2016 EXCELLENCE AWARD ENTRY

CATEGORY
Recycling Systems

ENTRANT
Zanker Recycling

ENTRY
Zanker Recycling’s Demolition Recycling Operation

POPULATION SERVED
San Francisco Bay Area
Population of 6 million

PROJECT BUDGET
Approximately $6 million

COST PER HOUSEHOLD
Total Households: 2,466,019
Approximate cost per household: $2.43
Zanker is a privately-owned and operated company. No government funds were used for the project.

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EXECUTIVE SUMMARY

Zanker Recycling (Zanker) is a privately-owned company that began operations in 1985, developing a landfill into a resource management and recycling facility. In 1998, Zanker expanded, permitting an adjacent landfill site as a construction and demolition (C&D) debris processing facility, now processing more than 2,300 tons/day.

We have continually pushed the boundaries of recycling technology, and redefined the expectations of the cities and customers we serve. Our new Demolition Recycling Operation has provided a solution to a growing waste stream new to our industry, known as Interior Demolition materials. Also growing are our customers’ LEED and State diversion goals.

This system delivers the solution our stakeholders demand. We embraced advanced sorting technology, working with Bulk Handling Systems (BHS), to develop a system that’s outperforming our throughput, recovery and uptime expectations. Zanker facilities are achieving an 86% recycling rate; we’re one step closer to reaching our goal of Zero Waste.
The primary goals of developing the new demolition recycling system were the ability to safely process demolition wastes, decrease operational costs of transporting sorted wood waste and concrete from our adjacent facility to our wood processing operation and our concrete crushing operation and to reduce the landfilling of the interior demolition materials.

Beginning in 2005, Zanker started to see a different type of demolition material that we were not able to process through our existing C&D system. This material is referred to as Interior Demolition (ID) which comes from the destruction of tilt-up buildings that are common here in the Silicon Valley, and also from tenant improvement (TI) projects from high rises. ID includes sheetrock, wiring, metal studs, insulation, ceiling tiles, carpet and carpet padding, vinyl flooring, fixtures, cabinets, doors and windows and is more difficult to process than traditional wood demolition. At the time, we were only able to process this material with hand labor through floor sorting, which is not a very safe or effective process.

Because of the ever-changing makeup of the materials Zanker receives, only 60% of the incoming demolition waste stream was considered wood demolition debris in 2013. At the same time, contractors were demanding higher diversion rates because of the development of LEED and other green business standards in California. Zanker identified that an automated materials processing solutions was demanded by our customers, legislators and community.

In 2014, Zanker and BHS started development of a type of demolition processing system that manages the newer types of demolition wastes while maintaining the ability to process the still prevalent wood demolition materials. By deploying air classification technology instead of water, interior demolition materials are now efficiently, effectively and safely recovered.
RECYCLING SYSTEM DESIGN

The system’s design and layout was dependent upon numerous factors. The solution had to be proven, robust and durable to operate with a high level of uptime. To achieve the goals of 75 tons per hour of throughput, 75% recovery, and minimal labor while maximizing worker safety, the system had to be highly automated. After thorough research, consulting and site tours, BHS was selected to design, engineer, manufacture and install the system. BHS offered a deep understanding of our material and brought new ideas to the table, such as the company’s decline screens. BHS subsidiary Nihot Recycling Technology has more than 70 years of experience and more than 750 operational reference sites, including hundreds in C&D applications. Zanker was confident that the combination of precise sizing using BHS’ Debris Roll Screens® and the closed-loop, highly accurate air separation of Nihot Single Drum Separators would produce industry leading recovery, purity and uptime. From our experience with BHS, we trusted their team of engineers, project managers and installers to exceed our expectations. And from the first week of operations until present time, the system has been doing exactly that—exceeding our expectations. Below is a system overview and a brief process description.
STEP BY STEP THROUGH THE SYSTEM

The most advanced and proven equipment was chosen for this system. To maximize recovery and, thus, diversion, it’s imperative to effectively size material. The bulk of the commodity classification is done by four Nihot Single Drum Separators (SDSs). Nihot SDSs separate heavier from lighter materials. While that sounds simplistic, they are effective because of their precision and flexibility. They are highly adjustable, with quick and easy adjustments to infeed speed, angle, air flow and drum speed. Negative air pressure, or suction, creates a laminar (flat and consistent) air flow for consistent separation across the infeed width while the closed loop system removes dust from the working environment. In this system, there are consecutive Nihot SDSs treating smaller and larger materials.

