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## *CASE* **STUDY**

### **Eriez Star Filter® System Reduces Cutting Oil Consumption by 40% on 20+ Swiss Lathe Machines at Hypertherm; New Manufacturing Facility Recycling 100% of Copper Chips**

Hypertherm designs and manufactures advanced cutting products for use in a variety of industries, such as shipbuilding, manufacturing and automotive repair. Its product line includes plasma, laser and waterjet cutting systems, in addition to CNC motion and height controls, CAM nesting software and consumables.

Hypertherm's newest 165,000 square foot facility opened in Lebanon, New Hampshire in 2012. Among other machinery, the new facility contains 26 multi-axis CNC lathes which are used in the manufacturing of plasma cutting torch components, primarily electrodes and nozzles, for light industry customers. The components are made of non-ferrous materials. The cutting oil for each CNC lathe is heavy cutting oil with viscosity of 214 SUS @ 100 degrees F. Machine operating temperature is approximately 90 degrees F.

Hypertherm realized the CNC lathes needed a way to reduce the oil consumption and also begin to recover the valuable copper chips as a byproduct of the manufacturing process, according to Tom Woodward, manufacturing engineer, and Dave Bean, maintenance leader, for the new Lebanon

facility. That's when Woodward contacted Tom Cassese, director of sales at Eriez, to map out an entirely new method of recycling the expensive cutting oil and recovering the valuable copper fines.

### Star Filter System provides solutions

The Eriez team, led by Cassese, recommended a Star Filter® System combined with a Temperature Control Package and an Oil Conditioning System. During the proposal stage, Woodward decided to switch from the Hangstefers PC45 to the PC28 oil weight for better machine performance. The complete system was installed in early 2012 and since that time has met all of Hypertherm's ROI requirements.

"We gave Eriez a challenge to develop a system that would control oil heat at 90 degrees plus or minus five degrees, recapture all our turned and milled chips, recycle 90% of the vegetable-based oil and spec the system to handle up to 52 machines in the future," recalls Woodward. "We have a 5,000 gallon system here with about 160 gallons turning over every couple of hours on the machines. Eriez had to build a system big enough to filter and recycle that much oil. The oil we use fluctuates between \$22 and \$25 per gallon so the cost savings alone can be significant."

Hypertherm is dedicated to Corporate Social Responsibility (CSR) where all associates have set ambitious reduction goals for waste, energy and carbon to be achieved by the year 2020. The Lebanon facility received LEED Gold Certification in 2013 from the U.S. Green Building Council. The Eriez Star Filter System is doing its job.

The Eriez Star Filter System with Hydrofiber® “F” filter includes two Star elements at 80 square feet each for a total of 160 square feet of filter area. Each CNC lathe has a sump in the base with a chip conveyor. Included in the sumps are high pressure clean spindle supply pumps. The sump volumes are between 60 to 80 gallons capacity and the sumps are approximately 13” high. The oil from each machine sump is filtered to 5-microns or better, with the filter oil delivered back to the machines at 30 psi.

“Because of the Star Filter System, we can re-capture all chips and particulate material content, so we are recycling 100% of machine chips,” Woodward says. “Over these three years, we have cut our oil consumption down by 40%. We were topping off each CNC machine with approximately 7 1/2 gallons of oil per day, and we have cut that down to just a little over two gallons per day.”

The sequence of operation of the Star Filter follows several steps:

- Contaminated fluid enters the main conveyORIZED portion of the Star Filter via pumpbacks at each machine tool, where baffles reduce the incoming velocity, allowing the larger contaminants to settle and be removed by a drag conveyor
- The filter pump suction is connected to the suction of the Star Filter elements. The filter pump pulls fluid through the filter panels of the Star elements. The contaminants in the fluid are trapped, forming a tortuous path for finer filtration. A small by-pass of filtered fluid, discharged directly from the pump, keep the back wash tank compartment full for regeneration and overflowing for further fine filtration. The filtered fluid is pumped directly back to the CNC machines on demand.

- Filtration continues until the depth and density of the filter cake create sufficient resistance to flow as sensed by a vacuum switch; at that point, the Star Filter automatically regenerates.

#### Oil Conditioning System keeps machines running smoothly

Along with the Star Filter system, Hypertherm also installed an Eriez Oil Conditioning System to restore the cutting oil using the following components:

- Flow controls to regulate the flow down 2 GPM into the conditioning system
- Two, 5-micron pleated cartridges to remove suspended solids
- Two, 5-micron Fullers Earth (bentonite and magnesium oxide) elements for adsorption of water and oxidization gases that increase the oil acid levels
- Two activated alumina elements for adsorption of sulfur, nitrogen, and naphthenic acid well as other polar contaminants
- Final polish with two, 1-micron activated charcoal elements for adsorption of color and organic acids that are a by-product of oil oxidation.

“The system we now have in place is one of the first of its kind in our industry.” Woodward notes. “I come from the aerospace world so I knew filtration systems and what we needed at this facility. The biggest factors were conditioning the oil, chip removal and temperature control when we were talking to Eriez.”

“The other challenge was for Eriez to put in a 325-foot dual supply line and return line so we could spec the system out to handle 52 machines in the future,” he says. “We built this system with the potential to grow as our business expands. What Eriez designed and installed was very unique.”

“Our machine tool sump systems did not clean all the oil out so the oil was going back to the machines dirty,” recalls Woodward. “Now we have fresh, clean oil and our tool life has gone up. We have a lot of customer training in this facility and some folks have never seen anything like the Eriez system. This is a showcase system for us and the returns over the past three years have been exceptional.”

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Eriez is recognized as world authority in separation technologies. The company’s magnetic lift and separation, metal detection, flotation, materials feeding, screening, conveying and controlling equipment have application in the process, metalworking, packaging, plastics, rubber, recycling, mining, aggregate and textile industries. Eriez manufactures and markets these products through 12 international facilities located on six continents. For more information, call toll-free (888) 300-ERIEZ (3743) within the U.S. and Canada. For online users, visit [www.eriez.com](http://www.eriez.com) or send email to [eriez@eriez.com](mailto:eriez@eriez.com). Eriez World Headquarters is located at 2200 Asbury Road, Erie, PA 16506