Office of Technical Assistance
Executive Office of Environmental Affairs
Commonwealth of Massachusetts

Toxics Use Reduction Case Study

COOLANT MANAGEMENT AT BELOIT CORPORATION

SUMMARY

Beloit-Jones Fiber Finishing Systems Division of Beloit Corporation in Dalton, MA, replaced the water-based coolant used in its metalworking operation with a mineral oil-based coolant. This change has nearly eliminated the dumping of spent coolant due to rancidity caused by tramp oil accumulation. Beloit expects that the change will save it more than $88,000 in associated machine tooling costs. This amounts to cutting costs by 28% in the first year and 32% in succeeding years.

BACKGROUND

Beloit Corporation employs nearly 400 people at its Fiber Finishing Systems Division, which manufactures heavy machinery for paper mills, designs paper mills and factories, and rebuilds old machinery. In the manufacturing process, metal stock and large castings are placed in CNC machines, lathes and milling machines to be cut into the required shape. The cutting tools on the machines are flood-cooled to reduce heat and increase lubricity. Every two weeks the coolant becomes rancid due to bacteriological growth. Tramp oil floating on the top of the sump prevents aeration, resulting in the flourishing of anaerobic bacteria. This requires that the sump be emptied, the coolant filtered in a central area, and the sump recharged. Additionally, the machine operators experienced dermatitis due to contact with the coolant.

TUR PLANNING

The coolant at Beloit had many drawbacks: short life, high disposal costs, poor lubricity and skin irritation problems. Plant Engineering Manager Paul Norcross, together with the tool room and maintenance supervisors, began looking for alternatives which would remedy these problems.

The first step was to invite representatives from five coolant manufacturers to run tests on machines within the plant. Beloit chose three milling machines which are used to manufacture identical stainless steel parts. The substitute coolant used in the first machine produced immediate results. The operator's skin irritation ceased and the cutting tool ran two to three times longer between changes. After three weeks, the coolant remained unaffected by tramp oil. The other two machines were changed over to different coolants, but dermatitis and poor cutting tool

life problems persisted.

By the 75th day of the trial, other operators were clamoring for the coolant used on the first machine and all other testing was terminated. The other 37 cutting machines were then systematically switched over to the new coolant with similar positive results. (It was found that the new coolant produced poor results in the grinding area.)

TUR MODIFICATIONS

The change required no operator retraining in order to implement. Maintenance operators are required to check coolant concentration and make-up levels. An oil skimmer for the tramp oil was added to the sump of each machine which did not already have such a skimmer, in order to achieve the maximum benefit from the coolant. The new coolant has eliminated dermatitis problems and increased tool life with no apparent need for disposal, thus reducing maintenance. Operators have been able to increase machine feed rates, yet even with the increased tool use, the savings potential in tool costs is around 24%, and finished surface quality has improved dramatically.

RESULTS

Reductions Achieved: Beloit no longer has to dispose of spent coolant, and this has reduced the amount of hazardous material which is disposed of off-site.

Economics: Equipment costs for the wheel skimmers, which were manufactured in-house, amounted to $9,000. The new coolant costs $11.34 per gallon, an increase of 47% over the old coolant. However, reduced disposal costs and make-up for spent coolant saves Beloit $18,000 annually. While difficult to quantify due to a wide variety of operations and materials, maintenance time and costs for the coolant has been reduced. Tool life has been extended by two to two-and-a-half times that achieved with the old coolant. Machine feed rates have increased at a similar rate (from 7 in./min. to 18 in./min.), more than doubling productivity. These factors combine to yield a savings of $61,200 (24%) annually in cutting tool purchases. Overall, this project generated savings of more than $88,000 of 1991.

This casestudy is one of a series of such documents prepared by the Technical Assistance (OTA), a much of the Massachusetts Executive Office of Environmental Affairs whose mission is to assist industry in reducing the use of toxic chemicals and/or the the generation of toxic manufacturing byproducts. 0TA's non-regulatory services are available at no charge to Massachusetts businesses and institutions that use toxics For further information a6out this or other case studies, or abut OTA's technical services , contact: Office of Technical Assistance, Executive Office of Environmental Affairs, 100 Cambridge Street, Boston, Massachusetts 02202, or phone at (617) 727-3260.