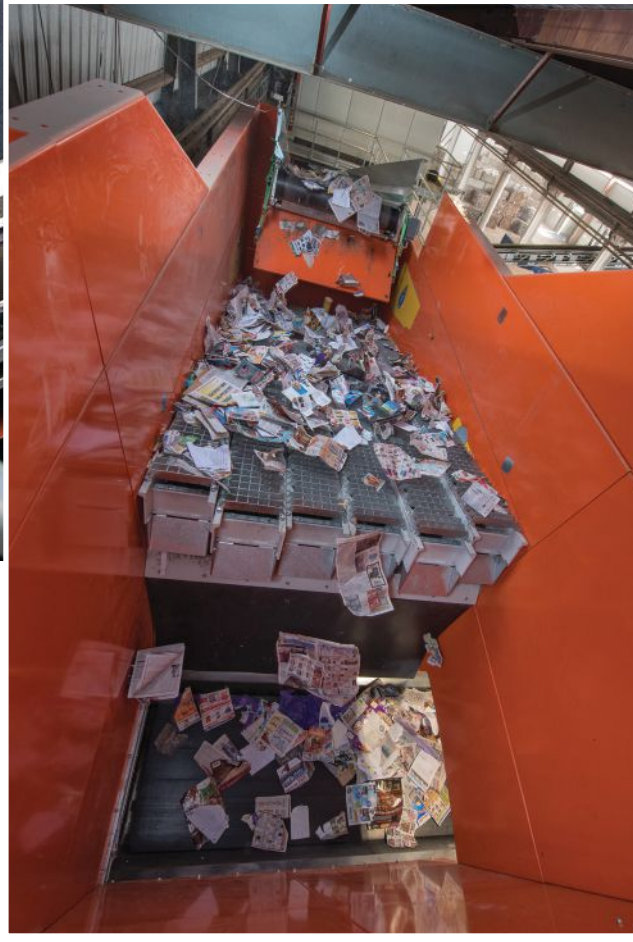

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these select wastestreams could be processed along with the residential materials with little or no modifications to the processing systems.

However, in many locations providing separate commercial and institutional routing to generate loads that contain more recyclables has limits due to costs and logistics. As a result of this and the sheer nature and volume of the commercial and institutional wastestreams, many recyclable materials remain.

Other efforts to boost recovery have been the implementation of residential green waste collection programs and composting of the collected materials. Measurable gains have also come from processing of construction and demolition debris.

Despite these historic gains, there is continuing pressure from many different levels to increase the amount of recyclables and divert more from landfill. Most notable are the new state and local regulations and/or policies aimed at setting higher recycling and diversion goals.

Recently, California passed new laws that will lead to a 75% statewide recycling goal by 2020. A key element of this legislation requires local jurisdictions to establish recycling programs for commercial and multi-family generators. The city of Seattle approved a policy to achieve a 70% recycling rate by 2022. Several other communities throughout the country have adopted "zero waste" plans with the goal to eliminate landfill disposal.

Another factor influencing the desire to increase mixed-waste processing is that landfills are significant contributors to greenhouse gas emissions. Another very important consideration is the fact that solid waste is a resource, and we should strive to reduce, reuse, recycle, compost, and recover energy before considering disposal.

These driving factors are ever pressing, and legislators and policy makers will not be deterred from passing regulations and policies that call for higher recovery rates. In order to satisfy these demands, increased processing of the mixed commercial, multifamily, and institutional wastestreams is imperative.

What Is Left to Recover?

Within the remaining wastestream, the mixed commercial, multifamily, and institutional wastestreams contain significant quantities of recyclable and organic materials, specifically food waste that can be composted or converted to energy through anaerobic digestion. Additionally, materials such as wood and mixed plastics can be recovered for thermal conversion, and there are beneficial uses for many other construction and demolition (C&D) wastes.

Waste composition studies from several communities verify this. In Seattle, a comprehensive waste characterization study was performed in 2010 that revealed their commercial wastestream contained between 25% and 30% of marketable commodities. The list includes traditional "readily recyclable" materials such as OCC, mixed paper, HDPE, PET, mixed plastics (such as rigids and film), aluminum, and ferrous and non-ferrous metals. In addition to these marketable commodities, another 20% of the wastestream is comprised of food waste and other organics.

This is not a unique case. A comprehensive waste composition study for commercial wastestreams in northern California showed their commercial wastestream contained about 30–35% of various marketable commodities. The mixed organic stream (food and green waste) was estimated to be about 32%.

In addition, a waste composition study conducted for the Fraser Valley Regional Waste District located east of Vancouver, BC, showed that their commercial/institutional wastestream is comprised of approximately 25% marketable commodities, and 21% food wastes and compostable mixed organics.

