MINNESOTA TECHNICAL ASSISTANCE PROGRAM
Case Study
UNIVERSITY OF MINNESOTA

Metal stamping company saves $26,000 by eliminating vapor degreaser

Dayton Rogers Manufacturing Company
Minneapolis, Minnesota

Prior to change:

- A vapor degreaser removed oil from parts prior to deburring

Changes made:

- Replaced vapor degreaser with an upgraded wet abrasive deburring system

Benefits:

- $26,000 savings annually

Cost:

- $8,800 for new equipment

Background

Dayton Rogers specialized in short-run metal stamping using common sheet metal alloys and sizes. Approximately 70% of all parts were deburred in a dry sander, with the remainder deburred in vibratory tumbling machines. A vapor degreaser removed forming lubricant—oil for stamping and drawing—from parts prior to deburring. If not removed, the lubricant would gum up belts in the dry sander.

Incentives for Change

In 1989, the company purchased 1,100 gallons of 1,1,1-tricloroethane (TCA) per year for use in its vapor degreaser. New regulations were phasing out the production and use of TCA. Dayton Rogers could have switched to an alternative solvent for its vapor degreaser. But, operating costs for the vapor degreaser had increased, prompting the company to evaluate its use.

Dayton Rogers efforts to limit its vapor degreaser use by limiting the type of parts degreased had failed. They found that while the vapor degreaser was in the plant, employees continued using it to clean all parts rather than only select ones.

Employees discovered that some cleaning operations using the vapor degreaser were unnecessary. For example, parts sent out for plating were degreased twice. Parts were degreased before being sent out and platers would degrease them again prior to plating.

Dayton Rogers decided to eliminate its vapor degreaser in 1990.

Upgrading the Deburring Operation

The first step to eliminating the vapor degreaser was to upgrade the existing deburring operation to debur and clean parts simultaneously. This eliminated the cleaning step formerly done by the vapor degreaser. The company modified the vibratory tumbling machines to increase throughput and added a wet sander. It switched to a water-based lubricant to make removing the forming lubricants easier in the water-based deburring system.

The dry sander was eliminated and by 1991, 75% of all parts manufactured were cleaned and deburred in the vibratory tumbler. To expand the vibratory tumbling process's limited capacity, the company switched from using a powdered cleaner to a liquid. The liquid cleaner could be automatically metered into a flow-through water stream using flow restrictors. Operators no longer needed to manually fill the tumbling machines with water and detergent for each batch of parts. Quality control also improved with the new metered system. The new flow-through cleaning system flushed parts constantly, keeping the deburring media clean. The mild liquid cleaner eliminated concern about high pH wastewater, which was an intermittent problem with the alkaline powder soap used in the past.

Most parts with formed designs were bent and shaped prior to deburring. This helped avoid problems with flat parts adhering to one another when wet, facilitating air drying.

The remaining 25% of parts were made of flat metal. These were cleaned and deburred in the wet sander and dried in a sheet metal drier placed in line with the sander.

Process flow was reorganized so that abrasive deburring was the final step for the vast majority of the parts produced. Once parts were cleaned their surfaces did not become recontaminated by deburring.

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Implementation Issues

To prevent rust on steel parts, sodium nitrite was added to the detergent solution of the vibratory tumbler at 0.2% by weight. Flat parts were dipped in a solvent-based rust proofing chemical after deburring with the wet sander. All parts were air dried without being rinsed to avoid removing the rust inhibitor.

One percent of parts had very stringent cleaning specifications or were too fragile for tumbling. These parts were sent off-site for cleaning in a vapor degreaser.

Although tool wear was a concern with the switch to a water-soluble oil lubricant, no additional wear was observed. Oil concentrations were kept within discharge limits. High oil content in the wastewater probably was avoided by using dilute water-soluble stamping oils.

Costs and Benefits

Eliminating vapor degreasing and installing a new cleaning/deburring system in 1990, resulted in an annual savings of $26,575 for Dayton Rogers. The capital investment to replace the vapor degreaser was about $9,000, and the payback period was roughly three months.

Operating Costs for Vapor Degreasing

Annual TCA purchase (1,100 gallons)	$10,500
Annual TCA recycling (2.5 drums)	200
Electricity	1,000
Water (10 gpm)	8,500
Labor	10,000
Total	$30,200

Increased and New Costs for Deburring[1]

Water-based cleaner	negligible[2]
Stamping lubricant	negligible[2]
Electricity	$125
Water	500
Labor	0
Off-site vapor degreasing	3,000
Total	$3,625

Capital Investment

Wet sander and drier (purchased used)	$8,000
Metered detergent set-up	800
Total	$8,800

Application to Other Companies

Using a vibratory tumbler with a water-based cleaner to clean and debur parts simultaneously should work in stamping and machining operations where deburring is done, but precision cleaning is not necessary. In some cases, the following modifications may be useful:

- When cleaning parts with heavy oil films, try using higher detergent concentrations and heating the cleaning solution.
- When cleaning parts with holes that are inaccessible to abrasive media, try using higher detergent concentrations. The tumbling action also helps knock out metal chips and allows the holes to drain.

1 The deburring operation was used along with the vapor degreaser in the old system. Therefore, this analysis only looks at the change in operating costs and not the total operating costs for deburring.

2 Cleaner and lubricant costs were not fully analyzed, but Dayton Rogers personnel believe that because the new chemicals are diluted when used, the costs are very similar to that of the old system.

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