LOW VOC COATING METHODS FOR WOOD:
A CASE STUDY

Presented at the:
Southern States Annual Environmental Conference
October 26-28, 1993

by
Larry K. Sibik
Capsule Environmental Engineering, Inc
St. Paul, Minnesota

Coauthor
Tom Leach
Artistic Finishes

Introduction. In 1990, industrial fugitive and stack air emissions in Minnesota, amounted to 50.6 million pounds of toxic compounds. Of these total emissions, 64.5 percent were volatile organic compounds (VOCs) that are commonly used in paint formulations, paint thinners, and as equipment cleaning solvents. Because the solvents associated with painting and coating operations potentially comprise such a large portion of the toxic air emissions, addressing this industrial source through regulatory enforcement, technical assistance, and pollution prevention grants offers the greatest potential for reducing toxic air emissions.

A number of options that result in significant reductions in air emissions have been developed and introduced for several segments of the painting and coating industry. However, the development of viable alternatives for the wood finishing industry has been hampered by the specific requirements of the industry and more demanding technical hurdles. Recently, several wood finishing options have been developed that balance the often conflicting requirements of superior physical and aesthetic characteristics; and environmentally friendliness.

This paper combines a discussion of the future regulatory effects with a case study that helps address the potential concerns. The case study was conducted under a pollution prevention grant funded through the Minnesota Office of Waste Management. The grant, co-sponsored by Artistic Finishes and Capsule Environmental Engineering, was to investigate low VOC alternatives for custom wood finishing.

Regulatory Background. Past environmental concerns over industrial coating operations have centered on the emissions of VOCs. The new Clean Air Act Amendments of 1990 (CAAA) will drastically affect industrial coating operations. These changes require that facilities with coating operations develop new compliance and pollution prevention strategies.

Part of the CAAA is the Air Toxic Program. Under the air toxics program, Congress has developed a list of 189 chemicals which will be regulated under the Clean Air Act. This list of chemicals reads like a Who's Who among chemicals commonly used by the coating industry. Emissions of hazardous air pollutants (HAPs) will be controlled through permitting and the development of standards. Under these new amendments, major and other designated sources will require operating permits. A major source is defined as a stationary source or group of stationary sources which emits or has the potential to emit 10 tons per year or more of any single HAP or 25 tons per year or more of any combination of HAPs.

Two types of standards will be developed under the 1990 amendments, maximum achievable control technology (MACT) and residual risk standards. MACT standards will apply to both new and existing sources. As the name implies, MACT standards will require the maximum reduction of HAPs.
achievable. MACT standards are required to balance the benefits of such reductions with the costs incurred, energy requirements and other health and environmental impacts. Residual risk standards will be developed if the risk to the public from emissions after the implementation of MACT are unacceptable.

The HAPs in use in the coating industry are listed below:

- Methyl ethyl ketone
- Methyl isobutyl ketone
- Toluene
- Xylene
- Cadmium and cadmium compounds
- Chromium and chromium compounds
- Lead and lead compounds

Because of the rigorous and time consuming permitting process, and the unknowns concerning MACT, facilities with coating operations need to begin investigating the options available to reduce their usage and/or emissions of HAPs.

State Initiatives. Many states have developed or are developing their own air toxics programs. These air toxics programs, modeled after the EPA's program, will be implemented much sooner than the CAAA.

General Strategies. The first step in developing a compliance plan for dealing with the CAAA is to conduct an assessment of your current status. The assessment will include developing an emission inventory. Much of this data should already have been gathered while compiling and documenting information for Form R emission reports. While the SARA 313 list and the CAAA list of HAPs are not entirely compatible, the methods used to develop the emissions inventory are similar.

The next step in the assessment is to survey the current control equipment and control practices, currently in use, that affect the releases of air toxics. From this assessment of current conditions, the requirements of the CAAA, and state and local regulations on these emissions can be determined and an overall compliance plan developed.

