

Resilient Recycling

How MRFs Can Thrive by
Adapting to Constant Change



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The quality and safety of materials sorting is more important than ever, at materials recovery facilities (MRFs) and for the entire recycled products industry.

Yet, the COVID-19 pandemic is just the latest in a series of major disruptions that have impacted the MRF workforce, especially labor for sorting jobs. How can MRFs adapt their mix of labor, equipment and processes to not only function safely during an extended emergency, but also to position themselves for long-term resilience and competitive advantage?

“Most MRFs were designed and built a decade or two ago when people still read actual newspapers and Amazon was a small bookseller,” said Mark Neitzey, sales director for Van Dyk Recycling Solutions. “Today’s recycling stream has completely changed, and it needs much more sorting.”

During this crisis and going forward, the key challenge for MRFs is to achieve the right blend of technology and labor that will reliably yield high-quality end products, while also managing costs and risks — and especially, by keeping workers safe and productive.

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SALES DIRECTOR
VAN DYK RECYCLING SOLUTIONS



1. Sorter Labor Challenges, Old and New

Line sorting has long been one of the least attractive jobs at recycling MRFs.

Line sorters earn about \$10-\$11 per hour, a low wage that is unlikely to change due to the tight margins of the recycling business. Turnover is high (roughly monthly), which increases time and costs for training and reduces productivity. Conveyor belts sometimes run at 300 feet per minute — fast enough to trigger motion sickness, which afflicts one in three people to some extent. In recent years increasingly stringent U.S. requirements for drug testing and employment eligibility (E-Verification) have further shrunk the available labor pool. Since COVID-19, access to prison labor has decreased. Despite massive recent layoffs, in many regions MRFs still struggle to hire, train and retain enough sorters.

COVID-19 has introduced new complexities for MRF line sorting. Key among these are:

1. Increased stream contamination.

While commercial businesses have closed and large parts of the population are still mostly staying at (and working from) home, the inbound recycling stream is largely from residential sources. Thus, it is contaminated with far more non-recyclables.

2. Worker repositioning.

Until recently, line sorters were typically positioned close together. New physical distancing requirements can reduce the number of sorters on duty. When fewer sorters are on the line, the process may need to slow down, resulting in fewer tons of material processed per day.

3. New PPE requirements.

MRFs have always supplied and required the use of personal protective equipment (PPE). However, new PPE protocols for COVID-19 have increased costs and can slow sorters' work. Increased PPE requirements and cleaning procedures mean shift changes tend to take longer.



Meanwhile, the recycling business environment keeps getting more challenging. In recent years, China dramatically increased quality standards for the recycled materials it purchases. Many MRFs have struggled to reliably generate marketable product. As recently as January 2020 (before COVID-19 had proliferated significantly within the U.S.), sales of recovered fiber to China were down nearly 40% compared to early 2019 — and back in 2018-19, sales of recovered material had already been slashed dramatically by China's National Sword ban on recycled material imports. Without reliably high-quality sorting and processing, MRFs cannot serve their remaining export and domestic markets.

Despite all these challenges, line sorters still play a vital role in recycling because of the high level of contamination of inbound streams. Even before the pandemic, approximately 25% of what gets put into U.S. recycling bins is not recyclable. Also, up to 2% of the inbound stream is film bags, which wrap around screens and must be cleared every one to four hours.

"MRFs are basically farms trying to create a yield of good-quality produce that an increasingly fickle market will buy," said Neitzey. "Many factors go into good MRF operation. Mechanical sorting devices, intelligent sorting devices and humans occupy different roles, with each as crucial as the next. Knowing how to sequence these different types of sorters is what separates a progressive, state-of-the-art MRF from an MRF that is behind the times."

In addition to pre-sorting the inbound stream, sorter positions are critical throughout the process line to improve quality control.

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MATERIAL RECOVERY FOR RESOURCE RECOVERY SOLUTIONS

Sorter positions on the residue line also are becoming more common, to capture missed recyclables. Many MRFs are contemplating equipment upgrades and adding new technology to simultaneously address labor and material quality issues.

