

CASE STUDY

Aerospace Components Manufacturer Turns Its Waste Stream into a Revenue Stream with a PRAB Dualpak™ Briquetter and Guardian™ Coolant Recycling System

A worldwide manufacturer of complex metal components for the aerospace industry (including structural investment castings, forged products and airframe assemblies for aircraft engines and industrial gas turbines) needed to achieve maximum recovery of its cutting fluids from scrap material that was being machined at its facility in the Pacific Northwest. Additionally, the company wanted to receive a higher value for its scrap by removing the maximum amount of coolant possible from the material, as well as reducing the material to a more solid, compact form that could be hauled away less frequently or re-melted.



Previously, the company's scrap removal process involved collecting material saturated with cutting fluid in a self-dumping hopper off of its gantry mill and discharge conveyor. A forklift would then pick up the full hopper and take it to a larger hopper or lugger box outside to be hauled away by the recycler.

The primary problem with this process was that it didn't result in a truly full hopper or lugger box. Only about 12,000-18,000 pounds of loose material, especially aluminum, can fit into such a container that can typically accommodate 40,000 pounds of material, or what a recycler considers a full truckload based on weight, not volume. Hauling away what amounts to as much as 28,000 pounds of air versus scrap per load is far from ideal for both the manufacturer and the recycler.

The company was aware of the benefits a PRAB Dualpak™ Briquetter system could bring to its operation, as it had achieved success with similar installations at several of its other facilities throughout Canada. That success included an ROI on the equipment expenditure in approximately 18 months and payback on the company's coolant costs in approximately 8-10 months.

Still, each specific facility and operation is different. PRAB collaborated with the manufacturer's corporate engineers to conduct a full site review as well as a complete audit of the company's existing system and other variables unique to the environment. The results of this investigation confirmed that implementing a system consisting of a briquetter, crusher and Guardian™ Coolant Recycling unit at the company's Pacific Northwest facility could bring results similar to those achieved at its plants in Canada.

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With the combination of the briquetter and a crusher ahead of it, the company was able to efficiently and significantly reduce the bulk density of its scrap material. Instead of dumping the contents of the hopper directly into an outside container, the forklifts now deposited the scrap material into the briquetter, which uses dual compression technology to transform the material into a “puck” that is almost 90% solid—the highest-density puck in the industry. In the process, cutting fluid is squeezed out of the scrap and collected in a bottom recovery pan. Next, the fluid is pumped from the pan to the filtration unit, which removes tramp oils and suspended solids before pumping the recycled coolant back to the machines where it can be reused and contribute to improved tool life.

As the pucks come off the briquetter, they are placed in a gaylord box, a 4'x4' lined, corrugated cardboard box that fits on a skid. The high-density, boxed briquettes can now be loaded onto trucks at full 40,000-pound capacity, which satisfies the recycler's preference for maximum weight and also means fewer haul-away visits.

Another reason the company opted for the briquetting scenario is that pucks offer greater potential to re-melt solid scrap in-house. While recyclers typically specialize in this type of work, this manufacturer now had the option to add a re-melting furnace within its plant and gain even more value from its scrap by minimizing material loss versus re-melting loose chips.

ROI Chart	Loose, wet	Briquette
Weight of scrap / mo (lb From customer (shipping)	500,000	500,000
Enter contained coolant from test data	15%	15%
Metal scrap generated / From customer (calculated)	425,000	425,000
Enter residual coolant from test data	15.00%	3.50%
Weight of scrapped shipped out	500,000	439,875
Recoverable Metal	425,000	425,000
Enter price per pound as shipped (dealer)	\$0.350	\$0.400
Enter processing fee (Deduction) (dealer)	\$0.020	\$0.005
Material Value	\$140,250	\$168,795
Coolant Replenishment cost / mo	\$1,200	\$1,200
Coolant Saving	\$0	\$920
Total Revenue from Scrap	\$140,250	\$168,795

Expenses of Process		
*Electrical	\$0	\$2100

Miscellaneous Additional Expenses		
Cost of Gaylord Boxes		\$200
Freight		\$1,200
Total Expenses	\$2,126	\$3,500