The need for two Nihot SDS lines stems from the principle that air density classification is most effective with a maximum material size differential of one to three. For example, if the smallest material entering a Nihot SDS is four inches, the largest material on that conveyor should be 12 inches. The closer the materials are to the same size, the more accurate the air density separation. The first Nihot in each series removes heavier aggregates, while the second removes wood as the heavier items from lighter materials. An Action Taper Slot Screen is extremely effective at separating large, bulky and abrasive 12” and over materials. The BHS Debris Roll Screen’s precise separation, for reasons which will be discussed later, has proven to be an excellent equipment choice for feeding the Nihot SDS units.

Finally, to capture ferrous metals, three size fractions pass under magnets.

1. TAPER SLOT 12" SCREEN
   Material is conveyed to the first screen in the system. 12" plus material goes to a post-sort line. 12" minus material continues through the system.

2. MAGNET
   The first magnet in the system pulls ferrous metals from the 12" minus material stream.

3. DEBRIS ROLL SCREEN® 5"
   12" minus material is fed into a Debris Roll Screen® with patented Tri-Discs™. This declined screen decreases dwell time, reducing wrap for maximum efficiency. The 5-12" material goes over the screen, continuing to the Nihot SDS; the 5" minus material continues to a second DRS®.

4. NIHOT SINGLE DRUM SEPARATOR 5-12" #1
   The 5-12" material goes to a Nihot Single Drum Separator, that uses air technology to separate material based on density. Concrete, brick, porcelain and other heavy material is separated out; the remaining material is conveyed to the next SDS.
STEP BY STEP THROUGH THE SYSTEM

5. **NIHOT SINGLE DRUM SEPARATOR 5-12" #2**
   - The second SDS on the 5-12" material line separates wood from residue. The wood goes to a final post sort and the residue is conveyed to a bunker.

6. **DEBRIS ROLL SCREEN® 2"**
   - The 5" minus material continues to the second DRS®. The 2-5" material goes over this screen and is conveyed to a Nihot SDS. The 2" minus fines continues to a magnet then to a bunker for use as ADC.

7. **NIHOT SINGLE DRUM SEPARATOR 2-5"#1**
   - The SDS uses air technology to separate the 2-5" material into heavies (aggregate) and lights (wood and other light material). The heavies are conveyed to a port sort and magnet; the lights continue to the next SDS.

8. **NIHOT SINGLE DRUM SEPARATOR 2-5" #2**
   - The second SDS on the 2-5" material line separates wood from residue. The wood goes to a final post sort and the residue is conveyed to a bunker.

9. **FINES MAGNET**
   - The 2" fines pass under a magnet before storage in the ADC bunker.

10. **HEAVIES MAGNET**
    - Concrete, brick, porcelain and other heavies pass through a final magnet before storage in the aggregate bunker.
STATE-OF-THE-ART TECHNOLOGY

BHS Debris Roll Screen®
The patented BHS Debris Roll Screen® is the industry’s flagship disc screen. Its proven, patented Tri-Disc™ design creates a consistent Inter-Face Opening (IFO) for precise material sizing (see graphic). Its triangular shape imparts an aggressive wavelike agitation upon material, and the waterfall effect on both screens in this system further agitates and turns material to ensure effective separation – as in the case of dirt and gravel on top of a piece of wood – the wood tumbles and turns over the waterfall drop. The patented gear timing paired with variable speed drives allows for fine tuning for variable material conditions. The timed discs are designed so that as one disc tip is moving downward, the reciprocating disc tip kicks troublesome materials out of the potential jamming areas.

The DRS has improved Zanker Recycling’s flexibility for processing the wide variety of material included in this ID material stream. In addition to aggressive material agitation, anti-jam design and precise IFO sizing, BHS also uses durable steel castings hardened to a 400+ Brinell rating. With highly abrasive material such as rock and metals, the durability and robustness of these screens are critical to the system’s more than 90 percent uptime. The DRS is extremely efficient, using the entire screen to size materials – it’s able to do more in a relatively smaller footprint, saving civil, structural and energy costs.