Reduce Exposure by Reducing Emissions. Because of the inherent delay in developing regulations, allowing for public comment, revisions, state implementation, etc. manufacturers still have time to reduce their regulatory exposure under the CAAA. Facilities can reduce their exposure to the new rules and regulations by reducing their emissions. The main goal of every facility facing regulation under the CAAA should be to reduce the potential emission of HAPs to below the major source thresholds. These thresholds are 10 tons per of any single HAP or 25 tons per year of an aggregate of HAP emissions.

Financial Opportunities. The additional burdens of permit preparation, emission fees, monitoring and overall program management may make uneconomical process updates or modifications a financial reality. EPA estimates that the annual cost to industry posed by the implementation of the CAAA at $25 billion by the year 2005. Other estimates put this cost at closer to $50 billion. Times have changed, again. Now is an excellent time to review those past emission reductions proposals and ideas that were deemed too expensive.

Case Study: Low VOC Coatings for Wood Finishing. While the case study involving Artistic Finishes and Capsule Environmental Engineering was focused on the reduction of VOCs in a wood finishing operation, the lessons learned are applicable to future concerns regarding the CAAA.

The products coated at Artistic Finishes can be divided into two major classifications: moldings and flat line products. The moldings generally are composed of solid wood, including maple, birch, oak,
and pine. Flat line products, the most varied of the wood products finished at Artistic Finishes, are constructed out of solid wood, veneers or composite materials. Flat line products include flat stock, profiled panels, louvers, and turned pieces. Clear and pigmented coatings are applied to both the molding and the flat line products.

Moldings are currently coated on seven automated lines. These lines use either high volume low pressure (HVLP) or air-assisted airless application equipment. The spray profile from the guns can be adjusted to minimize over-spray. The spray guns on these automated lines are triggered by an electronic eye to spray only as the product passes the guns. These application methods are very efficient and ensure a minimal amount of over-spray.

The coatings applied on three of the automated profilers include conventional high solvent-based coatings. The fourth and fifth profilers apply high solids, solvent-based coatings. The sixth automated profiler line has been converted to a pigmented waterborne coating. Testing is being done to convert the other molding lines to waterborne coatings as well. The final profile coater is new and is still being modified. This profiler will be dedicated to short millwork pieces.

Flat line products are mainly painted in two open, upright, manual spray booths. Approximately 10 percent of the flat line products coated by Artistic Finishes are nonprofiled flat line products with the balance including interior panels or edge profiles. The manual spray guns used are all the HVLP type. The coatings applied in these booths run the gamut of the coatings used at Artistic Finishes: conventional high solvent-borne, high solids, and waterborne coatings.

Extensive work has already been done on converting two of the molding coating lines to pigmented, water reducible coatings. Pending customer approvals, additional product lines will be converted to pigmented, water reducible coatings. Transfer efficiencies on these lines are considerably higher than for the flat line products. Because additional work on the remaining molding coating lines would make less of an overall impact, it was decided that the flat line products would be the focus of the grant work. For the purpose of the grant work, the options studied must apply to the entire class of flat line products. Further, the studied options must accommodate both pigmented and clear coatings in a range of finishes from matte to high gloss. The functional specifications of the coating also must adhere to the requirements of the Kitchen Cabinet Makers Association (KCMA).

Options investigated. Three strategies for decreasing the release of volatile organic compounds (VOC) were considered: increasing the application transfer efficiency, reducing the content of VOCs in the paints, and the use of alternative solvents for equipment cleaning. For each strategy, the available options were prioritized and a baseline established. The baseline for each option was defined as the option currently in use for flat line products that resulted in the lowest emissions of VOCs.

Alternative Application Equipment. The application equipment currently available on the market is listed below in roughly the order of increasing transfer efficiency:

- Conventional spray
- Airless spray
- Air-assisted airless spray
- Electrostatic spray
- High velocity low pressure
- Curtain coating
- Vacuum application
- Roll coating

For flat line finishing, Artistic Finishes already has converted to the use of HVLP spray equipment. The electrostatic spray application of coatings to wood substrates requires either that the wood be dipped in a conductive coating or a conductive plate must be placed behind the object to be coated. The additional step required by dipping in a conductive coating adds an extra process step and cost. The
small improvement in transfer efficiency offered by adding an electrostatic dip coating would not justify the added operating cost. The positioning of a conductive plate behind the part would be unrealistic in a job shop environment due to the large variety of products coated. Where spray application of products is required, it is felt that the HVLP equipment in use offers the best transfer efficiency.

