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RECYCLING MORE OF THE CAR

RECOVERING PLASTICS FROM SHREDDER AGGREGATE

THE SCRAP RECYCLING INDUSTRY HAS LONG DREAMED OF A COST-EFFECTIVE PROCESS FOR RECYCLING PLASTICS FROM AUTOMOBILE SHREDDER AGGREGATE. AT LEAST ONE EUROPEAN FACILITY HAS MADE THIS DREAM A REALITY, AND SEVERAL U.S. COMPANIES SEEM READY TO FOLLOW, BUT THEY STILL FACE A SUBSTANTIAL REGULATORY HURDLE.

BY RACHEL H. POLLACK AND THEODORE FISCHER

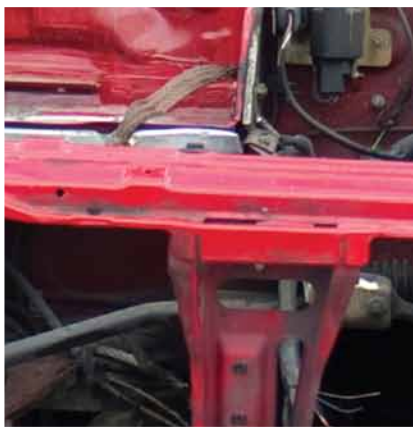
The quest to recycle every last bit of what comes out of an automobile shredder seems to take on mythical proportions. Automobile recycling has come a long way since the early days, when processors used magnets to remove the ferrous metal for sale and sent almost everything else to the landfill. With additional sorting and separation technology, the nonferrous metal streams have become as valuable as the ferrous, if not more so. Those two streams constitute about 75 percent of a vehicle, but a cost-effective process for turning the remaining bits and pieces into commodity-grade material has seemed like an impossible dream.

Several factors are propelling recyclers forward or holding them back in their quest. In the European Union, legislation has gradually increased the mandatory levels of end-of-life vehicle reuse and recycling. By 2015, EU scrap processors must reuse, recycle, or recover energy from 95 percent of a vehicle, with no more than 10 percent of that total coming from energy recovery—burning ELV materials in waste-to-energy plants. Processors have found it difficult to reach that goal without expensive and time-consuming manual dismantling—a problem that's spurring innovation in shredder aggregate separation and recycling. Most notably, a facility in England is using technology it adapted from processing electronics plastics to clean and separate the plastics from shredder aggregate on a commercial scale, turning them into marketable streams of recycled resins.

In the United States, the biggest impediment is not technology, but regulation—specifically, the regulation of polychlorinated biphenyls. PCBs were used for about 50 years in liquid and solid form in manufactured products until policymakers concluded they could pose serious health and





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environmental risks at certain exposure levels. The 1976 Toxic Substances Control Act banned the manufacture or sale of products containing PCBs at any level unless the U.S. Environmental Protection Agency (Washington, D.C.) authorizes it. (The EPA has granted such authorizations to dozens of manufacturing processes and products.) Over the years since TSCA was enacted, as most pre-TSCA cars and appliances have long since been recycled or disposed of, the average level of PCBs in shredder aggregate has fallen significantly, often to undetectable levels. Unfortunately, the TSCA regulations are sufficiently ambiguous, says ISRI President Robin Wiener, that "until the EPA specifically states that the regulations allow the recovery and recycling of the plastics, U.S. recyclers are not willing to invest the millions of dollars in capital, land, and labor it will take to do so."

The situation has recyclers frustrated. They point to the environmental and economic benefits of recovering this material that other countries are beginning to realize but the United States is not. "We're missing an opportunity," says Mike Biddle, founder and president of MBA Polymers (Richmond, Calif.), the U.S. company that operates the facility in England. ISRI and many recyclers have asked the EPA to clarify that existing regulations allow the recycling of plastics from automobile shredder aggregate so the industry can realize its long-held dream of recycling more of the car.

WHAT'S HAPPENING IN EUROPE

No single breakthrough solved the problem of recycling plastics from shredder aggregate. Instead, new technologies have made it possible at the same time other factors have made it desirable. For example, the growth of electronics recycling boosted interest in plastics recycling, Biddle says, because electronics shredder aggregate is typically 75 percent to 90 percent plastic. He founded MBA

Polymers in 1994 to find processes to separate and recycle the plastics from both electronics and automobile shredder aggregate. The company's first two commercial-scale facilities—which went online in Austria and China in 2006—handle plastics from electronics and appliances.