Nihot Single Drum Separator
Nihot equipment has been developed over the course of 70 years – and the company has perfected air separation technology. The company’s SDSs are Zanker Recycling’s most dependable asset – putting in a full day of work, day-in and day-out. The SDSs’ separation efficiency is excellent and proven – Zanker Recycling is able to extract aggregate materials by precisely tuning the equipment, and similarly, wood products are extracted by the following SDSs, leaving the remaining lighter material for hand sorting. Removing the heavier and abrasive materials early allows this system not only to create a highly pure commodity (see video), but to also limit the amount of hefty and potentially dangerous materials sorted by hand.
ENVIRONMENTAL PROTECTION & IMPACT

By striving to develop a truly integrated system of companies and system solutions to manage waste, Zanker has created and developed a family of companies that have been widely recognized as “state-of-the-art” processors. Our goal is to responsibly conduct business with an awareness of how we impact our natural and social environments and to develop solutions to new challenges as they emerge.

Our contribution to the advancement and development of new technology and mechanical equipment has enabled us to achieve some of the highest landfill diversion rates in the nation. The State of California set a policy goal of 75% landfill diversion by 2020. Currently, less than 16% of the total material handled at all of our facilities is being sent to landfill – well ahead of this statewide target.

From 2009 through 2011, our recycling efforts reduced Greenhouse Gas emissions (GHG) by nearly 1.7 million metric tons through recycling. Our goal is to achieve a combined, overall recycling rate for all of our facilities of 90%. In that same three-year span, our compost assisted in saving approximately 120 million gallons of water annually, and we reduced the amount of fertilizer being used by more than 5,000 tons annually.

Preventing negative environmental impacts from our business operations is of the utmost importance to our companies. We monitor our energy use, air quality and Greenhouse Gas Emission impacts. We have also made huge strides in “greening” our internal operations by reducing our waste, promoting green building design and implementing green and socially responsible purchasing practices. We do not exceed compliance but rather exceed all regulations, standards and industry best practices. This items are spelled out in our Sustainability Report.

RECYCLING PROGRAM IMPACT & MERITS

Besides the obvious benefits for providing more than 70% of all the C&D debris recycling for the City of San Jose, Zanker also provides more than $1,500,000 in fees to the City of San Jose and County of Santa Clara that pay for environmental programs throughout these jurisdictions. Zanker also employs more than 226 staff members and 12 specifically at the new demolition recycling system.

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<th>MATERIALS</th>
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<tr>
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<tr>
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<tr>
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<td>Residue</td>
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<tr>
<td><strong>DIVERSION RATE</strong></td>
<td><strong>77.11%</strong></td>
</tr>
</tbody>
</table>

Zanker diversion rates concerning our C&D processes are all third party certified by The Recycling Certification Institute. Our recycling rates are compounded annually and reported to the public on a monthly basis. As of March 2016, our current recycling rate for our recycling facilities is 86%.
USE OF EQUIPMENT/ SYSTEMS & TECHNOLOGIES

EFFICIENCY & EFFECTIVENESS

BHS Debris Roll Screen®: Decline Screen Angle
The first Debris Roll Screen in this system is making a 5” cut, whereby material that is 5” or less falls through the screen, while material larger than 5” (and under 12”) moves over the screen. This can be anything from 12” rocks to stringy metals and other interior demolition materials prone to jamming. To accommodate this wide range of abrasive and potentially troublesome materials, BHS deployed a decline DRS with a two-deck waterfall and ‘roll-off’ shafts. A declined screen reduces dwell time, or the amount of time that material is on the screen’s deck. This means that material moves faster which prevents jamming. BHS’ decades of disc screen design and research revealed that the most prone shaft to wrapping is the screen’s final shaft. Instrumental to this screen’s success are the double-drop roll-off shafts at the end of each deck – the final shafts are gradually lower, which has virtually eliminated material wrap (see picture).