The data sighted from these studies provide evidence of the potential to recover more recyclables from the commercial, institutional, and multifamily wastestreams. Considering the challenges with establishing consistent and reliable source separation collection programs for these generators, advanced mixed-waste materials recovery may be the best means for capturing these recyclable goods.

Programs to collect food waste from restaurants and grocery stores can play a role in reducing the amount of organics disposed into landfills, but the reality is that most food waste is embedded in the mixed wastestream and is not present in concentrated forms. Separating the food waste for composting or anaerobic digestion requires advanced systems and processes.

After separation of the recyclables and organics in an advanced MRF, a predominantly dry residual wastestream remains. Where markets exist, this residual stream—which consists mainly of plastics and fibers—can be converted to engineered fuel.

How Effective Are Advanced MRFs in Recovering Recyclables From Mixed Wastestreams?

MRFs that process source-separated wastes are designed to recover targeted recyclable materials that may comprise more than 90% of the incoming stream. In contrast, mixed-waste systems are required to process much larger quantities of materials to recover those same targeted recyclables, but also organics, inerts, and possibly dry residuals for engineered fuel.

To meet these demands, Advanced MRFs are designed with high-throughput, robust screening equipment to segregate materials,

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typically into three different size ranges, early in the process.

Dividing the wastestream through size segregation is a very effective first step in minimizing contamination. Additional processes include ballistic separation that effectively separates fibers from containers and other three-dimensional objects.

However, despite these advances in technology, the perception remains that materials recovered from a "dirty MRF" will be highly contaminated or soiled, and as a result, their market value will be diminished. Although there is lack of published data to dispute this, evidence provided by MRF systems providers and operators tell a different story. Information from the following case studies will provide some insight.

Case Study: Newby Island Resource Recovery Park, San Jose, CA

In addition to source-separated residential commingled wastes, NIRRP receives approximately 200,000 TPY of commercial wastes, split into three streams: wet, dry, and a third stream for generators of high volumes of select materials such as cardboard or mixed paper. Their Advanced MRF processing system was installed in 2012 and processes all four streams.

In 2013, recovery from this system was: (1) recyclable commodities = 22%, (2) residual organics for composting and anaerobic digestion = 36%, and (3) recovered wood for biofuel and other uses = 14%. The residual organics are processed at the ZWEDC anaerobic digestion facility nearby in San Jose.

Case Study: Grand Central Recycling, Industry, CA

The GCR Advanced MRF system was expanded in 2014 to receive and process 500 TPD of mixed commercial, multifamily, and C&D wastes. Their wastestreams fluctuate during the day and from day to day, and their recovery rates for marketable commodities fluctuate accordingly—from mid-20%, to mid-30%. Although the system produces organics and dry residual wastestreams, currently they are not recovering or marketing those materials.

Case Study: Athens Services, Sun Valley (Los Angeles), CA

The Athens MRF came online less than one year ago. Their Advanced MRF system is designed to process 1,500 TPD of mixed commercial and multifamily wastes. To date, over 30% of incoming materials are being recovered, primarily commodity recyclables, wood with some recovery of other materials for beneficial use.

According to Greg Loughnane, President of Athens Services, "Considerable materials we are recovering are being successfully

marketed as commodities. We see future increased diversion coming from organics, plastic film and engineered fuel markets." When all of these efforts are fully realized, Athens Services expects to recover more than 60% of the incoming wastestream.

Case Study: IREP, Montgomery, AL

The Infinitis Renewable Energy Park (IREP) MRF has received considerable attention because it is the centerpiece of Montgomery's "Single Bin" collection and processing system. All municipal waste collected in Montgomery with no source separation, creating a truly mixed wastestream. One hundred and seventy-five thousand TPY of collected materials are received and processed through the facility's Advanced MRF system.

Based on nearly two years of operations, recovery from this system is: (1) recyclable commodities = 22–25%; and (2) residual organics for composting = 20–22%. The total projected recovery, based on fully developing the markets for organics and dry residuals to be used as biofuel, is more than 60%.

Can Recyclables From Advanced Materials Recovery Facilities Be Marketed?

There are many vocal opponents of mixed-waste processing. The unflattering term "dirty MRF" often precedes discussions of low recovery rates, lack of public participation, and limited educational opportunities. Clearly, the potential for contamination is very high and the recovery rate is relatively low. However, advanced technologies have been developed specifically to minimize the effects of contamination and maximize the values of recovered goods.