As those facilities were under construction, metal commodities were on a sustained run of high prices. Shredder operators became interested in capturing more metals from shredder aggregate, and new technologies allowed them to do so, generating more revenue and reducing their landfill costs. When the aggregate goes through this additional processing, it takes just a few more steps to concentrate the plastics, Biddle says, making it a more attractive feedstock for companies such as his, which separate the plastics into individual types and grades. Once the technologies for plastics and metals separation were viable, MBA Polymers launched a joint venture with European Metals Recycling (Warrington, England) to recycle the plastics from shredder aggregate.

The new MBA Polymers plant in Worksop, England—the company's largest and most advanced—might be the world's first facility dedicated to recycling plastics only from automobile shredder aggregate. Opened in 2010, it has the capacity to process 60,000 mt of shredder aggregate a year, expandable to 80,000 mt—the volume of MBA's plants in Austria and China combined. To prepare material for the plant, EMR has installed post-shredding technology at several of its eight British facilities to reduce the proportion of metal in its aggregate. It can reduce the metals content to less than 1 percent, depending on the infeed material, Biddle says. These processes also concentrate the plastics, turning "a stream that may contain only 15 to 20 percent plastic into something with 75 to 90 percent plastic," he says. The result is that EMR will turn 500,000 mt of aggregate into 60,000 to 80,000 mt of concentrated plastics and capture more metal in the process.

MBA Polymers' Mike Biddle calls the recycling of plastics from shredder aggregate a "triple win" for scrap processors: It extracts value from the plastics, lowers landfill fees, and increases recycling rates.

Even in its concentrated state, the material that arrives at the Worksop facility is "probably the most complicated and challenging mixed plastic [stream] on the planet," Biddle says. "Auto recyclers shred everything, from large appliances to lots of things with metal, so calling them auto shredders covers only half of what they touch," he points out. He described the challenges of turning it into salable postconsumer plastic resin in a September 2010 *Recycling International* article. The material still contains 10 percent to 25 percent contaminants, primarily rubber, wood, and foam with smaller proportions of dirt, glass, stones, textiles, metals, and other nonplastic materials. Some of those materials, such as wood and rubber, have the same density and other physical similarities to plastics, complicating their removal. The plant uses a combination of screening, classifying, washing, metal separation, and granulation to start, then it uses its own proprietary equipment to remove wood and rubber, turning the latter into a commodity-grade material stream. MBA's specialty is the next step: separating the remaining mixed plastics into high-impact PP, filled PP, ABS, HIPS, and HDPE.

The principal customers for the postconsumer recycled resins from the MBA plant are manufacturers of durable goods, home and garden supplies, pipes, construction materials—and automobiles. "It makes a lot of sense to sell to automotive companies because a lot of the plastics come from their products, so it's the right grade and type of plastic," Biddle says. Currently all the customers are in the UK, but the company also is talking to buyers in continental Europe and Asia. MBA Polymers hopes to construct additional facilities to process automobile shredder aggregate all over the world, Biddle says. He calls the recycling of plastics from shredder aggregate a "triple win" for scrap processors: It extracts value from the plastics, lowers landfill fees, and increases recycling rates.

THE DOMESTIC OPPORTUNITY

That joint venture might be the first to recycle plastics from shredder aggregate on a commercial scale, but others undoubtedly will follow. Systems for separating and recovering plastics from electronics, municipal recyclables, and even shredder aggregate are on the market. If the EPA were to issue a clarification allowing this recycling, U.S. shredder operators would quickly implement those technologies—not to mention proprietary ones they're developing or have already developed. "A lot of time, a lot of effort, and a lot of dollars have been spent on the R&D for recovering plastics," says Jay Robinovitz, senior vice president and chief officer of operations of Alter Trading Corp. (St. Louis).

The technology can create the supply, but is there a demand? The recyclers say yes. "All of our industry would agree there's a huge market for plastics recycled from automobile shredder aggregate," says Scott Miller, chief corporate counsel for Sims Metal Management (New York) and chair of an ISRI task force addressing this issue. "There's a market for it, there's a demand for it, and there's a positive value to it." Biddle agrees. "I think every shredder in the United States would do this" if the EPA would allow it. The value of plastics has grown enormously, he says, with prices now almost double the lows they hit during the recession. And continued strong oil prices "will drive demand for plastics recycling higher and further strengthen the industry's position"—and the need for this regulatory change, Robinovitz says.