BHS Debris Roll Screen®: Incline Screen Angle
The second DRS treats 2-5” material and does not require the decline design. The slight incline on this screen increases the dwell time, which allows the material to spend more time on the screen deck and enables the material to completely spread across the width of the screen. The material travels up the inclined screen deck against the forces of gravity. An inclined screen separates more materials per square foot of screen deck, increasing separation efficiency and allowing for a smaller footprint.

Nihot Single Drum Separator
The Nihot Drum Separator separates material streams based on density using a rotating drum and recirculating fan to pull light materials away from heavy materials and into the engineered expansion chamber. Air is filtered and recirculated. The Nihot SDS is extremely accurate at separating rock from wood and then wood from other materials.

- Highly adjustable separation
- Guarantee high separation efficiency up to 99%
- More than 750 operational reference sites, many in C&D
- Low maintenance costs and very few wear parts for more uptime and low operational costs

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RECYCLING SYSTEMS • ZANKER RECYCLING
EQUIPMENT SAFETY FEATURES

BHS’ Product Development Manager, Jim Webb, is a member of the American National Standards Institute (ANSI) Z245 Accredited Standards Committee as well as two subcommittees, including Z245.41, responsible for “Facilities for the Processing of Commingled Recyclable Materials – Safety Requirements.” BHS not only follows both OSHA and the more stringent ANSI requirements, but is a change-leader and driving force for increased safety in these facilities. The latest safety improvements are featured prominently in this system, including:

- Debris Roll Screens are equipped with large 900-square inch doors for comfortable maintenance access as well as multiple accessible anchor points.

- Ergonomic sort stations and conveyors to slide material, rather than lifting over a flat edge – extra-large bins eliminate material jams

- Auto-close gates on ladders and protective cages at every applicable location – OSHA safety standards require cages on ladders above 20 feet – at Zanker, ladders are caged at 12 feet and above

- Platforms and walkways feature continuous handrails, and wide platforms provide wrap-around access to equipment and safe exit routes

- Guards cover all rotating shafts on drive and non-drive sides and all conveyors below 7 feet are guarded. All conveyor ‘nip points’ are guarded

- Electrical panels are accessible for diagnostics without opening the doors, limiting exposure to electrical system. Controls feature NEMA 12 safety enclosures with 3-phase indicators on outside panels.

- Emergency stops to all conveyors are strategically located throughout the plant within 3-feet of a manned station. Emergency stops meet or exceed ANSI standards.

- Disconnects for every motor are located in accessible areas and are easily accessible. All doors to equipment feature interlocks that will stop equipment and trigger an alarm if a door is opened during operation.

To date there have been no injuries attributable to the New Demolition Plant or its operations.
Compliance with the California Environmental Quality Act (CEQA) was required during the local (City of San Jose) zoning and permitting process. This CEQA process was open to public review and comment and required extensive evaluation of all possible environmental impacts. All identified impacts were appropriately mitigated to acceptable levels and are regularly monitored for ongoing compliance. Upon completion of the CEQA process, appropriate local zoning changes (from Public Open Space to Planned Development [PD]) were allowed, a local permit (PD Permit) was obtained and the site was recognized in the County of Santa Clara as an Integrated Waste Management Plan. With the CEQA process completed and all of the local approvals (zoning and permits) recognized, the State of California (State) permits were obtained from the Department of Resources Recycling and Recovery (CalRecycle) and the Environmental Protection Agency (CalEPA). Because of the site’s wetland setting, development approvals also had to be obtained from the United States Corps of Engineers and United States Fish and Wildlife Service. Additionally, operational approvals were obtained from the local Air Quality Management District (Bay Area).

Regulatory compliance is ensured through monthly inspections by the Local Enforcement Agency (LEA - City of San Jose Department of Planning, Permitting and Code Enforcement) and periodic inspections by CalRecycle and CalEPA. No regulatory citations have been issued at Zanker in the last 5 years. Copies of the LEA inspection reports can be obtained here.
Zanker employees handle many types of materials and must deal with multiple safety issues every day. OSHA as well as our Local Enforcement Agency that works for the State of California Solid Waste Facilities Permit provide a safe workplace regulations and monitoring for all employees.

