



When designing C&D handling and processing facilities, Robert Brickner (foreground on a facility tour) has found that vibrating/finger screens for the materials as received, in combination with star screens later in the process, enables effective manual sorting.

## BIOCYCLE Q&A

# TRACKING TRENDS IN C&D DEBRIS RECYCLING

**W**HEN it comes to waste disposal, the construction and demolition industries traditionally have been able to operate in their own sphere, outside of the municipal solid waste stream. Most states have dedicated C&D landfills that are regulated separately — and less stringently — than MSW landfills. Similar to the scrap industry, high value materials in the C&D stream typically are recovered and recycled. But the nature of the beast is such that without a mandated initiative or some sort of incentive (such as rising tip fees), it had traditionally been easier to load up demolition or construction waste and haul it to the landfill.

A combination of factors over the past ten to 15 years — including local and state recycling mandates and incentives, closure of C&D (and MSW) landfills resulting in longer hauling distances and increasing demand for some materials in the C&D stream — led to many recycling initiatives across the country. C&D debris recycling facilities handling both mixed and segregated loads use an array of equipment and systems to maximize efficiency and boost recovery rates.

To get a national picture of where C&D recycling has been and where it is going, *BioCycle*'s Executive Editor Nora Goldstein

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*A veteran of the C&D recycling industry talks about evolution in programs and processing equipment, public policies and trends in facility design.*

interviewed Robert Brickner, Senior Vice-President of Gershman, Brickner & Bratton, Inc. (GBB) in Fairfax, Virginia. GBB has been a leader in providing C&D waste management consulting, assisting clients in developing sound and cost-effective approaches to improve the handling, processing, recycling, and/or disposal of C&D waste materials. Bob Brickner has visited over 100 C&D waste handling and processing facilities around the country over the past 15 years. He recently completed surveys on the C&D industry for both the National Demolition Association and the Construction Materials Recycling Association.

**Q:** How have C&D waste recycling program initiatives evolved over the past 15 years? Have municipal and state governments become more involved in these programs?

**A:** Ironically, it was 15 years ago that GBB identified construction waste and demolition debris (C&D waste or C&D) as a major waste stream that no one was paying much attention to. The focus at the municipal level was more on materials recovery facilities for residential and commercial recyclables and yard waste processing as the 1980s boom with waste-to-energy project development slowed. I termed C&D waste the “sleeping giant” at the municipal level, because municipal folks were pushing recycling of things they controlled, e.g., residential recyclables and how to meet recycling goals, while C&D materials tended to be a private sector activity and “out of sight thus out of mind.”

Over the past five years, however, C&D waste has become recognized as a significant waste stream by municipal, state and federal solid waste and recycling officials. Without recycling, these materials are ultimately going into someone's landfills. While many of the constituent materials may be inert, there are still many “conventional recyclable materials” in this waste stream, with wood as the most prevalent in new construction and concrete and other inerts the most prevalent in demolition waste.

**Q:** Are there any significant pressures on C&D landfills that could lead to increased recycling of these materials?

**A:** There are fewer C&D landfills, but the ones that exist are bigger than in the past. Since they are larger, the potential for problems is greater, especially because, in the past, C&D landfills have had to meet less stringent environmental regulations than MSW landfills. Most state regulators, however, are becoming more aware of the need for some type of liner — typically re-compacted clay, and some leachate collection system. The old, unlined C&D landfills are a thing of the past. We anticipate that as the older, permitted C&D landfills close and municipalities and private companies look to build new ones, that they will face more regulations than before, not just for design

but for operation, such as a requirement for cover material and odor control. More stringent regulations, including even certain “material bans” from C&D landfills, will drive up the cost of C&D disposal and likely lead to more recycling opportunities. The extensive new C&D regulatory regime in Massachusetts is a prime example.

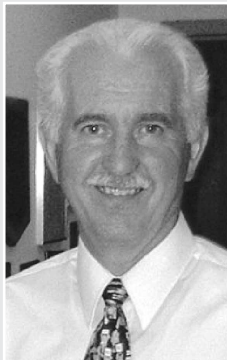
**Q:** Some local jurisdictions in California adopted ordinances or deposit programs to encourage the recycling of C&D. The California Integrated Waste Management Board subsequently drafted a model ordinance. Do you think ordinances of this type are effective?