ISRI and individual scrap recycling companies are making the case to the EPA and other government officials that recycling plastics from shredder aggregate and returning them into the manufacturing process would have myriad

economic and environmental benefits for the United States. ISRI commissioned Nathan Associates, an economic consulting firm in Arlington, Va., to quantify those benefits, from the investment in manpower and technology to construct and operate the processing equipment to the revenue the plastics could generate.

Based on industry estimates that U.S. shredders could recover 1.75 million mt of separated plastics annually, the firm calculated some staggering economic impacts. Recyclers would spend $946.7 million on new equipment and $247.9 million on new construction-industry services, and the plastics would generate $1.3 billion in revenue. That new spending would have a total economic impact of $5.3 billion of additional economic output, creating 23,746 new jobs and $1.1 billion in additional gross earnings for employees. About half of that economic impact comes from the initial capital investment in new equipment and facilities, the firm concluded. The remainder—$2.4 billion in output, 12,471 new jobs, and $529 million of earnings—will continue year after year. Those calculations don't take into account new products developed to use these plastics, additional tax revenues the new sales and earnings will generate, or the effect on the U.S. trade balance. (Recycling these plastics would help the U.S. trade balance, the firm says, as U.S. processors export recycled plastics and U.S. manufacturers substitute domestic recycled plastics for imported virgin material.)

New spending [on recycling ASA plastics] would have a total economic impact of $5.3 billion of additional economic output, creating 23,746 new jobs and $1.1 billion in additional gross earnings for employees.

That's just the economic argument. The environmental argument is equally strong. It takes less energy to recycle plastics than it does to manufacture plastics from virgin material. If the United States were to recycle an additional 1.75 million mt of plastics a year, Nathan Associates found the country would save 171.5 trillion Btus of energy—the equivalent of 1.5 billion gallons of gasoline. Less energy consumption means fewer greenhouse gas emissions, too. The nation would reduce its carbon dioxide output by 1.75 million to 5.25 million tons, the equivalent of removing about 265,000 to 795,000 cars from the road each year. Because plastics are made primarily from oil, recycling 1.75 million mt of plastics annually would save 28.5 million barrels of oil. And it would keep the plastics out of landfills, freeing up 52.5 million cubic yards of landfill space—nearly as much landfill volume as the state of Michigan uses in a year. Finally, recycling plastics uses less water than manufacturing virgin plastics—39.9 billion gallons less for this particular plastics stream each year.

The bottom line, Robinovitz says, is "there's a huge opportunity industrywide to recover additional value out of shredder aggregate, increase our recycling rate, divert material from the landfills, and produce a value-added commodity to go back into the economy."

THE REGULATORY OBSTACLE

With all the economic and environmental benefits that could come from recycling plastics from shredder aggregate, what frustrates recyclers is a regulatory barrier they believe is inconsistent with how the EPA treats other materials under TSCA. The agency has approved the manufacturing and sale of a variety of products that contain low but detectable levels of PCBs. For example, the regulations allow products created by "excluded manufacturing" processes to contain an average of 25 parts per million and up to 50 ppm of PCBs. The EPA created such exceptions for a good reason, explains Chris Bell, a partner in the environmental practice of Sidley & Austin (Washington, D.C.) who is working with ISRI on this issue. During the rulemaking process, the agency, along with major environmental groups and industry groups, identified about 80 manufacturing processes that inadvertently create PCBs. "The stakeholders agreed it was not the goal of TSCA to shut down" those processes, he says. Further, the EPA concluded that allowing PCBs at those levels in manufactured products "would not pose an unreasonable risk to human health and the environment."

Plastics from shredder aggregate have PCB levels far below those limits, Wiener says. Research that Argonne National Laboratories (Argonne, Ill.) conducted about five years ago found U.S. shredder residue (which contains dirt, rubber, wood, and other nonplastic materials) had PCBs in the 15 to 20 ppm range, says Ed Daniels, director of Argonne's Energy Systems Division. At MBA Polymers' UK plant, the material has low and often undetectable levels of PCBs, Biddle says. Recent tests of material from ISRI task force members also found untreated plastics from shredder aggregate had low and sometimes undetectable PCB levels.

