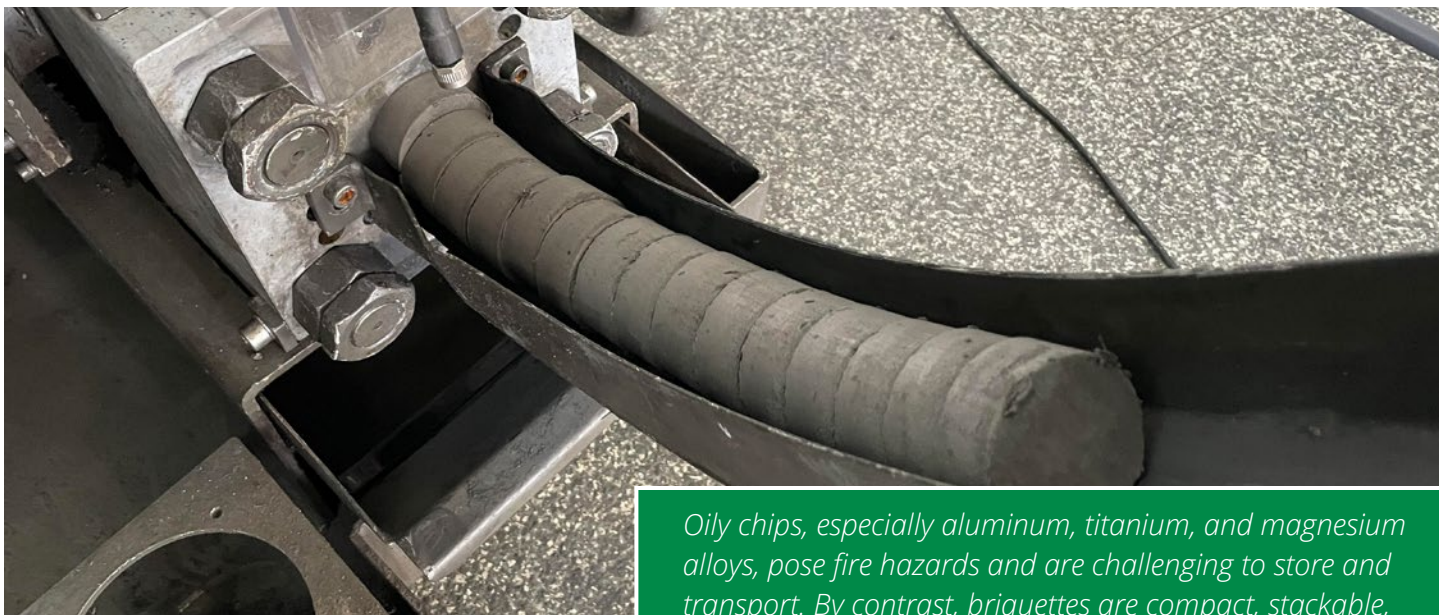




BRIQUETTING IN THE MACHINING INDUSTRY: TURNING METAL WASTE INTO HIGH-VALUE RECYCLABLES

Executive Summary

Metalworking operations generate massive volumes of oily swarf, grinding sludge, and fine particulate waste. Historically treated as liabilities, these byproducts represent untapped value. As manufacturers face mounting pressure from environmental regulations, rising fluid costs, and lean efficiency mandates, briquetting has emerged as a high-ROI technology. By compressing loose metal waste into dense briquettes, RUF Briquetting Systems enable fluid recovery, boost scrap resale value, simplify compliance, and streamline shop operations. This white paper details the mechanics, economic impact, and strategic advantages of briquetting in modern machine shops.



Oily chips, especially aluminum, titanium, and magnesium alloys, pose fire hazards and are challenging to store and transport. By contrast, briquettes are compact, stackable, and safe to handle, reducing risks and simplifying logistics.

The Problem with Metal Waste

Today's machining operations rely heavily on metalworking fluids for precision, cooling, and tool life. These fluids, combined with metal fines and chips, result in waste streams that are expensive to manage and environmentally complex. Manufacturers face a series of challenges: coolants are often lost, embedded in chips and sludge; disposal costs are high, especially for hazardous material; scrap contaminated with oil procures lower prices; and saturated waste poses safety and housekeeping concerns.

In North America alone, an estimated \$4 billion in recoverable value is lost each year due to inefficient chip and sludge handling—primarily from coolant loss and undervalued scrap.¹ Much of this loss goes unnoticed because waste handling remains relegated to the cost center column on most operational spreadsheets.

As competition tightens and sustainability becomes a core expectation, many manufacturers are reconsidering their approach to managing waste streams. Once regarded as a necessary nuisance, waste is increasingly seen as a potential resource. A reimaged approach to swarf and sludge management, particularly one that enhances resource recovery, can turn what was once a burden into an asset.