**A:** As state and local recycling officials continue to seek waste diversion options, they have become pretty creative at figuring out what to do about a problem or challenge. In California, with the state’s mandated 50 percent waste diversion goal, the local municipal C&D ordinances requiring deliveries to C&D recycling centers prior to disposal, and deposit programs requiring solid waste plans and disposal verification tickets, are examples of some of these creative solutions put into practice to regulate C&D management behavior. But what government officials always need to recognize is that if private sector companies, like demolition contractors, are mandated to do something and it costs them more money, these additional costs will just be passed through to their customers, but then we all know that! Any new regulatory regime can be accommodated by the private sector, and someone will typically step in and provide the service. The only issue at play is the money. What cost must be passed on to the homeowner (for a new roof or bathroom remodeling), or a developer to demo a two-story building to make room for a 20-story building, for the new regime of regulations that the service provider must accommodate?

*(Editor’s Note: See <http://www.ciwmb.ca.gov/ConDemo/SampleDocs/> for a list of C&D recycling ordinances and models in California.)*

**Q:** Similarly, what are your thoughts about the recent disposal ban in Massachusetts?

**A:** It will be interesting to see what happens in Massachusetts, where the state’s disposal ban on certain materials in the C&D stream — asphalt pavement, brick, concrete, metal and wood — became effective this year. We’ll see what effect that will have on increasing tipping fees at these C&D processing facilities that are providing the new recycling infrastructure resulting from the ban. Since the state has had a well-published and participatory process for several years, most of the new processes have now been constructed, with a few more in the permitting mode. There most likely also will be an impact on rail haul to ship these materials out-of-state for disposal if necessary. Ultimately, any additional costs in-



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– Robert Brickner

curred will show up in the price of new homes, renovation and demolition contracts, etc.

**Q:** Has recycling at construction sites become a standard industry practice these days?

**A:** It really depends on where you are and if Green Building certification issues are part of the process. If you are doing construction in Orange County, North Carolina, or Seattle, Washington, for example, there is a lot of focus on construction site recycling. Elsewhere, if it is required, it is basically a matter of having a roll-off box on the site for materials to recycle and having laborers sort those materials out. Basically, builders need to be entrepreneurial and compete. Say the charge for a roll-off box is \$1,000. A builder can pay the \$1,000 and not do any recycling if they aren’t required. Or, for the same \$1,000, they can have laborers put cardboard in one place, wood in another and the rest somewhere else and recycle 25 to 50 percent of the materials at the new construction job. It may not cost them any more, and they can have the wood mulched, OCC recycled, and recover labor costs through the waste services avoidance and lower waste management costs. CornerStone Materials Recovery outside of Chicago is one firm offering such services. In most cases where this is going on, the builders have higher hauling and/or landfill costs to begin with to help push (or pull) these options.

The US Green Building Council’s (USGBC) LEED program has become very popular over the past five years and continues to gain momentum. Points are awarded for reuse and materials recycling, and many new private and public sector buildings are being designed within this USGBC template.

**Q:** What trends do you see in terms of sorting and recovery systems for recycling loads of mixed C&D debris?

**A:** Nothing is ever as effective or flexible as having warm bodies working along a sorting conveyor, making decisions based on their eyesight and use of their hands. If markets are down or throughput capacity is an issue, you just reduce or increase the sorting pool respectively. In terms of equipment, it really boils down to the volume anticipated and how much capital a company can afford to invest. Typically, the risk is what C&D volumes the entrepreneurial owner/operator thinks will be received. At times, the ultimate decision becomes a balancing act of how much equipment you want on the mechanical side versus how long and wide to make the sort conveyors and use extensive manual sorting. The business plan must realistically present how many sorters you have and how much you need to pay for the sorters, and still make the economics work. Ultimately, facilities end up having a combination of sorting conveyors, screens, grinders and magnetic separation systems. The higher the capacity and tipping fees, the more the C&D recycler can typically afford to invest in special pur-

pose mechanical recovery equipment.

Companies in a related business, e.g., a roll-off box service, that do not have a disposal company see the majority of their money going to a third-party landfill or other processing/recycling plant. If those kinds of companies can afford to step up and base-load their own C&D recycling system, and only have 40 to 60 percent (by weight) of what they are collecting go to the third party disposal site, the economics may start to make sense. They can take those dollars and invest them in their own site, labor and equipment and potentially, a site working at 40 to 60 percent recycling rates, depending on local tip fees and end markets, can survive. But a good business plan and performance sensitivities need to be developed as part of the decision-making and implementation process.