To further ensure the safety of our employees, Zanker has a fulltime safety coordinator that provides complete comprehensive inspections every month at each operation. Our safety coordinator spends 80% of his time in the field, ensuring that safety guidelines are being followed. Safety meetings with the employees are completed weekly, with an emphasis on Lock Out-Tag Out and Confined Space procedures. These meetings are also used as a forum for employee suggestions on operations. In 2015, only 8 minor injuries were reported out of the 186 employees.

Safety Procedures and Enforcement:
Safety procedures area strictly enforced for the benefit of employees. To date there have been no injuries attributable to the new demolition system or its operations. Also, a monthly safety inspector from our worker compensation insurance company provides inspections of all operations to ensure the safety of our employees and to train our in-house safety coordinator.

Safety procedures begin early on. By pre-screening for dangerous materials we’re able to identify hazardous materials and prevent them from reaching the demolition recycling system where they could affect employee health. These inspections are conducted on every load that enters our facility. If dangerous materials are found in the load, the material is given back to the hauler along with disposal instructions so they can legally dispose of the materials. In addition to items such as tires, paints, batteries, liquids, and asbestos, there are literally hundreds of hazardous materials commonly found in homes and offices that prohibited to enter this.

Zanker employs a lock out/tag out procedure to ensure machines are properly shut off and cannot be started up again prior to completion of maintenance or service work. Non-slip stairs and walkways help to prevent slips and falls. Functional barriers prevent casual contact with any moving parts and dangerous areas. Personal Protective Equipment (PPE) must be worn in all areas of the facility.

The facility’s air emissions are permitted through the Bay Area Air Quality Management District and routinely tracked and reported to ensure that they are within legally established limits. Fire safety system equipment is located throughout the sorting systems as well.
MEASURING SUCCESS

**Diversion has nearly doubled with the new system.**
The recycling rate for the new demolition recycling operation is slightly higher than our projection of 75% and this is mainly due to increased wood and soil in the demolition materials. The recycling rates are based on all the outbound commodities compared to the amount of residuals sent to landfill. In future years, we are hoping to increase our diversion rate to 80%. Considering the fact that our recovery rate for ID materials was barely 40% over the last several years, the Zanker team is delighted with the results.

SYSTEM EFFICIENCY & DOWNTIME

Based on our previous tonnage projections, we were anticipating an average of 8,000 tons per month to be processed through the demolition recycling operation. The C&D recycling business is a lot different than a traditional curbside MRF or landfill in that Zanker does not have any contracts with government agencies or private haulers. Our demolition tonnages are all based on how well our marketing department has reached out to customers and haulers. Therefore, we are quite excited to see tonnages that have exceeded our projections, knowing that the winter month’s tonnages are dependent upon increment weather.

In the 10 months of operations of the demolition recycling system, Zanker is averaging more than 6,900 tons per month. As the summer approaches we anticipate that tonnage will steadily surpass our projection. Our current throughput average of 48 tph is below our projection but this has nothing to do with the plant itself, rather, the material availability and operational decision to load the system with only one excavator. The capacity is available and with an additional excavator feeding the system, surges will be eliminated and we will be consistently operating at or above the 75-tph capacity.

In December 2015, we performed a week-long test utilizing another Caterpillar 320 Excavator to manicure the material prior to the Caterpillar 570 Electric Excavator feeding the system—tonnage increased to 75 tph which far exceeds our projected 60 tons per hour we were looking for in our system planning. Both C&D systems provided by BHS have delivered throughput capabilities above and beyond the design requirements. A new Caterpillar 320 excavator has been ordered to arrive this June, just in time for the summer surge!
THE BOTTOM LINE

The demolition recycling operation is currently within 4% of its operations budget, however it is 19% below projections for the sales of finished products. Throughout the last 18 months, the price of ferrous metals has decreased from $240 per ton to $55 per ton. The good news is that our average of 3% material composition of metals has increased to compose 7% of our incoming tonnage.

At the same time, the biomass markets in California have plummeted from $35 per bone-dry-ton to $20. We anticipate that pricing for our biomass fuel will be at a $-10 per bone dry ton by 2019. To make up for this shortfall, tipping fees have increased from $56 per ton in January 2015 to $64 per ton currently. Zanker plans to increase tipping fees again in July in order to meet our budget. The entire operation is depreciated over a 10-year period.