\$4B
IN ANNUAL
recoverable value lost

The Briquetting Solution

Briquetting addresses these inefficiencies by compressing metal waste into compact, dry briquettes, extracting fluids for reuse in the process. RUF's Sludge Machines apply up to 42,000 psi while our Metal Machines can apply over 70,000 psi of hydraulic pressure to achieve high levels of fluid recovery and material densification. The process is straightforward but powerful. Metal chips or sludge are fed into a press chamber where they are hydraulically compacted. Fluids are forced out through integrated drainage and routed for filtration, while dense briquettes are discharged, ready for disposal or sale. Unlike centrifuges or gravity draining, which struggle with fine or mixed material, briquetting can handle a wide variety of inputs—from aluminum turnings and cast-iron fines to brass, copper, titanium, and slurry-like grinding sludge. An additional advantage is the consistency and safety of the resulting briquettes.

INPUT



Oily Chips/Sludge



Sludge Fluid Recovery

OUTPUT



High Value Recyclables
and Recovered Coolant/Oil

Performance Benchmarks

METHOD	FLUID RECOVERY RATE	SCRAP VALUE	KEY LIMITATIONS
Gravity Draining	~10–20%	Low	Slow, inconsistent, not suited for fines
Centrifuging	~30–50%	Moderate	Only works for coarse chips, not sludge
RUF Briquetting	~85–98%	High	Requires configuration/testing for best ROI

These figures, supported by RUF's internal testing and field data, reveal a clear advantage. For example, reclaiming 90% of coolant at \$20 per gallon can result in monthly savings that quickly compound. Meanwhile, scrap buyers may offer premiums for briquetted material due to its density, dryness, uniformity, and lack of fluid contamination.

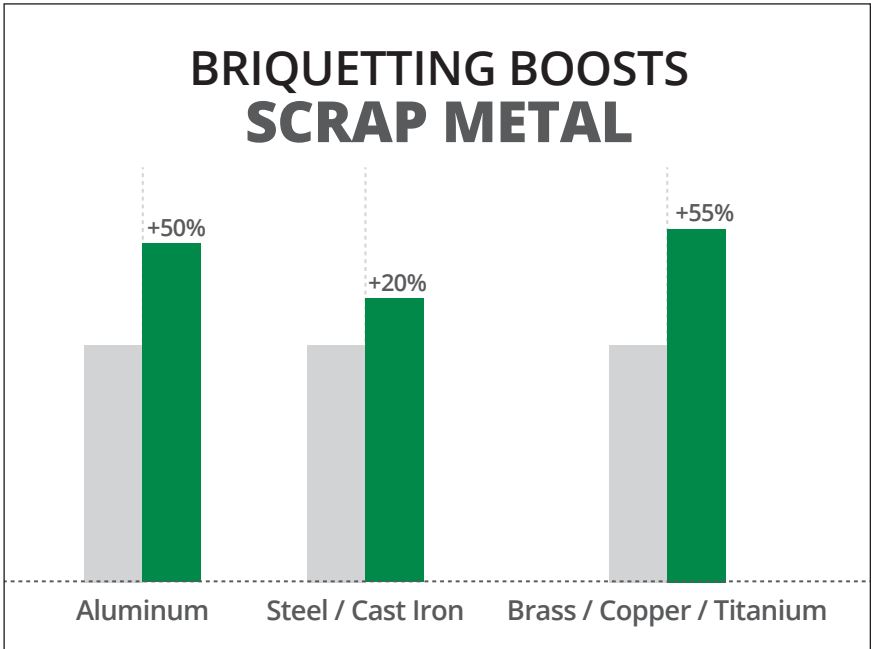
The improvement in scrap value can be substantial. Aluminum, when converted from oily chips to clean briquettes, often commands 30% to 50% more per pound. Steel and cast-iron yield 10% to 20% more, while brass, copper, and titanium can exceed 50%, particularly in industries like aerospace and precision machining.

More importantly, these gains apply regardless of shop size. Small- and mid-sized manufacturers with tight margins can benefit just as much, if not more, than large OEMs because the recovered fluids and upgraded scrap directly offset fixed operating costs.

To illustrate the broader operational impact, consider these typical downstream savings associated with briquetting systems:

COST FACTOR	IMPROVEMENT AREA	TYPICAL BENEFIT
Disposal Fees	Lower waste volume (up to 90% reduction)	Fewer hauls, smaller containers
Labor & Handling	Automated cycles and fluid separation	Up to 50% reduction in manual labor
Storage & Transport	Denser, stackable briquettes	Lower transport cost and space requirements
Shop Floor Safety	Cleaner floors, fewer spills	Reduced slip/fire hazards, better 5S scores

BRIQUETTING BOOSTS SCRAP METAL



These outcomes often create cascading benefits, lowering insurance risk, boosting employee morale, and enhancing productivity across shifts.