A related and very important issue is knowing what kinds of material loads a facility will be receiving to process/recycle. Is it from new construction? Renovation? Demolition? A demolition waste stream will have a lot more concrete, asphalt and brick/block. Demolition companies will remove materials like copper, brass and ferrous metals before or during the knock down process, so a recycling facility may not be receiving much in the way of these high value materials. Knowing the typical feedstock, even though variable on a day-to-day basis, can help determine whether a recycler should invest in any kind of unique sorting equipment. Programs, costs, and materials to be marketed in older city/urban areas are much different than the feedstock of new community and more rural projects.

**Q: What lessons have been learned in terms of equipment best suited to process mixed loads of C&D for recycling?**

**A:** The use of vibrating/finger screens for the materials as received, in combination with star screens later in the process for fines separation, enables effective, manual sorting and yields higher quality products for recycling markets. A substantial quantity of inert materials may justify a destoner. When mixed C&D processing systems first came out, there was an attempt to adopt bar screens, vibrating multideck screens and trommel screens to this industry. Typically, it was the wood recyclers and soils producers that had these types of screens, or the composters of organics that had lighter duty screen systems. For probably five to seven years, many trommel screens were sold that weren't well suited for screening heavy, big, bulky, massive, and rigid C&D materials. Operators needed equipment built to be abused, day after day, hour after hour, by an ever-changing C&D stream. Over the years, equipment manufacturers and the owner/operators have recognized this reality and are making more effective, heavy duty, less maintenance-intensive equipment for handling all the different variations of materials that come into these C&D recycling facilities.

Another critical area that has advanced is

the design of sorting conveyors with multiple pick stations. Having the capability to sort commodities with minimal contamination always has been an issue. Workers sort various material(s) day after day, sometimes over two shifts. We encourage long picking conveyors that allow greater flexibility over the term of system operations. Oftentimes, there ends up being a lot more woody material that has to be picked, and it is hard to capture it with only one or two sort stations. The wood is in bits and pieces — it's not all long 2 x 4's — and you need more workers on the line to touch and pull it. Some facilities use multiple sorting stations/chutes to have the opportunity to get out more wood waste along the line. Also, a lot of people still use bins and self-dumping storage hoppers along much wider picking platforms providing more opportunity to pick the valued small materials. For example, if the sorters' assigned material isn't in front of them at a given moment, they can pull metal, aluminum, plastics or wire, or something else while waiting for their "assigned material." Operators place 30- or 60-gallon containers along the sort line to collect those items. We are looking at having wider platforms to accommodate those product bins.

Some recyclers and equipment manufacturers are starting to look at optical sorting for wood to try to separate painted and pressure treated wood from the untreated materials. I saw a test unit about three years ago in Florida and another prototype recently at Waste Expo. It will be interesting to see how these innovative technologies work out. Mixed wood waste is a very problematic waste stream due to paints and the use of preservatives. Trying to train people and/or develop mechanical equipment to differentiate this wood stream at small piece sizes will be a challenge.

**Q: If you had to single out one factor that is key to successfully processing C&D to recover recyclables, what would it be?**

**A:** My answer is two-fold, both involving employees at the facility. Most important in terms of materials recovery efficiency is having synergy with the workers on the sort line. You need motivated people. It takes a unique group to put up with the manual sorting of C&D day after day after day. These materials are much more massive, messier and dusty than the cans, bottles and mixed paper at a MRF, where the sorting of traditional residential and commercial recyclable material occurs. C&D waste is nasty and heavy. Therefore, it takes a lot of time and good management techniques to build an adequate, motivated work force — and the owner/operators need to invest that time to ultimately make the sorting efficient so as to reach system design capacity and, hopefully, make the marketable products and economics work.

Second, even with the best mechanical equipment, the key to an effective C&D recycling operation is the person operating the ex-

What kinds of material loads will a facility be receiving to process and recycle? Is it from new construction? Renovation? Demolition? Knowing the typical feedstocks will guide investments in sorting equipment.

cavator(s) on the tip floor of the facility. That individual is the most valued person in the entire facility, whether there is a highly mechanized and staffed sorting system or a more traditional C&D recycling operation, such as the one GBB recently helped to procure in Portland, Maine. (See “C&D Management Facility Upgrade,” March 2006.) The people in the front receiving area make the decisions about what to feed into the system, what to pull out, and what to roll over and crush. Private sector C&D recycling companies tend to be able to pay those operators very well because they understand how key they are to capacity, recovery rates and protecting the other workers and machinery. In a municipal structure, however, where they are adding C&D recycling at an existing operation, e.g., a C&D landfill, they may have to assign an existing excavator operator who works in another division to the task, and this may or may not work out satisfactorily. Supervisors need to be aware of the critical role that these frontline individuals play in the success of the plant, and compensate them accordingly.