"If they help you meet export market specifications, sorting devices and labor pay for themselves," said Michael Timpaine, principal and vice president of process optimization and material recovery for Resource Recovery Solutions. "Applying technology and people at the right points in the process, to remove contaminants efficiently and safely, ultimately yields a higher-value, more marketable product."



2. Newer Technology Improves Safety for Human Sorters

Newer, more automated technologies can complement the unique capabilities of human sorters. This allows the MRF process line to remove more contaminants and recover more high-value recyclables, while also reducing risks and downtime.

“Machines cannot and should not replace every human sorter,” Timpaine said. “However, sorter positions do turn over about every month. That work is tedious, and conditions can be challenging and potentially dangerous — especially at the front of the line.”

Neitzey agreed. “The goal is to automate the hardest, most dangerous parts of the pre-sort,” he said. “Then humans can handle the sorting that humans do best: quality control of individual commodities.”

In a modern MRF, the first line of defense is to use non-wrapping screens to remove large, bulky items that could cause harm to human sorters. Residential customers are notoriously likely to dump a surprising number of large non-recyclable items in their recycling bins: bicycle wheels, rugs, TVs, etc. Unwieldy items are easy to spot, but they can be physically difficult and risky to remove by hand. Similarly, glass and fines pose some danger, so they should be removed early by glass breakers and similar devices.



After the stream has been screened for size, the key challenge is to continue separating material despite the high volume of film bags and other contaminants. Two-dimensional (2D) material (such as paper) must be separated from 3D material, such as containers. However, film and other stringy materials (such as Christmas lights) that have made it through the pre-sort can compromise this process. These contaminants can wrap tightly around the screen shafts, interfering with the separation process: containers that should have bounced off the screen end up riding over with the paper.

When a screen gets bound up, the entire MRF process line must be halted so the screen can be cleaned. To do this, workers must don harnesses and lay on the screens for up to hours at a time, cutting tightly wound plastic and rope-like material from the shafts by hand.

To reduce process downtime, many MRFs have installed non-wrapping screens, which are dramatically less likely to be fouled by film bags. The cleaning process on these newer screens can be as quick as 15 minutes.

“Today, the screens are very, very good,” said Todd Hubbard, vice president of recycling for LeadPoint, which provides staffing for the recycling and waste industry. “Cutting bags away from a screen is definitely one of the hardest, most dangerous and least favorite tasks that sorters are asked to do. Anything that reduces wrapping makes the sorter’s job better.”

3. The Path to Profitable Equipment Upgrades


Upgrading screens should be a top priority for any MRF, for economic as well as safety reasons. New screens yield immediate, dramatic improvements in safety and efficiency. Plants that delay in upgrading most/all of their screens put themselves at a significant competitive disadvantage.

“When a whole shift’s staff stops working and material stops flowing due to a wrapped screen, multiple times each day, that reduces how much product you have to sell,” said Timpaine. “MRF operators do that math and make a decision based on the margin.”

As the recycling business environment keeps getting more challenging, it also becomes more challenging for MRF operators to decide when to invest in additional equipment upgrades. Navigating upgrade decisions can be complex; however, delaying upgrades increases dangers, risks and costs.

Timpaine explained that planning MRF process equipment upgrades is similar to planning equipment upgrades for any industrial process. To project a reliable return, operators must estimate costs associated with before-and-after conditions in efficiency and yield. Key variables include reductions in hazards, turnover rate, injury rate and training costs. “Once you’ve determined those factors, you can calculate the return requirement for a new piece of machinery,” he said. “That tells you which equipment you can afford, and how fast you’ll see the return.”

In addition to non-wrapping screens, optical sorters (historically used further down the line to separate containers and plastics) now are increasingly located toward the front of the



line for primary separation of paper fiber. Placed after a non-wrapping screen, an optical sorter can examine 2D materials and separate film from paper ten times faster than a robot or human. Robots also are increasingly popular for quality control.

Before considering new intelligent separation devices, MRFs may be able to reap considerable benefits from adjusting existing process equipment.

