# Part Placement, Spray Adjustment and Overspray Reuse Increase Transfer Efficiency

Minnesota Technical Assistance Program ■ INTERN SUMMARY

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| **Company** | Medallion Kitchens<br>Waconia, Minnesota |
| **Results** | Reclaim 11.5 gallons of sealer overspray daily, saving $23,000 per year. Waste sludge reduced 50 percent saving $30,000 annually. |

Medallion Kitchens is a leading woodworking company manufacturing a variety of kitchen cabinets and bathroom vanities at a daily rate of approximately 900 cabinets. Wooden cabinet parts are stained and then finished with a solvent-based catalyzed sealer and topcoat before they are assembled into completed cabinets. The process of spraying the sealer and topcoat finishes onto the cabinets is automated; a central computer controls a conveyor belt system, two water-wash spray booths and two drying ovens. Sensor-automated spray guns apply coatings to cabinet parts in each booth.

Overspray, the finish that misses cabinet parts during application, is wasted raw material. Overspray generates waste by (1) volatilizing, which releases volatile organic compounds (VOCs); (2) landing on conveyor bands, which then must be cleaned off and disposed of as hazardous sludge; or (3) falling into a tank containing recirculating water; which collects and floats in the water until manually removed and disposed of as hazardous sludge. Before any changes were made, this application process used approximately 75 gallons of sealer per day in the sealer spray booth, and generated approximately 50 gallons per day of hazardous waste sludge. Approximately 50 percent of the sludge content consisted of water.

## Incentives for Change

Medallion Kitchens was interested in: 1) reducing solvent emissions because future air quality regulations promise to reduce the allowable VOC emission levels; 2) reusing the sealer and topcoat overspray to reduce raw material costs; and 3) minimizing sludge waste to reduce hazardous waste disposal costs, along with liabilities after the sludge leaves the facility; and 4) reducing labor costs associated with sludge removal, dewatering and handling.

## Intern Activities

A system for reclaiming and reusing overspray material was designed by Medallion Kitchens and installed in the sealer spray booth. The system consists of two collection trays, a holding reservoir, copper piping, and a pump. The MnTAP intern tested the new system, and examined ways to improve transfer efficiency through adjusting spray timing and part placement.

**Spray timing adjustment.** One source of overspray came from the spray guns starting too early or remaining on too long. To determine the actual area covered with finish, a piece of paper the size of an average part was taped to Plexiglas® and sent through the spray booth. The photo-electric cell ignored the clear surface and sprayed the paper. Overspray that collected on the clear surface was measured to determine the areas and amounts of overspray. This test method was used to adjust the spray gun timing to minimize overspray.

**Part placement.** During the application of spray coatings, the spray system was unable to turn off and on fast enough to avoid spraying the empty spaces inside the cabinet frames. This resulted in another source of overspray. Attempts were made to place smaller parts (doors or drawer fronts) within the internal areas of the frame to improve transfer efficiency.

## Results

**Overspray reclamation and reuse.** The reclamation system was built for $2,500 and is currently operating in the sealer spray booth at Medallion Kitchens. An



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average of 11.5 gallons of sealer is reclaimed daily, resulting in raw material cost savings of $92 per day or $23,000 per year. Waste sludge generated in the sealer spray booth was reduced by 50 percent to an average of 25 gallons per day. Hazardous waste disposal costs for the sealer booth were also reduced by 50 percent, saving $30,000 annually.

**Spray gun timing.** During testing of spray gun timing, the overspray pattern on the Plexiglas® had dimensions of 15 centimeters by 16 centimeters. This showed that regardless of part size, the spray guns were being triggered on at a distance of 16 centimeters from the parts and spraying 15 centimeters past the edge of parts. By adjusting the timing of the spray gun controller, overspray dimensions were reduced to 10 centimeters by 11 centimeters. Further reduction was not possible because of the need to "wrap" the edges of parts with spray. Transfer efficiency calculated for an average part measuring one foot by one foot improved from 44 percent to 55 percent after adjusting the spray controller timing. However, the increase in transfer efficiency was less for larger parts.

**Part placement in frames.** A problem with placing parts within the frames occurred during the conveyor transfer of the parts from the spray booth to the drying oven. The sudden change in speed during this transfer caused the parts to shift, touch each other, and stick together resulting in an unacceptable finish. To remedy this situation, an electronic control was installed to gradually accelerate the conveyor as parts enter the oven. Gradual acceleration prevents the smaller parts from sliding into the frames.

Although changing the acceleration rate allows parts to flow through the system without touching, other concerns must be resolved before implementation. Part scheduling will need to be altered to coordinate frames with smaller parts, and another worker may be needed to assist with added duties during part placement, sanding, and unloading. In addition, quality could suffer if parts were placed too close to each other which could prevent the edges from being sprayed.

## For More Information

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that maximize resource efficiency, prevent pollution and reduce costs. Our information resources are available online at <mntap.umn.edu>. Or, call MnTAP at 612/624-1300 or 800/247-0015 from greater Minnesota for personal assistance.

*This project was conducted in 1992 by MnTAP intern, John Sipple a mechanical engineering junior at the University of Minnesota.*