**Q: What are the markets like today for recovered C&D debris?**

**A:** Unfortunately, materials in the C&D debris stream change every day, and the markets for the C&D constituents, once separated, are not as advanced as we see with typical types of materials recycled at MRFs. The latter is a mature industry that supports shipments of PET, paper, aluminum, etc. hundreds to thousands of miles. That is not the case with markets for recycled C&D because of the nature of the materials, mainly wood and inerts that are earthy, heavy and have lower value. There is recovery of some ferrous metals, which are easy to pull out with magnets. That is the highest value commodity typically recovered. Some plants may pull out nonferrous metals, e.g., bronze, brass, and aluminum, but these materials are a very small percentage. Except for bulk wood waste going to fuel markets, the rest of the material typically has to move within 10 to 20 miles of the site, especially with transportation costs these days.

The higher capacity facilities, where the larger volume of materials to process brings in real cash flow, are in a much better position to invest in market development, e.g., hiring someone dedicated to knowing markets and knowing how to sell, getting the word out that products like landfill cover, clean fill, colored mulches, etc. are available.

In the C&D industry, and because of the local radius of the markets, large demolition jobs or track home projects pop up today and are gone tomorrow. So having the same materials day-in and day-out to provide to markets can be a challenge. In addition, markets for recovered C&D materials may change depending on local conditions. For example, there may be a strong market for landfill cover while a land-

There often is a lot more woody material on the conveyors that has to be picked, and it is hard to capture it with only one or two sort stations.

fill is going through closure. But once it is closed, and the next landfill undergoing closure is 50 miles away, the economics of the landfill cover market for that C&D recycler may change. So another market needs to be found quickly for a lower value, ground material like that.

There are opportunities to create value-added products. Colored mulch is a case in point. Before, C&D recyclers may have shipped off ground mulch to another company that does colorizing. Now, they are finding they can do that themselves, and add \$5/cubic yard or more to the value of their material.

**Q: Are C&D recyclers tapping into boiler fuel markets for wood recovered from the C&D stream?**

**A:** On a regional basis, particularly in the Northeast, the boiler fuel market has been reliable for ground wood from recycled C&D debris, but some changes in air emissions regulations for the boilers (or the contaminants in the wood fuel) can make it difficult for those plants to handle painted or pressure treated wood. In addition, with energy markets shifting, more and more wood recyclers are supplying wood boilers and it is becoming more important to have sources of unpainted and untreated wood. In the past, these plants only had a few sources; today, they have many more, so they can be more particular about who they want to buy from, which will be reflected in their specifications. That can be a disadvantage to new C&D recyclers who are trying to sort clean wood out of mixed C&D streams.

The issue of end market specifications can be addressed, in part, through quality control on the sorting line, but high capacity and fast-moving sort lines make this challenging, to say the least. When recycling facilities first start operating, they probably generate the cleanest product they ever will generate because they want everyone to be in tune with them as a new supplier. But then they may get tempted, because of tipping fees, to be a little less discriminating about the loads they accept, which can compromise the quality of the end products. Or, as a cost-saving measure, they may decide to eliminate sorters but keep production up. These steps backwards can seriously compromise quality control.

**Q: Who is the next generation of C&D recyclers?**

**A:** C&D recyclers will survive if material quantities can be preserved and end markets developed. The C&D quantities are usually found in roll-off boxes (for the “C”) and dump trucks/transport trailers (for the “D”). Thus, solid waste haulers typically have the waste and the cash in hand. They are the most tempted to vertically integrate if they are not in the disposal busi-



**C&D recyclers are tapping into opportunities to create value-added products from processed materials, such as colored mulch (above).**

ness. At the opposite end of the spectrum is the recycler (e.g., a scrap processor) or a wood processor (e.g., a forest products service provider). This group is comfortable with materials handling equipment and processing to meet a market specification. With C&D, a company could easily go out of business if it is not involved in hauling. If you are a solid waste hauler all of your life, your expertise is more on transport. Teaming up with someone coming out of the scrap industry, or someone in logging with grinders, chipping wood, etc. creates a comfort zone in the entrepreneurial team. If someone is able to instill the "can do" confidence in the people making the decisions, and they are not timid, they can be successful in this industry.