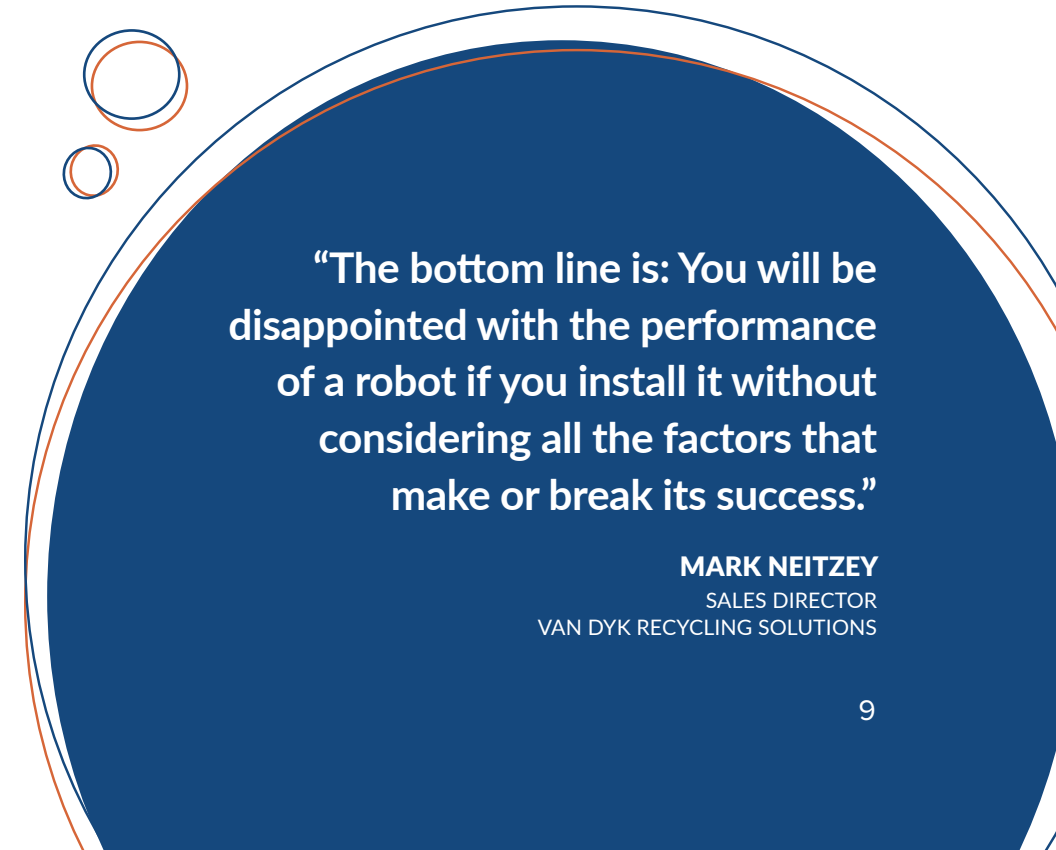
Neitzey related a recent exchange with a MRF operator who expressed interest in buying a robot. “They needed to examine all parts of their operation first,” he said. “Large cardboard was falling through their fiber screen, so they positioned some line sorters to capture it. They wanted to install a robot so they could reposition those sorters. But it was clear to us that they needed to tighten the spacing on their screen shafts. Once the screen was working properly, they were able to remove those two sorter positions without adding a robot on that line.”

It’s essential to pay close attention to the performance of every individual machine in the plant. “Each piece of equipment on your line directly affects the performance of the machine that follows it,” Neitzey said. “It either does its job well and sets up the next machine for success, or it performs poorly and sets up the next machine for failure. That domino effect will continue through your system and result in poor product yield.”

Intelligent (optical or robotic) sorting devices perform well only when the conveyor belt displays an even, single layer of material. To achieve this, sizing screens should remove large pieces of cardboard or other

material, so angled screens can focus on 2D and 3D separation. “The second set of screens should do their job without getting clogged with film bags, so that an optical fiber sorter has an even stream of material to work with. Subsequently, the optical sorter will make more accurate picks — which means robots on the quality control line will have less contamination to deal with,” said Neitzey. “The bottom line is: You will be disappointed with the performance of a robot if you install it without considering all the factors that make or break its success.”

