



The Widespread Hazards of Lead [in the US Scrap Metal Recycling Industry]

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Lead exposure in scrapyards is a bigger and more far-reaching problem than most realize, according to a new study, and it might warrant more extensive protective measures and biological monitoring.

by LINDSAY HOLST, assistant editor of Scrap.

The word lead brings to mind an array of associations. Lead contamination in imported toys and jewelry has been in the news lately. Old pipes and paint also contain lead, and their potential hazards—especially to children—are well-known. Many people even remember the phasing out of leaded gasoline in the United States.

The scrap industry is no stranger to lead. Recyclers of batteries, cathode ray tubes, and some types of wire regularly process this metal and have specialized facilities to minimize the risks in doing so. And scrapyard workers know to look out for common lead hazards in ferrous and nonferrous scrap: car batteries, radiators, brass, and painted steel, for example. Employees who handle these materials, especially torchcutters, routinely wear gloves and respiratory protection gear to keep from inhaling or ingesting the lead. Unfortunately, a new study reveals, those protective measures might not be enough.

Between 1990 and 2000, New York's Heavy Metals Registry recorded elevated blood lead levels in 65 individuals working for scrap metal companies. In response, the state Department of Health (NYSDOH) launched a project to assess the problem's true magnitude. A total of 101 scrapyards completed a questionnaire about their operations, potential employee lead exposures, and preventive measures. The department also conducted on-site industrial hygiene consultations at eight facilities selected via the survey as representative of industry practices. Industrial hygienists collected personal breathing zone air samples from employees performing tasks such as sorting metal, driving a forklift, operating shears and balers, torchcutting metal, and crushing cars. They took dust-wipe samples from lunchrooms, bathrooms, locker rooms, and workers' hands.

The study's findings, released in 2000, revealed that a variety of workers—not just torchcutters—are exposed to lead in scrapyards, and they might unknowingly be bringing it into their homes.

The Leading Sources of Lead

Lead in scrapyards comes from long-suspect sources and other sources that many might find surprising—namely, new steel. New steel scrap is “not painted, it looks clean, it just came out of a steel warehouse or a fabrication shop, so scrapyard owners think, ‘How could it have lead?’” says Julia Zhu, an industrial hygienist and research scientist at NYSDOH. Torchcutters often don't use respiratory protection when cutting new steel “because they simply don't think there is a hazard,” she says. Zhu and her team of industrial hygienists conducted site visits at three scrap companies, all of whose operations involved torchcutting new steel scrap. The air samples they collected in the torchcutters' breathing zones revealed “very significant levels of lead exposure,” she says.

The explanation comes from the chemistry of steel. Adding small amounts of lead to the blend can improve carbon steel's machineability, Zhu says. Lead is malleable, fairly stable, and highly resistant to corrosion. Over time, steelmakers have greatly reduced their use of lead in steel; Zhu says that 12L14, a commonly used carbon steel blend, is only 0.35 percent lead. But “lead is insoluble in steel and doesn't distribute uniformly in a blend,” Zhu explains. If a blend of 12L14 carbon steel contains 0.35 percent lead, “that does not mean that every piece contains 0.35 percent lead. Sometimes, there will be no lead in a piece of this steel. Other times, a torchcutter could hit a pocket of pure lead,” she says. In other words, the lead content at any given spot on a piece of steel could be higher than its average, putting unprotected torchcutters at a greater risk.



To further prove this point, the NYSDOH researchers found vast differences among air samples taken from the same torchcutter at different times in a single day. One facility's torchcutter was exposed to 1,400 micrograms of lead per cubic meter of air ($\mu\text{g}/\text{m}^3$) in the morning and 260 $\mu\text{g}/\text{m}^3$ in the afternoon. The OSHA standard for lead gives two figures: the action level of 30 $\mu\text{g}/\text{m}^3$ and the permissible exposure limit of 50 $\mu\text{g}/\text{m}^3$. Both figures are average calculations over an eight-hour work shift. OSHA requires that employers maintain employee lead exposure below the PEL by implementing engineering and work practice controls and providing respiratory protection. Employers must provide a worker with biological monitoring for lead if he or she is exposed to lead exceeding the OSHA action level for more than 30 days a year. "Scrapyards have a wide range of lead exposures," Zhu says, "and it's not worth taking the risk."

Steel isn't the only concern, however. Lead is prevalent in nonferrous scrap, too, such as automotive radiators. Lead solder often holds a radiator's fins in place, says Bill Rouse, quality, environmental, health, and safety manager at PK Metals (Coram, N.Y.). "As it oxidizes in the automobile over the years, you have lead dust in the radiator." Brass can contain up to 10 percent lead, as can communication cables and various other car parts, especially car batteries, which occasionally are still in cars that yards receive for processing. Brian Mayer, regional safety manager at CMC Metal Recycling (Lexington, S.C.), says his facility began fining its customers \$25 for each car battery they leave behind.

A variety of scrapyard processes—not just torchcutting—can put unprotected employees at risk for lead exposure. At one facility Zhu studied, there was no torchcutting at all; workers were simply hand-sorting material. Four out of four workers her team tested had elevated blood lead levels.

How Lead Spreads

It's easiest to describe the lead dust hazard throughout a scrapyard by using a kitchen metaphor, says John Gilstrap, ISRI's director of safety. "Say you're throwing a party, everyone is in the kitchen, and they're all wearing black," he says. "The chef is working with a lot of flour, and he's wearing an apron. How do you keep the flour off the other people? First of all, you make sure nobody hugs him. You make sure nobody gets close to him. But the stuff is in the air, which you have to redirect," and it's probably on all the kitchen surfaces, on the floor, and everywhere else. But it's not flour—it's lead dust, which is poisonous.