The operating costs are appropriate for this type of processing system and less than projected as a result of the automation and the reduction in labor costs compared to our other system. The energy costs for the machinery was also below budget even though we included a new Caterpillar 570 Excavator. Because our recovery rate was better than projected, we have also reduced our residual disposal expense.

CUSTOMER SERVICE

Zanker maintains more than 1,800 commercial account customers for its operations. A marketing team including a marketing manager and five staff members focus on all inbound and outbound customers. Each marketing team member supports a business segment such as demolition contractors and debris box haulers while another marketing staff member deals with the general contractors, as the needs of these business are different. In most cases, our outreach to the customers focus on our diversion rates and materials acceptance. This outreach is usually in the form of LEED letters which explains how we recycle materials and what our diversion rates are. Zanker also provides online review of all transactions including photos of incoming loads. Customers are able reprint tickets or photos of loads, run monthly reports and download their invoices. Additionally, all operations have been third party certified for their diversion rates and these reports are also available on our website. Diversion rates are public and updated monthly by the Recycling Certification Institute (RCI).

To answer our customers questions on how materials are recycled, we direct the customer to our website where integrated YouTube videos are available to show the system works. Videos link

Our Lunch at the Landfill is a unique event that we plan annually for our customers and friends. Zanker is a family-oriented company, and it only makes sense that we treat our customers with the same values. Lunch at the Landfill is our way of saying thank you for being part of our family.
PUBLIC ACCEPTANCE

As one of the newest, largest and highest performing C&D recycling systems in the U.S., Zanker’s 60-tph system will be on display for the industry’s flagship trade organization, the Construction and Demolition Recycling Association (CDRA) at the group’s May, 2016 C&D World Exhibition & Conference. Hundreds of conference attendees will have the opportunity to tour the MRF. Attendees will also be able to see the older 50-tph C&D recycling system and (also onsite) the world’s largest dry anaerobic digestion facility, owned and operated by Zanker’s sister company Zero Waste Development Company (ZWEDC).

Since the start of Zanker in 1985, our staff has been part of the local community in Alviso. Alviso is predominantly a Hispanic community and home to many of our employees. Every month the community elders and citizen boards hold meetings to discuss problems in the community. Zanker attends all these meetings and has been a driving force to improve the community through education and community development to foster science education. Zanker provides annual funding to the school district to pay the majority of expenses for its 6th grade science camp. Zanker Recycling is also a partner with the Santa Visits Alviso Foundation, an organization dedicated to serving the city of Alviso’s younger generation through scholarships and community involvement. Every year we host a barbecue lunch and contribute funds towards scholarships.

Zanker Recycling also provides weekly van tours to the public. We have done tours for all types of groups, from children interested in waste recycling to government officials and community members. This is one of the best ways we can immerse our community into what we do, as the vans drives right through each facility’s operations. We are active on social media, and have found it a great way to interact with our community and provide information, awareness and education on recycling.

FACILITY CLEANLINESS/MAINTENANCE

The Zanker aesthetic is a result of our continuous employee involvement. Our employees take responsibly for their working space and patrol the areas after each shift and or when there is a break in the sorting action. A smaller crew oversees the perimeters of the operation, including the several miles of roads leading to our facility. Zanker maintains a full time street sweeper to remove dust and dirt from the operational areas and roads between our different sites. Litter fences surround the operational areas to decrease any windblown litter and cleaned as needed.

Maintenance on the machinery is provided on a regularly scheduled basis. Some machinery receives daily inspections from our maintenance staff. Bag houses remove the dust generated in the processing of the demolition debris to maintain our permits with the Bay Area Air Quality Management District (BAAQMD). The taper screens and disc screens are cleaned regularly as part of our preventive maintenance program. Trucks and equipment are washed regularly as part of the equipment maintenance program. Maintenance on the loaders and haul trucks are performed in the enclosed shop on a scheduled basis.
First, the CDRA board wanted to change up the format of the show. "One of those changes is being able to offer a tour of a world-class facility, which Zanker Recycling certainly qualifies as," said Troy Lautenbach, chair of the CDRA Convention Committee and owner of Lautenbach Recycling.

Read more here

Read the Recycling Today article on the Nihot Single Drum Separator here