

GREEN ENGINEERING

How to Design More Profit into the Metalworking Operation

By Ron Chapman, Systems Sales Manager & Teresa Phillips, Senior Marketing Specialist, PRAB



Introduction

The green movement is not a new concept. In fact, the basic principles were well-known throughout Europe in the medieval era. However, it was the Industrial Revolution in Europe that caused the movement to really take root. America soon followed, and after World War II, quickly transformed from an agricultural society to an industrial one—which was the start of the modern-day environmental movement.

According to a Harvard Business Review article, “The Challenge of Going Green,” in the first 25 years of the modern movement the United States spent more than \$1 trillion to address environmental threats caused by commercial activities.¹ Since that time, being environmentally responsible, or green, has been an ever-growing concern. However, many companies—including metalworking operations—are motivated to protect the earth and conserve its natural resources by a stronger driver than just having an environmentally friendly reputation. That motivator is money.

Proof of Financial Reward

Manufacturers are finding that by adopting a green philosophy and employing green engineered equipment as a means to sustainable manufacturing, they are reaping significant financial gain. The National Institute of Standards and Technology (NIST) reports that U.S. manufacturers are achieving quantifiable results by implementing sustainability and green initiatives.² Some examples of these results include:

- A Virginia company's environmental commitment resulted in over \$200,000 in operational cost savings.
- Lean and clean programs helped a New Jersey manufacturer realize \$3 million in new/retained sales and \$500,000 in cost savings.
- A Profitable Sustainability Initiative (PSI) helped a company in Wisconsin reduce fuel consumption and emissions, reducing shipping costs by \$75,000.

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- An energy savings project led a Kansas organization to more than \$61,000 in overall equipment savings and \$24,000 in annual energy savings.
- A new energy efficiency project helped a New Hampshire manufacturer reduce energy consumption by 10% and save \$25,000 annually.

Like these companies, metalworking operations that consciously take steps to be good to the environment by using less energy, producing less scrap, or eliminating hazardous waste disposal also see financial rewards for being green by shifting to green engineered equipment and processes centered on sustainable manufacturing.

Business Benefits Beyond the Environment

While green manufacturing and sustainable manufacturing are not defined the same, they are closely related and often used interchangeably. According to Quality Digest's article "Five Benefits of Sustainability and Green Manufacturing," green manufacturing refers more to a single product or production process, while sustainable manufacturing is typically associated

with an organization's holistic approach—taking the entire production process and logistics into consideration.³

An article published by the Environmental Protection Agency (EPA) about sustainable manufacturing states that there are several reasons why companies are pursuing a green approach to sustainability:⁴

- Increase operational efficiency by reducing costs and waste
- Respond to or reach new customers and increase competitive advantage
- Protect and strengthen brand and reputation and build public trust
- Build long-term business viability and success
- Respond to regulatory constraints and opportunities

An April 2017 study published by the International Journal of Business and Social Science on green manufacturing and operational performance concludes that adopting green manufacturing practices has been proven to enhance operational performance.⁵

Green Manufacturing Practices



Waste Management
and Minimization



Energy Efficiency and
Fuel Substitution



Process Design,
Modifications, and Upgrades



Enhanced Operational
Performance



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As defined by the EPA, green engineering is the design, commercialization, and use of processes and products that minimize pollution, promote sustainability, and protect human health without sacrificing economic viability and efficiency.⁶ Because of the many benefits, several international suppliers, including U.S.-based equipment manufacturer PRAB Inc., engineer and build all their systems with this green engineering philosophy. PRAB's entire product line of metal scrap processing, fluid recycling, and wastewater treatment equipment are built to help manufacturers achieve their sustainability goals. They work with a wide range of industries within the metalworking sector to optimize their operational performance by improving the management of their metal scrap and fluid waste streams, extending tool life, reducing new coolant purchases, and helping them to meet or exceed compliance to strict environmental rules and regulations.

The American Foundry Society (AFS) states that, "From implementing management systems and metrics, to waste management and beneficial reuse, metal casters can play a key societal role in the sustainability of our natural resources."⁷ One example of this is described in a case study⁸ published by the AFS about a project completed for a company's tool room scrap metal recycling, where they realized several environmental and other benefits including:

- An estimated two tons of metals per year will be kept out of the landfill and will be recycled for re-manufacturing
- Bottom line cost savings
- Self-esteem of the team members was increased

Enhancing Operational Performance with Green Engineering

Here are four very important ways that metalworking operations can use "green engineering" to improve their environmental footprint and bottom lines.

1. Find the profit holes.



Before equipment suppliers specializing in green engineering can help metalworking operations save money, individual shops need to identify their profit drains. One of the first areas to analyze—regardless of facility size—is the waste stream. With green engineered equipment, this should be looked at as a

revenue stream. An article published by *The Fabricator magazine* titled, "Do you manage scrap properly?,"⁹ states that scrap metal—in most instances—represents the second largest source of revenue for a metalworking operation. With that said, shops should find how much it costs to haul-away polluted metal scrap and used lubricants each month. Then, a monthly report with housekeeping numbers should be run to determine how much time and labor is being spent on removing this metal waste, along with other maintenance and cleaning required in their current scrap and fluid management process. Next, they should quantify their monthly expenditures on new lubricants, cutting fluids, and metals.

2. Turn expenses into profit centers by reducing, reusing, or recycling.



When the metalworking operation knows its waste stream spending, it can solicit green engineering equipment suppliers—like PRAB—to provide them with an efficient and reliable profit-building solution.