**Q: Are there any "hot button" issues in the C&D debris recycling world these days?**

**A:** One major issue relates to the handling/disposal of gypsum wallboard from home building construction and demolition. Since it is hard to distinguish when presented within a mixed C&D stream, that material may get ground with mixed C&D or become part of the screened fines and marketed as an alternative daily cover or ADC. One concern with gypsum is the production of hydrogen sulfides  $\text{CH}_2\text{S}$ . There are ways to properly handle that material so the situation is mitigated, but C&D recyclers servicing the ADC market need to be aware of those steps and ensure they are implemented as part of quality control at the landfills using the cover material. The key question is: Are the landfills handling that material in an environmentally sensitive manner and using Best Management Practices? If not,  $\text{H}_2\text{S}$  can be produced. Operations plans must address the interim storage, spreading and concentrated use of the ADC. If landfill operators cut corners, you will be smelling it. It will be interesting to see how the EPA or state legislation deals with this issue.

In Massachusetts, new regulations and local handling issues with regard to gypsum are forcing more control at job sites to keep the material source separated. The issue becomes, what to do with it? Does it all go into MSW landfills, or are there enough wallboard manufacturing sites available to move this clean separated gypsum into their manufacturing process? The answer to that is, how much is anyone going to pay them?

**Q: Gershman, Brickner & Bratton, Inc. (GBB) recently completed a survey of demolition contractors throughout the U.S. Could you provide some details on the findings?**

**A:** GBB conducted the survey for the National Demolition Association (NDA). The effort began with a major survey of the NDA members themselves, and we had over 100 NDA member companies respond. About 80 percent of the demolition contractors responding indicated that their "D" waste was from the structural and building demolition

sector, about 1.5 percent of the material was from demolition of bridges, and the remainder did a variety of demolition projects. Based on the responses and the breakdown of company size within all of the NDA's membership, we were able to estimate the overall nationwide activity among "demolition contractors." What we found is that over 115 million tons per year (2004 data point) of demolition materials are handled across the United States through traditional demolition services companies and that the industry as a whole reuses/recycles an estimated 73 percent of that total material.

As far as what materials are recycled, it is what you would expect from big demolition companies doing traditional foundation site excavation work with large buildings on top of them. Concrete is the highest amount of material that gets recycled, and most of the larger companies have a portable crusher(s) on site and may start marketing product directly from the job site so they don't have to pay to have it hauled, crushed offsite, and/or landfilled. Depending upon the sizing, this material can be used as fill under concrete or asphalt slabs or backfilled around walls or as French drains. The NDA members second most recycled material was asphalt, followed by metals, brick and block, and wood.

**Q: Finally, what steps can be taken to facilitate increased recycling of C&D debris?**

**A:** The best way to answer that question is to briefly describe a demolition project GBB managed for Metro Nashville. The size of the project was big enough that we knew we would potentially need the services of a national company. To keep the price under control, it required a demolition company to bring in a crusher and grind concrete and asphalt and leave it on site for Metro to market on their own projects. We tried to identify all the risk factors that a large demolition company would need to address — and which would drive up the price of their "out of area location." We took care of those project needs locally through a separate bidding process. For example, asbestos removal, underground storage tank (USTs) removal and fencing of the site, as well as final dirt/seeding, were done by local companies without an additional prime contractor markup. By the time the major demolition company showed up, the site was clean, and the environmental risk factors, as well as cost add-ons, were eliminated. Not only did Metro Nashville get a good price for the ultimate demolition work, the elimination of hazardous materials meant that what was left could be effectively processed and efficiently recycled. The result was that 98.5 percent (66,000 tons) of materials were reused/recycled from that site. Metro became a market participant and also used their consultant team to identify cost risks that could be isolated and managed locally, to help control costs. ■

Meeting end market specifications for biomass fuel can be addressed, in part, through quality control on the sorting line.

Reprinted From:  
July, 2006

**BioCYCLE**

JOURNAL OF COMPOSTING & ORGANICS RECYCLING

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610-967-4135 • www.biocycle.net