



# Eaton's Greenwood, SC, facility sets example for sustainable manufacturing

## A history of dedicated performance

Eaton's Greenwood, SC facility on Emerald Road is setting the standard for sustainability in Eaton's Power Systems Division. The location is the production facility for Eaton's power capacitor and network protector product lines. This site has continually demonstrated its focus on sustainability activities and minimizing its environment impact.

After multiple years of efficiency improvements and waste reduction projects, in 2018 the site achieved Zero-waste-to-landfill certification. In 2020, the United States Environmental Protection Agency (EPA) recognized historic reductions in the site's Toxics Release Inventory (TRI) emissions from capital project installation and process improvements. Recently, the site developed a CapSeal™ bushing bonding process, which greatly reduced precious metals and flux usage. By the end of 2020, this location successfully eliminated 100% of its lead usage, captured a 75% reduction in zinc content in wastewater and eliminated several hazardous waste streams. These achievements showcase the facility's continued commitment to environmental initiatives focused on sustainability and employee safety.



## Sustainable manufacturing

Sustainable manufacturing offers tremendous benefits to employer, employees, the local community and customers. Although its primary purpose is protection of the environment and reduction of carbon footprint, it goes far beyond the concept of just being "green." Sustainable manufacturing requires a complete mindset shift toward including environmental impact in critical decision-making. This mindset includes but is not limited to capital investments, innovations and business strategy. It is at the forefront of how Eaton operates its Emerald Road facility. Sustainable manufacturing allows Eaton to maximize operational efficiency.

### Operating in a sustainable manner allows Eaton to:

- **Reduce costs**
- **Reduce waste**
- **Reduce emissions of harmful chemicals to air, water and land**
- **Protect employees**
- **Enhance and build trust with corporate and community stakeholders**
- **Promote innovation**
- **Increase compliance with regulatory requirements**
- **Reduce liability**



## Facility recycling journey

The Greenwood, SC, site began its sustainability path with efficiency improvements and waste reduction projects. From there, the focus switched to development of recycling processes on remaining site waste.

- **By 2010, Eaton established a variety of procedures for recycling** of standard materials such as wood, insulating paper and cardboard at the Emerald Road facility
- **In 2013, the plant established an internal draining, filtration and treatment process** for dielectric fluid from damaged units – further eliminating potential waste streams
- **In 2015, a recycling facility was identified that could process one of the site's primary disposal materials**, resulting in over 100 tons/year reduction in landfill waste, and a dramatic decrease in reduction of SARA TRI emissions from off-site transfers going to landfill
- **Recycling efforts continued to evolve** until 2018 at which time over 90% of primary disposal materials and wastes were recycled and diverted from landfill
- **In 2018, Eaton partnered with an Alternative Engineered Fuels (AEF) recycler** to process the Emerald Road site's general trash into a usable fuel source, a change which allowed the site to achieve 98+ % recycling of disposal materials/wastes

Eaton continues to focus on limiting landfill material by prioritizing primary sources, reducing scrap, automation improvements and technology advances that limit waste generation at the Emerald Road facility. Additional recycling opportunities are constantly being evaluated. The latest methods focus on:

- **Oil-contaminated absorbent pads** that undergo a closed-loop cleaning service that extracts the oil and launders/returns the pads for future reuse
- **Reclaiming and recycling aluminum oxide** that is a byproduct of the grit blasting cleaning process

## Zero-waste-to-landfill achievement

Over the last several years the Eaton collaborated with their waste broker, to pursue Zero-Waste-To-Landfill (ZWTL) at the Emerald Road facility. ZWTL is defined under Eaton as a consistent 98% diversion from landfill rate through reuse, recycle or positive energy balance incineration. ZWTL status has been achieved and maintained since 2018, landmarking an important step in our demonstration of sustainability. The cost to recycle various streams of industrial materials is not insignificant, but Eaton's commitment to the environment and to sustainability is evident by the importance placed on recycling materials that could be landfilled.

Eaton has pride in the environmental commitment the Emerald Road site has for its stakeholders, community, employees, families, area business partners and future generations to come. Eaton's Greenwood, SC, Emerald Road site is one of the growing numbers of Eaton sites across the globe showing commitment to environmental sustainability. Eaton's goal is to have all manufacturing locations achieve ZWTL certification by 2030.



## United States Environmental Protection Agency (EPA) recognition of Eaton Emerald Road facility

As a result of the Eaton Emerald Road facility's completion of multiple sustainability projects, there was a notable improvement in its Toxics Release Inventory (TRI) emissions. The site's annual SARA TRI chemical emissions had been steadily declining since 2012 when the site eliminated some critical manufacturing waste generating processes. As a result, in February of 2020, Eaton's Emerald Road facility was formally recognized by EPA during an on-site visit for significant Toxics Release Inventory reductions notably in lead and chromium. In addition to senior Eaton site leaders Randy Gazdecki, Product Line Manager, John Masiala, Plant Manager and Rob Schoenberger, EHS Manager, in attendance were EPA representatives, Director for South Carolina Department of Health and Environmental Control, and members of the Greenwood SC community, including City of Greenwood Mayor, Greenwood County Manager, District 3 Councilwoman, Greenwood County Emergency Coordinator and local news outlets.