Around 10 years ago, most suppliers could only offer centralized metal chip processing, fluid recycling, and underground conveyor systems for waste stream management. But that has changed in these past years with the development of modular metal chip processing equipment and other turnkey systems, engineered for at-the-source (CNC or machining equipment) waste handling. With green engineered solutions, metalworking operations can:

- **Reduce metal scrap volume.** Shredders and crushers can cut the volume of hazardous scrap by up to 12 times. Briquetters can turn wet chips into compact, 99% dry briquettes that are no longer labeled hazardous, are easy to store, and oftentimes get more value when selling to the scrap dealer. By reducing scrap volumes, processors can cut on-site storage costs and significantly lower the number of truckloads shipped to hazardous waste disposal sites.
- **Separate metal scrap from fluid for reuse or recycling.** Wringers/centrifuges and briquetters can separate cutting fluids from metal chips. Operations can then reuse this easy-to-melt scrap (reducing new metal purchases) or recycle it—getting top dollar from secondary smelters. The extracted fluid can then be recycled for reuse or sale.

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- **Reclaim and filter fluids for improved profitability.** Metal chip processing systems such as wringers and briquetters can extract spent cutting fluids and route them to a centralized or machine side fluid recycling system that will filter and reclaim up to 98% of valuable coolant—automatically circulating it back into the process or into recycling containers. This significantly reduces the need to purchase new oil or coolant. PRAB customers, for example, report reductions in new fluid purchases of up to 75% and reduced fluid disposal costs by approximately 90%.
- **Reduce energy consumption.** Green engineered equipment is typically designed for reduced energy consumption. One example is Eaton Corporation's Fluid Power Division in Marshall, Michigan. After installing a new PRAB wastewater treatment system, Eaton experienced a drop in operating temperature of their washwater which resulted in a reduction of energy usage by about 20%.

Metalworking operations can also improve their profitability and conserve resources by prolonging the life of their tooling. Filtering fluid with the right recycling system has been proven to extend tool life by up to 25%.

3. Proactively address threats of environmental fines.



A green approach not only saves money with improved waste stream management, it can also prevent hefty regulatory charges.

In the United States, the EPA governs the generation and disposal of hazardous waste under Title 40 CFR, part 261 (Identification and Listing of Hazardous Waste) and 279 (Used Oil Regulations).¹⁰ Metal scrap containing free flowing liquids is classified as hazardous wastes. Other countries also have environmental agencies and regulations that oversee and control hazardous or toxic substances.

Operators, maintenance, and other employees who handle these hazardous wastes are not always familiar with the monetary penalties for regulatory non-compliance. Nor are they aware that those penalties are often greater at the state and local levels. So, when employees take shortcuts or don't follow hazardous

waste handling procedures, they may not understand the financial repercussions.

That is why it's advisable to inform employees during orientation and training of the financial impact EPA and environmental fines can have on the company and their jobs. Point out that non-compliance fines often increase with the amount of waste generated and repeat offenders are fined even higher. Managers and supervisors also need to know the costs associated with tracking and doing paperwork related to hazardous waste stream management.

If there are pollution issues with the drainage of water coming from the business or leakage from containers filled with wet chips, there is another cost threat—the saleability of the property. Business owners and stakeholders need to remember that proactive protection of their land and water can pay dividends in stable, or increase property values. It can also help to avoid large clean-up and property rehabilitation costs, and help maintain a good community reputation.

Incorporating green engineered equipment into the metalworking operation can alleviate these threats. Conveyors, carts, and dumpers, for example, can help shops safely contain hazardous materials and prevent spillage and fluid leaks that can contaminate the ground and water. Horizontal screw presses can dewater hazardous grinding swarf or filter cake by up to 85% and the extracted fluids can be disposed of safely.

4. Evaluate if ISO 14000 certification will improve your green profitability.



As metalworking operations look at ways to increase their green profitability, ISO 14000 certification may provide a global foundation for improvements. These internationally recognized environmental management standards and guidelines help companies comply with regulations as well as reduce waste, improve process inefficiencies, and cut operational costs. Companies with ISO 14000 certification say that the guidelines keep them ready for regulatory inspections. But the certification can also improve the ability to get capital, lower insurance rates, simplify labeling, get permits, defend themselves in environmental litigation, and expand into global markets where the certification is requested or required.

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Conclusion

Whether a manufacturer chooses to apply for ISO 14000 certification, use green engineered equipment in its process, or both, the decision requires an investment. But, that investment can often be recouped in just months from the reduction in waste handling costs and the prudent selling or reuse of what was once hazardous scrap metal and cutting fluid. Being able to add that return to the bottom line makes being green definitely worth it.

About the Authors



Ron Chapman is Systems Sales Manager for PRAB and has more than 45 years of sales and engineering experience with a focus on industrial automation design.



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Sources:

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About PRAB

PRAB is a leading engineer and manufacturer of conveyors and chip and fluid management systems. Its customized solutions automate metal handling, reduce labor costs, reclaim and recycle expensive cutting fluids/coolants, and maximize return on recycling metals. With its expertise honed by more than 4,500 installations for the world's leading OEMs and suppliers, PRAB continuously improves material handling, housekeeping, and compliance to environmental rules and regulations within the automotive, aerospace, medical, electronics, defense, off-road, and energy markets. For more information about PRAB, visit prab.com.

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