Case Study No. 22 Waterborne Coatings
Schrock Cabinets
Hillsboro, OR

Background

Schrock's Hillsboro, Oregon, cabinet plant employs approximately 300 people. The majority of the cabinets manufactured at the facility, approximately 90 percent, have a clear finish. The other 10 percent are finished with a pigmented topcoat. Oak, maple, hickory, and cherry are the primary woods used at the facility.

The Hillsboro plant is subject to reasonably available control technology (RACT) regulations. The facility has a yearly cap on their VOC emissions and a VOC limit on their topcoats. The facility is a major source and is subject to the Wood Furniture NESHAP.

Schrock Cabinets has made a corporate commitment to reduce their VOC and HAP emissions through the use of low-VOC and low-HAP coatings. The facilities in Hillsboro and Grants Pass, Oregon, are well below their State-imposed VOC limits and both met the HAP limits included in the Wood Furniture NESHAP months before the compliance date. While meeting the regulatory requirements was a primary driver in the decision to convert to low-VOC and low-HAP coatings, the company has moved beyond what is required by the regulations because of their commitment to the environment.

Manufacturing and Coating Operations

Cabinet doors are purchased premade from several different vendors. Cabinet components are finished on a hanging line. The line runs 22 to 25 feet per minute. In a typical finishing sequence, one coat each of stain, sealer, and topcoat are applied, although two coats of stain are used for some applications. Stains are applied with HVLP spray guns, and sealer and topcoat are applied with air-assisted airless guns. All cabinets are assembled after they are finished. In 1992, the facility converted to waterborne clear topcoats. They began using waterborne pigmented topcoats in 1998.

The waterborne topcoats are approximately 37 percent solids, with small quantities of glycol ether (about 2 percent) and methanol (about 5 percent). The facility also uses sealers with a relatively high solids content of about 38 percent. They have worked to reformulate their stains with less HAPs. They also have done some preliminary work with waterborne stains. Eventually, they will begin using waterborne stains, but they have no set date for doing so. One of the major problems with moving the facility to waterborne stains is color matching. The products manufactured at the Hillsboro facility are mixed and matched with products manufactured at other Schrock facilities. Because the color has to match the color of the products from other Schrock facilities, the Hillsboro facility probably will not convert to waterborne stains until the other Schrock facilities that manufacture products for the same lines also convert to waterborne stains.

Conversion to Waterborne Topcoats

The conversion to waterborne clear topcoats at the facility was fairly smooth. Another Schrock facility had already converted to waterborne topcoats, and the Hillsboro facility was able to learn from their successes and failures. Testing was conducted at the Hillsboro facility intermittently for about 9 months before the facility converted to waterborne topcoats full-time. The Hillsboro plant had the advantage of already having stainless steel lines in place. Switching to stainless steel lines often is a large part of the cost of converting to waterborne coatings.

Although the conversion to waterborne topcoats was not extremely difficult, there still are some problems with the waterborne topcoats that the facility did not have with the solvent-borne topcoats. When the facility was using solvent-borne topcoats, parts removed from the finishing line could immediately be stacked. With the waterborne topcoats, parts removed from the finishing line must be placed in racks so they do not touch other parts. Parts that come in contact with each other will stick together because the topcoat is not completely cured when the part comes off the finishing line. Schrock extended their finishing line to help with this problem, but even with the additional drying time, the parts are not completely cured when they come off the line. Placing the parts in a rack until they are completely cured has helped to solve the problem, but it also requires some additional storage space.

Another problem with the waterborne topcoats appears only sporadically. The problem relates to the appearance of the finished product. For some pieces finished with the waterborne topcoats, the topcoat will move or creep away from the sides leaving a noticeable blemish in the finish. This problem affects approximately 1 percent of the finished parts. It tends to occur most on products manufactured with plywood. The blemish cannot be repaired and the finished part is scrapped. Schrock has worked closely with their coating supplier, Akzo, to try and identify the reason for this problem. At different times they thought they had the problem solved only to have it recur. Potential causes of the problem include hand lotions used by operators handling the product, latex gloves used by the operators, mold release agents in the plywood, or operator error. Errors by the operator applying the sealer are particularly critical. If the product is not sealed correctly, the waterborne topcoat will penetrate the wood, causing grain raising and other problems. In general, the waterborne coatings are more sensitive to changes or operator error than the solvent-borne coatings. While waterborne coatings are being used successfully at Schrock, the rejection rate for finished parts is higher than it was with solvent-borne coatings.

The switch to waterborne topcoats did require some retraining of the spray booth operators. The application techniques for waterborne coatings are somewhat different than for solvent-borne coatings. Although some initial training was required, the waterborne topcoats are, in some ways, easier to apply correctly. The waterborne topcoats have a milky appearance when they are first applied. Therefore, it is easier for the operator to tell where he or she has applied coating. They are less likely to miss

spots with the waterborne coatings. The coatings lose their milky appearance as they dry, and the final product has a clear finish.

Switching to the waterborne pigmented topcoats was not as easy. For several years waterborne pigmented topcoats were not viable because they did not have sufficient elasticity. The lack of elasticity led to cracking at the joints. However, by working closely with their coating supplier, this problem was overcome and the transition to waterborne pigmented topcoats was made. Schrock's main issue with the waterborne pigmented coatings is that they settle out more rapidly than the solvent-borne coatings used previously.

Costs

Initially, the cost of the waterborne topcoats was approximately twice that of the solvent-borne topcoats, but has improved over time. Tthe waterborne topcoats have a higher solids content than the solvent-borne topcoats so less coating is needed per piece. Other costs incurred by the facility in converting to waterborne topcoats include labor and materials associated with the testing and the capital cost of extending the finishing line. As discussed earlier, the facility already had stainless steel lines in place, which helped reduce the cost of converting to the waterborne topcoats.

The primary cost associated with the use of waterborne coatings now is the cost associated with the rejected pieces. These costs include the labor associated with milling and finishing the part and the cost of the finishing materials and wood. With a rejection rate of 1 percent of the finished product, this cost is significant. Schrock also has experienced an increase in cleanup and disposal costs, in part due to the shorter shelf life of the waterborne pigmented coatings.

Emissions

With the waterborne topcoats, Schrock is well below their VOC emissions cap. According to the facility, the VOC content of the waterborne topcoats is approximately half that of the old solvent-borne topcoat (2.48 pounds of VOCs per gallon versus 4.9 pounds of VOCs per gallon). They comply with the emission limits in the Wood Furniture NESHAP, which became effective for them in December 1997, using an averaging approach. With an average HAP emission rate of less than 0.6 pound HAP per pound solids, they are well below the NESHAP limit of 1.0 pound HAP per pound solids.

Customer Feedback

Schrock has not experienced any increase in customer complaints since moving to the waterborne topcoats. Product quality has not suffered. The cabinets finished with the waterborne topcoats meet all standards for resistance and durability established by the Kitchen Cabinet Manufacturers Association.