Summary		
Revenue	\$140,250	\$168,795
Expenses	\$2,126	\$3,500
Net	\$138,124	\$165,295

Difference per month vs loose, wet **\$27,171**

Difference per year **\$326,052**

System Cost = 450,000.00

*Est. \$.06 to \$.12 per kwH (Foundry Series x 2. Pay Back= 12.89 months

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All told, the crusher/briquetter/recycling system enabled the manufacturer to see substantial benefits consistent with those achieved at its Canadian facilities as well as by other aerospace manufacturers who implemented a similar system:

- Added value of 25 cents per pound for pucks versus loose material (which adds up to an additional \$10K per full 40,000-pound load of scrap that briquettes make possible)
- 50 gallons per hour of reclaimed cutting fluid (or 600 gallons of diluted coolant per day in a 2-shift operation or 1200 gallons in a 3-shift operation)
- Increased average tool life from properly filtered fluid, specifically as much as:
 - 209% for drills
 - 78% for turning tools
 - 66% for form tools
 - 47% for boring tools
 - 26% for reamers
- Improved surface finish by an average of 27%
- Reduced machine downtime by an average of 50%
- Reduced re-sharpening cost by an average of 50%

Application Information:

Material Handled	Aluminum
Chip Configuration	95% chips, 5% turnings
Volume of Material	2,000 lbs/hr
Bulk Density of Material	Varies
Tramp Metal Solids	2 to 3 per year 2" to 8"
System to be Fed By	Up to 3 cubic yard self-dumping hoppers
System Location	Inside plant
Plant Power Supply	480VAC/3/60
Power Consumption	126 total amps, 108.3 total H.P.
Fluid	Fuchs Ecocool water soluble coolant
MSDS Supplied	No
Number of Machines Sumps	31
Sump Sizes	The largest sump is 450 gallons (1), then 405 (2), 300-200 (4), 200-100 (5), < 100 (19)
Total Sump Capacity	4,300 gallons

By briquetting its solid waste, this company turned its scrap and spent fluid from a waste stream of loose, flowing byproduct to a 90% solid commodity that is released from its coolant and can now be processed, reused or even sold for value. The reclaimed cutting fluid also adds to what is now a revenue stream by reducing the need to purchase pure

coolant concentrate that costs between \$20-\$30 a gallon. Ultimately, this solution not only constituted a new approach to processing equipment but also a new way of thinking that many aerospace manufacturers are adopting: Scrap and spent fluids are a part of what they produce and can be turned into real dollars that go directly to their bottom line.

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PRAB Briquetting System Summary:

PRAB Dualpak™ Briquetter by Neff Model MX50-100M

- 4 (four) cubic yard live bottom hopper
- Unit produces 5" diameter briquette
- 30,000 psi compacting pressure
- 100 HP TEFC motor with 141 gpm hydraulic pump and 150 gallon reservoir
- Reclaimed fluid tray with sump pump
- Auto restart feature (when empty, the unit will go into standby mode, saving energy; when material is added, it automatically resumes operation)
- NEMA 12 control panel includes PLC and HMI
- Fan cooled heat exchanger
- Shipped as three prewired modules for easy on-site assembly

Discharge Conveyor – 2½" Pitch Steel Belt

- 2½" pitch, 6" wide, plain hinge belting
- Z" style conveyor with 5' discharge height
- Pusher flights move briquettes along belt path
- Hydraulic drive system
- Special pivoting design allows for multiple container loading

PRAB Filtration System Summary:

- PRAB Model HG-1200 Guardian™ Coolant Recycling System
- Dirty Coolant Transfer System with in-line bag filter assembly
- Model PFA-120 Paper Bed Filter System with 25-micron filter paper
- Process tank (one 600-gallon capacity dirty coolant compartment and one 600-gallon capacity clean coolant compartment)
- TW15 Tramp Oil Separator
- Dosatron Coolant Make-up System
- Coolant manager
- Control panel
- System flow rate: 15 GPM

About PRAB

PRAB is a leading engineer and manufacturer of conveyors, chip and fluid management systems, and industrial water and wastewater treatment equipment. Our customized solutions automate metal handling, reduce labor costs, reclaim and recycle expensive cutting fluids/coolants and maximize return on recycling metals. With our 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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