The last three options in the above list typically achieve transfer efficiencies in excess of 90 percent. Vacuum application equipment is applicable to moldings or millwork and was not considered for use with flat line products, the objective of this study. Curtain coating and roll coating both require that the products be flat stock with no profiling. Approximately 10 percent of the products coated at Artistic Finishes can be curtain or roll coated. This option entails coating each flat surface. Where edge coverage is required, the products are stacked, and coating is spray applied to the edges.

Alternative Coatings. The coatings currently available on the market are listed below in roughly decreasing order of VOC content:

- Conventional high solvent-based
- High solids
- Water reducible
- Critical carbon dioxide (CO2) reformulations
- Ultraviolet (UV) curable
- 100 percent solids

At the start of the project, Artistic Finishes was using the first three types of coatings listed above. Water reducible coatings had achieved only limited success and usage at Artistic Finishes. The water reducible coatings in use were limited to pigmented finishing applications. Previous experiences with clear, water reducible coating yielded unacceptable appearance and performance.

Critical CO2 reformulation is a new technology that replaces some of the solvent in the paint with carbon dioxide at its critical temperature and pressure. According to the manufacturer, this technology allows a paint to be reformulated with 50 to 80 percent less solvent while retaining the same characteristics as the original formulation. The spray pattern achieved with this system is very similar to conventional spray patterns. Also, because the solvent content of the paint is lower than conventional formulations, high film build can be achieved with a single application without the coating running or sagging.

Conversations with equipment vendors, coating suppliers, and a user of the critical CO2 system indicate that this option currently is not achieving the reductions in VOC emissions or economic benefits claimed. Engineers associated with this system reported that they had reduced the solvent content of their nitrocellulose lacquer from 7 pounds per gallon to 5 pounds per gallon.

The major drawback with the critical CO2 system is the cost of capital equipment and materials. Capital costs are approximately $65,000 for equipment that will supply two spray guns. Union Carbide, the holder of the systems patent rights, is charging a reformulation fee of $8 to $15 fee for each gallon of paint applied with the system.

Based on the information available, it was decided that small VOC reductions with the critical CO2 system did not justify the capital and increased operating expenses. It was felt that this system would be more applicable to severe service or high performance coatings. These coatings typically have higher VOC contents and have fewer options available for VOC reduction.

UV curable coatings can be formulated with 50 to 100 percent solids. UV curable formulations which contain 100 percent solids can be applied using roll coating or dip coating equipment. Roll coating provides an even film thickness but is not applicable where profile coverage is required. Edge coverage requires an additional process step, usually stacking and edge spraying. Dip coating of 100 percent solids UV curable coatings results in a coating with high and uneven film thickness. In order to spray
apply UV curable coatings, the viscosity must be reduced. The viscosity of UV curable coatings are
typically reduced with solvents, although water reducible coatings have also been developed. UV
curable coatings are not acceptable as a top coat for exterior uses. The use of UV curable coatings
as sealer or filler coats under a pigmented top coat is acceptable for exterior uses provided the two
coatings are compatible. The use of UV sealer or filler coatings under a more conventional top coat
is referred to as a hybrid system.

Spray application of 100 percent solids coatings has been tested in the metal finishing market with
limited success. As applied, these coatings are very thick -- on the order of 6 to 10 mils. Application
of this type of coating is limited to situations where the coated products require extremely high
chemical resistance. Except for specific products, this high-build coating would be unappealing and
too costly for use in the wood finishing industry. The 100 percent solids considered refer to coatings
that are composed of resins, catalyst, and other components of the final coating; powder coatings are
not considered in this definition.