When the lead is released into the air, employees working with the material can inhale it as a dust or as a vapor (if it's torchcut). Even if the employees are wearing gloves and respirators, their hair and clothing can be coated with lead dust. They then unintentionally carry it into otherwise clean areas that employees frequent, including lunchrooms, bathrooms, and locker rooms.

What's perhaps even more disturbing is the prospect of workers carrying lead dust out of the facility and into their homes. "The take-home lead was a huge problem" in the New York study, Zhu remembers. If a scrapyard does not take the proper precautionary measures, workers could have lead dust in their clothes, on their shoes, and in their cars. Family members who come into contact with the workers or ride in their cars could thus get contaminated as well. In one study, Zhu says, the most alarming thing was that three of the workers' children had elevated blood lead levels as a result of being exposed to the lead dust brought home by the workers.

The Health Hazards

One of the most frustrating aspects of human lead exposure is the fact that its symptoms are so wide-ranging and, at least initially, not obvious. Lead poisoning can cause "fatigue, dizziness, weakness, decreased libido, abdominal pain, vomiting, diarrhea, impaired motor skills, impaired cognition ... [but] these symptoms can describe any number of medical conditions," Gilstrap says. "Because lead is a poison that affects the enzymes of the body that interact at the cellular level, no organ system is immune."

As Zhu puts it, "Lead is a systemic toxin, so it can basically affect any and every system of your body." The risks are significantly higher for children. "Children are more susceptible to lead poisoning than adults because their bodies are still developing," Zhu says. Lead can cause learning disabilities, decreased growth, hyperactivity, and even brain damage, she says.



Taking Action

Implementing a comprehensive lead program can be expensive and involve major operational changes, Gilstrap says. For someone with a known potential for lead exposure, like a torchcutter, the ideal safety procedures are as follows, he says: You come to work, change out of your clothes, and change into coveralls. You put on a respirator and a face shield, then you go to work. At lunch, you change out of your clothes in a separate “dirty” changing room, shower again, put your street clothes back on, and go to lunch. Half an hour later, you go through the same procedure to go back to work. “It’s not an easy regulation to deal with,” Gilstrap says.

Scrapyard managers might wonder: Is all that—the clean and dirty changing rooms, showers, respiratory protection, and other PPE—really necessary, and for how many workers? Unfortunately, the only way to identify an exposure is to bring in industrial hygienists to test for it. Some yards are undertaking smaller measures and testing first in the hope that they won’t need such extensive measures.

PK Metals’ Rouse is developing a plan to reduce potential lead exposure at his facility, especially the torchcutting operation. “Since we don’t have a lead program right now, the idea is to try and engineer the problem out of our facility before we do the testing,” he says. He’s looking into implementing a hooded HEPA filter system of the kind welders often use, with a giant, flexible hose that goes right to the source, between the employee’s face and the torchcutting area, to vacuum up vapor and particles. The company’s torchcutters already must wear paper masks, welding gloves, tinted glasses, leather chaps, and metacarpal protectors, but it only requires respirators for known hazards, Rouse says.

Ideally, with the new system in place, testing will show that the yard does not exceed OSHA’s permissible exposure limit and the company will not need to implement further protections. “Engineering controls tend to be preferred over personal protective equipment if the system is able to remove the hazard,” Gilstrap says, but “it’s all about what contamination actually still makes it to the employee.”

OmniSource Corp. (Fort Wayne, Ind.) tried a ventilation system to contain lead hazards at some of its facilities, says Jeff Wilke, the company’s director of environment, health, and safety, but it was not sufficient, so it implemented a lead program even more stringent than what OSHA requires. The company’s policy, Wilke says, is that anyone who “has the potential to be around an area where we’re dealing with lead”—such as a supervisor, who is in and out of the area frequently—is biologically monitored. Everyone who works for an OmniSource nonferrous facility gets a blood test at least once a year, regardless of responsibilities. Anyone with regular exposure to airborne lead gets monitored at least quarterly, and if a worker’s blood lead level increases, the monitoring becomes monthly. “This way, we remove the potential for them to even get close to a medical removal” of the lead, Wilke says.

Further, OmniSource workers with a known exposure to lead follow the process Gilstrap outlined. They wear uniforms that are laundered separately by a uniform company; they leave all of their dirty clothes and boots in a dirty locker room, shower, then enter a clean locker room. Torchcutters wear respirators, and the company conducts regular inspections of their locker rooms to ensure that they are wearing, storing, and cleaning the respirators properly. What is most important, Wilke says, is to ensure that employees are not taking the lead dust home.

The company’s preventive measures also include testing the air when a facility gets a new customer. “If your production increases, you also have the potential for exposure [increases],” Wilke says. “If we know we’re processing lead, and we’re handling 1,000 pounds a month, then next month we’re handling 5,000 pounds, then we retest.”

Getting Ahead of Lead

Though OSHA and state agencies like NYSDOH are trying to make scrapyards more aware of the widespread lead hazard, its diffuse nature and the confusing array of potential lead poisoning symptoms make it easy for an operation to ignore the warnings. “We’ve visited with many companies at this point, and they’re willing to talk to us and ask about the best way to control lead exposures,” Zhu says. “Some of them are not very receptive to our advice, but that’s part of our job. We just have to keep working with them. Hopefully, the message will get through.”