### Reduction of waste through innovation

Eaton continues to reduce waste and emissions at its Emerald Road facility by utilizing a preferred hierarchy of options, in order of preference:

- 1 Reduction or elimination of waste at the source
- 2 Better recycling/reuse means
- 3 Energy recovery
- 4 Treatment
- 5 Disposal as a final option

The facility's R&D and Operational Excellence Engineering teams recently designed and implemented two projects that deserve mention for their innovative technology. Both are examples of sustainable manufacturing at its finest in the category of source reduction.



### Project showcase 1 – CapSeal bushing bonding

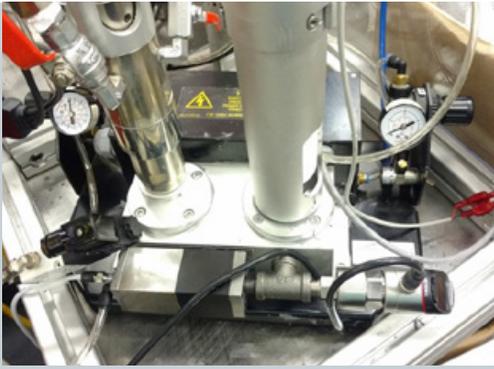
Eaton's power capacitor product line staff identified a development project to improve the way in which bushings were joined to the enclosure and terminal cap.

There were several commercial benefits of the project such as removing wear out failure modes and improving reliability, but sustainability was a key area of focus. Staff at the facility took this design opportunity to develop a fully automated process, which greatly reduced production inconsistency, waste and non-conforming materials.

In addition to the product benefits, the team spent significant effort in selecting material and process improvement investments. The legacy process was chemically intensive - utilizing solder flux and precious metals, which resulted in being a multi-waste stream generator. This historic process was a direct contributor to lead and zinc levels in plant wastewater.

Realizing an opportunity for improvement, facility engineers developed the CapSeal™ bushing bonding process, which is utilized on 100% of the capacitor units manufactured at the Emerald Road facility. CapSeal is a fully automated hermetically sealed process achieved via a molecular bond at capacitor tank and terminal cap. The streamlined process reduces construction variation and scrap materials, while streamlining production flow. Sustainability benefits include the elimination of three separate hazardous waste streams. It is also inherently safer for operators as the new design eliminates use and exposure to molten solder and hazardous metals in the process area, thus removing exposure to fumes and burn risks.





## Project showcase 2 – Reclamation and source reduction

Eaton continually review all waste generation at the Emerald Road facility along with opportunities to improve in these areas.

Upon review of the production processes, a potential project emerged. The engineering team was challenged to improve the efficiency of internal processes with the goal, to eliminate a waste stream. The historic method had operators monitor and manually replace fill tubes that were nearing complete use. This was a key function to prevent equipment downtime for changeover and prevent shutdown due to lack of material flow. As this was an operator-driven function, the removed tubes were often not fully utilized and would typically have ~4-10% material remaining in disposal packaging. Due to the physical properties of the raw material and the amount of material remaining, these disposal application packages were deemed to be a hazardous waste stream per the EPA via the Resource Conservation and Recovery Act (RCRA).

The engineering project was focused on developing a smarter changeover process that also improved the material usage and eliminated this waste stream. The final design included incorporation of a smart sensing system to monitor the material usages and identify optimal change out timing. The new process included operators being notified via system control and the empty applicators occurring automatically. The system overhaul also included the incorporation of an accumulator system that serves to capture any residual amount and store reserve materials for use during the change-out process. The new process optimized material usage and successfully eliminated the previous hazardous waste stream.



## Providing our customers with sustainable solutions

Although Eaton's efforts are primarily site- and community-specific, recently the Emerald Road facility expanded its sustainability focus to include end-of-life management for equipment produced by Eaton. An exclusive recycling program for power capacitors used by our utility and industrial customers was launched. This first of-its-kind program includes onsite material pickup and recycling of capacitors regardless of the unit's age, original manufacturer or current condition. By leveraging the processes, Eaton uses to achieve zero waste-to-landfill in manufacturing facilities, power capacitor materials, including dielectric fluid, metals and porcelain bushings, can be recycled and repurposed to create environmentally friendly solutions for our customers. Additional information can be found at [Eaton.com/GreenwoodSustainability](https://www.eaton.com/GreenwoodSustainability); sustainable manufacturing at its finest in the category of source reduction.



## Sustainable future

Eaton is proud to share its sustainability accomplishments at the Emerald Road site and is committed to continuous improvement. Eaton believes that, as an equipment manufacturer, it is our responsibility to not just comply with environmental and safety regulations but to continually strive to do better, to manage our waste and emissions more effectively and further reduce our environmental footprint. Eaton is in the process of adding an industrial compactor to its Emerald Road facility to decrease physical size of material, and thus reduce the number of transportation trips and fossil fuel consumption associated with waste removal. Eaton is also actively working toward the Emerald Road facility becoming a zero-water discharge site in coming years. Manufacturing in a sustainable way is critical in the work that Eaton pursues and continues to look for ways to improve the quality of life and the environment at the Emerald Road site and within the Greenwood, SC, community.

To learn more about Eaton's sustainability efforts, visit  
[Eaton.com/sustainability](https://www.eaton.com/sustainability)

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