Case Study:

AUTOMOTIVE

A prime example of briquetting's return on investment is found in an Ohio-based major auto manufacturer's deployment of a RUF system to process grinding sludge. Prior to installation, the plant incurred excessive costs due to coolant loss, labor-intensive handling, and frequent waste disposal. Once the briquetting system was operational, the manufacturer reported over 90% coolant recovery, a significant reduction in sludge volume, and improved shop floor cleanliness. The most staggering

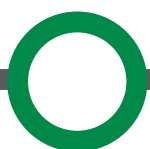
metric, however, was the 19-day payback period—achieved through coolant savings alone.

The case also highlights the importance of cross-departmental buy-in. The plant's facilities, maintenance, and EHS teams participated in selecting and implementing the system, ensuring long-term usability and value. The decision to invest in briquetting aligned not only with cost reduction goals but also with environmental targets and 5S improvements.

ROI IN 19 DAYS



Installation



Coolant >90%



Sludge Volume ↓



Payback

Regulatory and ESG Advantages

Beyond cost savings, briquetting carries regulatory and sustainability benefits. Under U.S. EPA guidelines (40 CFR Part 261), waste saturated with fluid may be classified as hazardous, which triggers more stringent handling, documentation, and disposal requirements. By extracting up to 98% of embedded fluids, briquetting may help shops reclassify their waste as non-hazardous scrap, reducing both cost and complexity.

The sustainability advantages extend downstream. Briquetted material offers more consistent furnace charging and, in many melting applications, can improve thermal efficiency by allowing denser material to penetrate deeper into the bath. This can help limit oxidation losses and reduce the total energy input required for remelting. In addition, the volume reduction from briquetting—often up to 90%—leads to fewer scrap hauls, lowering Scope 1 emissions. Recovery and reuse of cutting fluids further reduce the need for virgin chemical inputs, positively affecting Scope 3 emissions. For manufacturers tracking ESG metrics, these benefits are both operationally meaningful and reportable.

For suppliers working with large OEMs, particularly in aerospace, medical, or automotive sectors, these data points can also support supplier scorecards and improve competitiveness in future contracts.



Engineering Considerations

System configuration plays a critical role in briquetting performance. Several variables affect how a press should be designed and tuned for a specific shop.

VARIABLE	IMPACT
Moisture / Oil Level	May require a longer cycle or pre-dewatering
Metal Density	Affects throughput and system load
Chip Morphology	Influences on feeding and briquette uniformity
Abrasives Present	Informs die selection and wear protection, lower purity value
Throughput Needs	Determines press size and cycle speed

RUF begins every engagement with lab testing. Typical customers send 5 to 10 gallons of representative material, which the RUF team processes using a full-scale press. This yields detailed insights into recovery rates, cycle time, and briquette density. The customer receives a report along with sample briquettes to validate results internally.

This test data not only ensures proper sizing and press selection but also builds confidence among stakeholders evaluating capital investments. By demonstrating real-world results with their own material, manufacturers reduce risk and expedite project approval.

Implementation & Maintenance

Installing a briquetting system is straightforward when guided by proper testing and planning. RUF customizes each system to the facility's layout, chip volume, and fluid management process. Systems often integrate with existing conveyors or closed-loop coolant systems.

Maintenance is simple but imperative. RUF presses are engineered with replaceable wear parts and steel dies. Integrated drainage channels promote consistent fluid evacuation, and PLC software features compensate for wear to maintain briquette density over time. These systems are designed for continuous-duty operation in demanding shop environments and are already trusted across the automotive, aerospace, medical, and defense industries.