The same principle applies to human sorters. “Can your quality control sorters find what they are instructed to sort, while swimming through deep clumps of material whizzing by on the belt?” asks Neitzey. “They won’t be at their peak performance under those conditions. They will be tired, frustrated and have little sense of accomplishment.”



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4. Empowering Human Workers to Do Their Best Work

Reducing the danger associated with certain front-line MRF positions, and reducing frustration on quality control lines, can make line sorter jobs more attractive. Once this is achieved, MRF operators can think more creatively about opportunities to add variety and opportunity to this role. In particular, cross-training encourages sorters to stay on the job, by creating opportunity to eventually move up the ranks.

“Ultimately, MRFs want their team of sorters to be safe, permanent, cross-trained and happy employees,” said Timpaine. “When the MRF is staffed correctly with happy employees who can each fill multiple roles, that greatly reduces the risk of hazardous, repetitive work. It also increases productivity, and job satisfaction. Wherever I see that achieved, the sorters are more efficient, and the plant runs much better.”

The quality and consistency of management strongly influences this good outcome, by establishing a culture where all roles are valued. “MRFs that take the time to cross-train generally have the best managers,” Timpaine said. “The worst MRFs have lots of management turnover. It takes time to establish a highly constructive culture.”

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Working with a reputable labor outsourcer can be a useful middle ground for MRFs that urgently need to enhance worker productivity, but lack the time needed to optimize their culture. “The best labor outsourcers have their own employees and culture. They do their own screening and training, and they focus on serving MRFs, so sorters show up ready to work.” said Timpaine. “This can be a huge, immediate improvement for MRFs that previously relied mainly on temporary workers hired off the street.”

Hubbard observed that one of the simplest yet most effective ways to build a culture that encourages sorters to do their best work is for managers to regularly converse with sorters. When sorters see that managers value hearing their experiences and ideas, they feel more engaged in the MRF’s business — which can encourage them to keep returning.

“Communicate with your sorters on a daily basis,” Hubbard recommended. “Ask them: ‘Why are you grabbing that material? Do you know why that’s so important to our process?’ Break down for them how every pick they make translates to the bottom line, so they know the value of their work. If everyone is just collecting a paycheck and doesn’t know what their work is for, you’re not going to get their best work.”

Conclusion

The latest technologies that help make sorter and other MRF jobs safer, cleaner and less tedious also enable MRFs to adapt more easily to changes in the recycling stream and new product quality requirements. Intelligent sorting devices can be reprogrammed in seconds to recognize and pick a different commodity whenever there are sudden changes in market value or stream composition. Such flexibility makes MRFs more resilient to many kinds of disruption, while enabling them to capitalize on emerging opportunities.

To stay competitive, MRF operators should consider upgrades that might drastically improve system performance — or else risk being left behind. Examining the line from the first pieces of equipment to the last can reveal opportunities for strategic investments.

Cross-trained staff and employees who know the value of their contributions are more likely to remain productive and engaged. The goal is not to replace people with machines, but rather to strategically leverage technology to better align the number of sorters needed with changing amounts and sources of labor. Thus, working together, humans and machines can help reduce costs and increase product quality — and ultimately, revenue.

A time of crisis can be a useful point to ask deep questions about processes, people and business. Crises can also strengthen the spirit of collaboration, encouraging municipalities and labor representatives to devise mutually beneficial solutions. In the long run, MRFs might emerge from this period of pandemic safer, more efficient, more flexible and even more resilient.

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Van Dyk Recycling Solutions helps waste and recycling processors maximize their profits by supplying equipment solutions that use state-of-the-art sorting systems and balers. Van Dyk has been a MRF designer and equipment supplier since 1984. We specialize in turnkey systems and retrofitting outdated plants with the newer, more efficient machinery needed to produce a high-quality end product from an increasingly contaminated stream. Retrofits can be as simple as adding a screen, optical, or robot, or as complex as a total modification and upgrade to an entire sort line. Designing the proper sequence of mechanical and intelligent sorting is essential to achieving an optimal flow of material throughout the MRF. This ensures a cleaner end product and more consistent plant performance. Call us for a free evaluation on how and where your operation can be improved.

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