Dan Domonoske, Vice President of Potential Industries in Wilmington, CA, operates a MRF that processes source-separated as well as mixed-waste materials. According to him, "Moisture content is a major factor in determining the value of recovered fibers. Small amounts of excess moisture from water are far less of an issue than any moisture from foods and unknown sources. Modern, well-designed MRF systems can sort and remove these potential contaminants from fibers that entered the wastestream in clean and dry condition. This is the key to higher quality and commodity values."

Steve Miller, President of Bulk Handling systems states, "A common misconception is that a mixed-waste facility ships contaminated fibers and polymers and/or the fiber and polymers shipped must be sold at a discount. Speaking for the facilities that we have built, this is simply not true. All products shipped meet or exceed the specifications provided by end use customers. Anyone in the industry understands that no user of material would accept anything less. In fact, since the implementation of the Chinese 'Green Fence', standards have tightened, making the production of quality material even more important. While it is true that some of the fiber becomes contaminated during the collection cycle, the processing systems that we build have technology that separates contaminated materials and only material that meets customer standards is baled and shipped."

Terry Schneider, CEO and President of CP Group, adds, "Clean fiber recovery can be challenging, yet it is feasible to achieve end-market specifications. Profitable fiber recovery requires additional equipment and additional sorting. While some yield loss is inevitable, it is offset by the additional volume. Organics solutions are ongoing and continue to develop. CP Group has engineered and installed several profitable mixed-

waste processing plants in recent years."

According to Chris Hawn, North American Sales Manager for Machinex, "With optical/near-infrared technology, we can do a very good job of reading and segregating plastics, fibers, metals, etc. However, we can't control the cleanliness of the materials before they are received. Although our systems can separate many of these contaminated materials, from a systemwide standpoint, the more foods and liquids that are segregated at the source, the higher the yield, quality, and market value of the recovered goods."

According to Carl Mennie, NIRRP Plant Manager, "We experienced some short-term, specific issues with rejections due to the implementation of the Green Fence. Other than that, NIRRP has had no problems with marketing recovered materials at the upper end of commodity prices." However, as Mennie also pointed out, Newby has a healthy flow of residential source-separated materials and their fiber products are a blend of what comes out of that stream and the commercial dry wastestream. Thus, they don't have a true experience of selling fiber from only mixed commercial sources.

Kyle Mowitz, CEO of Infinitus Energy, reports that since the IREP MRF in Montgomery began operation in April 2014, they have never had problems selling materials they recover. OCC is sent to Georgia Pacific mills here in the US, Mixed Paper sent to China with no rejections to date and satisfy "Green Fence" requirements. Plastics and other materials are marketed domestically with high success and praise from purchasers.

Can Advanced Materials Recovery Be the Next Step to Reach Your Recycling Goals?

Actions taken recently by several jurisdictions on the West Coast confirm that advanced materials recovery will be a key element in achieving increased recycling goals.

This question was recently answered in the affirmative by the Monterey Regional Waste Management District in Marina, CA, which has been at a 50% recycling rate for several years. In anticipation of the 75% recycling goal, the District conducted a feasibility study that led to the decision to move forward with a significant MRF improvement project.

An Advanced MRF system will replace an aging MRF designed to process only dry wastes (self-haul and C&D). The new system will replace the C&D processing line with a far more efficient line and add a second line that will process mixed commercial wastes. This new system will also have the ability to process source-separated residential materials. When the Advanced MRF is operation in mid-2016, its increased recovery will enable the District to achieve the 75% recycling goal for its member jurisdictions well before the 2020 date.

In Oregon, Portland Metro is the regional agency responsible for solid waste management. They are currently in the process of evaluating various alternative technologies to consider future actions needed to increase recovery. According to Paul Ehinger, Director of Solid Waste Operations, "from our review of the available technologies Advanced Materials Recovery appears feasible and we expect it to be a component for our system to increase recovery."

Conclusion

As the previous Case Studies indicate, mixed-waste MRFs are operational and achieving positive results, including increased recovery and marketable materials. Innovations in processing technology give facility operators the ability to process mixed commercial and multifamily wastestreams effectively and efficiently.

So as politicians continue to push the envelope to increase recycling goals and to divert more from landfill disposal, the burgeoning mixed-waste processing industry is reacting. By processing mixed wastestreams that historically were destined for landfill disposal, gains in the recovery of marketable materials and other materials with beneficial uses increases have been significant.

Advanced Materials Recovery is a proven method for recovering valuable materials and reclaiming the energy value locked in other materials and is a growing trend as a next step towards achieving higher recycling rates. The case studies presented in this article are good examples of the successful implementation of Advanced Materials Recovery and are provided to help other jurisdictions that are committed to increasing recycling and diversion. MSW

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