Biddle is confident the product he produces is not harmful. "We wouldn't be doing it if we didn't think it could be done safely," he says. "The PCBs are not going to come out through any normal use of the plastics after the extensive processing and cleaning we've put them through." A risk evaluation ISRI commissioned came to the same conclusion: The plastics recovered from shredder aggregate should not pose an unreasonable risk. The study, by Weston Solutions (West Chester, Pa.), used methodology reviewed by Lynn Goldman, a pediatrician and epidemiologist who was assistant administrator for the EPA's Office of Prevention, Pesticides and Toxic Substances in the Clinton administration. The study, which used "conservative EPA assumptions," Bell says, found that PCB concentrations on the surfaces of plastics that meet the EPA's existing standards would pose a risk that is far below the "one in a million" level the EPA typically considers insignificant. "Dr. Goldman reviewed the results and concluded the study was good science," Wiener says.

MOVING FORWARD

ISRI thinks its research on the positive environmental and economic impacts and the insignificant health risks makes a convincing case that plastics from shredder aggregate should be recycled, and it has asked the EPA to clarify that existing regulations allow it. "We believe the EPA has the authority under current law" to do so, as it has for many other products, Bell says. The current state of "regulatory uncertainty"—the EPA has neither explicitly allowed the use of this material, nor has it explicitly forbidden it—has companies in a holding pattern, he says. "Nobody wants to invest several million dollars" in the technology to do this "with the risk of the EPA saying, 'Guess what? You invested wrong.'"

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The EPA "understandably has a natural inclination to be cautious," says Sally Katzen, senior adviser for the Podesta Group (Washington, D.C.), a government relations consulting firm that works with ISRI. "ISRI thinks, and justifiably so, that the materials they have assembled are sufficient and compelling [enough] to overcome this inclination and obtain the clarification that they are seeking. It's a process of education, providing information, and explaining different factors, and that process takes time. It's important to do it right so that we can all be comfortable with the outcome."

Historically, Bell says, the EPA concern has been that cars or appliances with pre-TSCA electrical equipment (containing liquids with more than 50 ppm of PCBs) are getting shredded, which dilutes the PCBs by spreading them through the shredded material. He points out, however, that no one has manufactured such products in more than 30 years. "Given the average lifespan of cars or appliances, we are well beyond the time when such pre-ban products would still be in use," making it "very unlikely" that they are a source for whatever PCBs remain in the plastics recovered from shredder aggregate. When a shredding facility does come across a product that old, the workers are taught to recognize and remove any PCB-containing devices, he adds.

Instead, "to the extent this plastic contains detectable concentrations of PCBs, we believe it's much more likely they're coming from uses and sources the EPA has already authorized," Bell says. For decades the EPA has approved the manufacturing and sale of products that contain PCBs at concentrations it believes do not pose an unreasonable risk. Such

products get shredded, so it should be no surprise that plastics recovered from shredder aggregate might contain some of these "legally manufactured" PCBs. "Given these facts," Bell says, "the EPA has the authority to reasonably conclude and clarify that the recovery of the plastics from products legally in the marketplace is acceptable under current law."

What the industry does not want, Bell and others say, is for the EPA to conclude this common-sense decision requires lengthy and complicated rulemaking. Not only is this unnecessary, Bell says, "given the EPA's budget and resources for this program, it could be many years before [the agency] ever promulgates a final rule on this issue, by which time the investments will have already been made—and they will not have been made in the United States." As Miller puts it, "There's a commercial market being generated right now, and a commercial investment being made right now in parts of Europe … that we don't have an opportunity to take advantage of." The delay also puts the United States at "a competitive disadvantage environmentally," Katzen says. "We're building landfills while [other countries are] reducing their greenhouse gases."

Several recyclers point out that the U.S. government partially funded the development of this recycling technology—technology U.S. companies can't use. Argonne, which is part of the U.S. Department of Energy (Washington, D.C.), worked on and off for 20 years on separating plastics from shredder aggregate and removing PCBs, Daniels says, spending about $5 million in U.S. taxpayer dollars. MBA Polymers received more than $1.5 million in grants from the EPA, Energy Department, and National Institute of Standards and Technology (Gaithersburg, Md.) to develop its recycling processes for electronics and automobile plastics, Biddle says. "It's really a shame" the company can't implement them in the United States, he says.

"ISRI has had several meetings and communications" with the EPA on recycling plastics from shredder aggregate, Wiener says, and its efforts are ongoing. At press time, a meeting with an EPA assistant administrator was scheduled for mid-July. ISRI also is exploring its options on Capitol Hill, she says, "though our preference would be to resolve this problem through the EPA." (For more information on ISRI's efforts, contact Wiener at 202/662-8512 or robinwiener@isri.org.) "We are working diligently as an industry to make those legal changes," Robinovitz says, and to convey "the importance and the timeliness of doing this today."

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