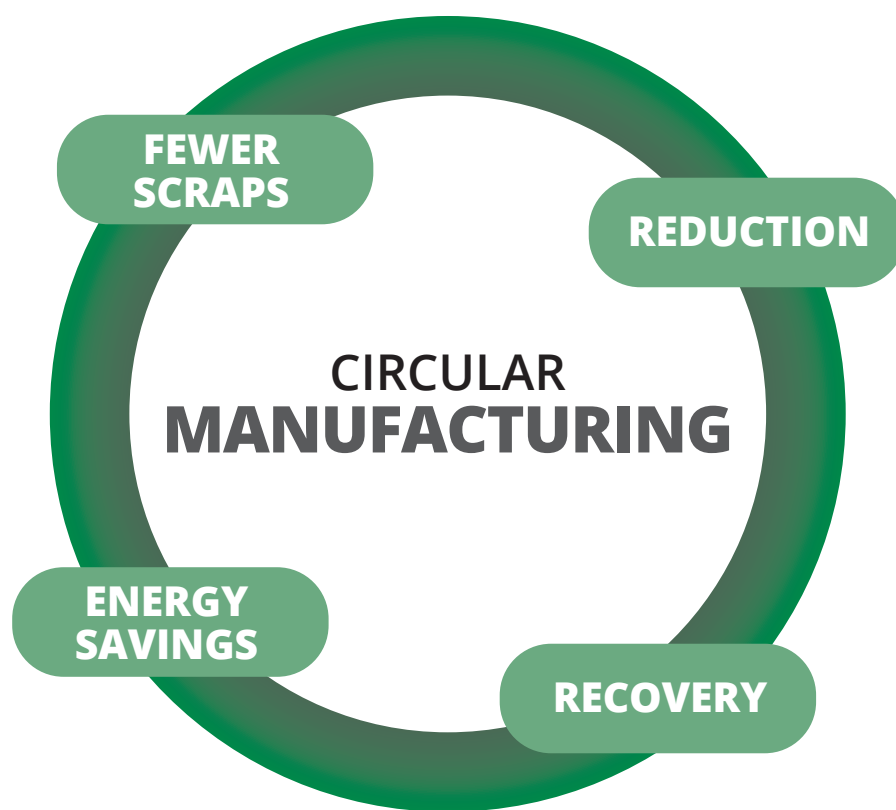
Operators typically require minimal training, and maintenance teams find the modular design makes servicing straightforward. This ease of ownership, combined with strong pre-sale support, contributes to high long-term satisfaction among RUF customers.

Strategic Impact

Briquetting should not be seen as a niche tool for minimizing waste. Instead, it's a strategic lever that supports lean manufacturing, environmental stewardship, and operational excellence. By recovering expensive cutting fluids, improving the salability of scrap, and simplifying compliance, briquetting generates both short-term ROI and long-term competitive advantage.

It also aligns with broader trends in manufacturing, such as digitalization, energy efficiency, and green procurement. Data from briquetting systems can be integrated into sustainability dashboards, tracked against KPIs, or used in stakeholder reporting. For companies preparing for ISO 14001 certification or responding to supplier sustainability assessments, this is a significant advantage.

For machine shops navigating cost pressure, labor constraints, and increasing ESG expectations, briquetting represents a rare convergence of operational, financial, and environmental value.



Additional Considerations and Market Trends

The relevance of briquetting extends beyond individual shop floors. The broader shift toward circular manufacturing—driven by industry coalitions, customer expectations, and government policy—places greater emphasis on material stewardship and waste traceability. According to the U.S. Department of Energy, metal recycling consumes up to 95% less energy than producing primary metals from ore.² This makes metal recovery an attractive element in decarbonization strategies.

Additionally, global supply chain volatility and raw material price increases have sharpened manufacturers' focus on reclaiming in-house value. In 2022 alone, average prices for aluminum scrap rose more than 40% year-over-year, with similar spikes seen in copper and steel markets.³

Finally, the adoption curve is flattening. What was once a niche solution is becoming standard among progressive manufacturers. System integrators and fluid management vendors are now building briquetting into turnkey solutions for metalworking environments. This broader acceptance helps reduce perceived risk, supports interoperability, and opens the door for mid-sized manufacturers to follow in the footsteps of prominent OEMs.

Closing the Loop on Metal Waste —The Next Step

For manufacturers looking to strengthen operations, reduce waste, and unlock new sources of value, briquetting offers a proven path forward. Whether you're managing oily chips in a CNC shop, fine grinding sludge in a high-speed production line, or a mix of alloys in a job shop, the economic and environmental returns are tangible—and measurable.

Briquetting systems are not just for large OEMs. With modular equipment sizing, extensive lab testing, and seamless integration options, RUF helps shops of all sizes reclaim control over their scrap and fluid handling processes.

The transformation from waste to revenue begins with a single step: testing your material. In just a few days, RUF can show you what's possible with your swarf or sludge stream, backed by real data, real briquettes, and real potential.

Ready to find hidden treasure in your chip bin?

Start with a no-cost, no-risk material test. Visit www.ruf-briquetter.com to submit your sample request or speak with a briquetting specialist.

About RUF Briquetting Systems

With over 50 years of experience and more than 5,000 systems installed worldwide, RUF specializes in briquetting metal, wood, and biomass waste. All systems are engineered and manufactured in Germany and supported by a U.S.-based team. RUF offers lab testing, custom system design, and responsive technical service, giving manufacturers the confidence to convert costly waste streams into valuable process inputs.

To request a free test or learn more, visit: www.ruf-briquetter.com

¹ Estimate derived from EPA and SME data, compiled in RUF's internal market analysis, 2024.

² U.S. Department of Energy: <https://www.energy.gov/eere/amo/metal-recycling>

³ Scrap Monster Market Intelligence, 2022.