Roll coating of 100 percent solids coatings is possible due to the ability of the roll coater to control
coating thickness. Both catalyzed and UV curable coatings are available in 100 percent solids
formulations. The UV curable coatings are more desirable because cleanup is easier and waste
generation is less.

Alternative Cleanup Solvents. Only two alternative, low volatile solvents were identified for use in
equipment cleanup. These solvents are dibasic esters (DBE) and N-methyl-2-pyrrolidone (NMP). DBE
is manufactured by E.I. DuPont while NMP is manufactured by GAF Chemicals. Both solvents have
been used in paint formulations and as paint strippers. However, due to their cost and ability to
degrade the synthetic materials commonly used for seals and supply lines, these materials were not
considered good replacements for highly volatile cleaning solvents.

The approximate costs for DBE is $10.50 per gallon while NMP is $11.50. More commonly used
equipment cleaning solvents such as xylene, toluene, and mineral spirits are all priced less than $2.00
per gallon. Due to the low volatility of DBE and NMP, if these solvents were to be distilled in-house
to recycle the solvent, a vacuum assisted still is required. The addition of a vacuum assist to a still
increases the equipment cost by 50 to 100 percent.

The use of DBE and NMP as cleanup solvents would also require that all hoses, seals, and gun
components be upgraded to viton or other compatible material. Both DBE and NMP caused swelling
and occasionally degradation of synthetic materials used in paint systems. Compatibility was
determined by immersing these synthetic materials in neat DBE and NMP. Swelling and/or cracking
was noted within less than 24 hours.

Technical Results. Three of the options presented above were tested by Artistic Finishes for
application in their facility. The options tested were: water reducible clear and pigmented coatings,
roll coating, and UV curable finishes. Each of these options potentially meets the requirements and
goals of the grant project and Artistic Finishes’ production requirements.

Water Reducible Coatings. Seven water reducible coatings/coating systems and one water reducible
stain were tested. Three of the coatings were provided by Sherwin Williams, one by PPG, and three
by Akzo Coatings. The stain was provided by Sherwin Williams. The test panels coated included
Southern yellow pine, solid oak, oak veneers, popular, birch, maple, and medium density fiberboard
(MDF).

The Sherwin Williams lacquer systems required separate materials as sealers and top coats. The VOC
content of the lacquers was 2.3 pounds per gallon for lacquer system #1 and 2.5 pounds per gallon
for lacquer system #2. Both VOC contents are reported less water. The seal coats caused
considerably grain raise. Less grain raise was noted when air was moved across the test panels.
When used in conjunction with the water reducible stain, the grain raise was worse. The lacquer seal
coats sanded easily. These lacquers meet all KCMA specifications except for the water soak test. Both lacquers achieved a high gloss but had a milky or cloudy appearance. The cloudy appearance was considered unacceptable.

The Sherwin Williams conversion varnish is a self sealing, catalyzed varnish. The VOC content of the product as applied, less water, is less than 2.3 pounds per gallon. The pot life of the coating is approximately 10 hours. Grain raise from the conversion varnish was similar to the lacquers. The seal coat did not sand as easily as the lacquers but was acceptable. The conversion varnish meets all KCMA specifications. The coating achieved a high gloss, clear finish. Initial tests with the lacquer resulted in dimples or pits in the coating. These surface defects were eliminated through a minor reformulation of the coating. The final appearance of the conversion varnish was very similar to the high solids lacquer which is currently in use.

The water reducible coatings supplied by Akzo all had similar properties. The VOC contents of these coatings, less water was 2.17 pounds per gallon for the black top coat, 1.61 for the black base coat, and 2.22 for the clear top coat. The appearance of the clear coating was slightly milky but was still acceptable. The only problem noted was that panels coated could not be stacked for at least 10 minutes after curing. Stacking too soon resulted in the panels sticking together. Grain raise was comparable to the other water reducible coatings.

The water reducible stain supplied by Sherwin Williams was the only water reducible stain tested. This stain caused excessive grain raise even on tight grained woods such as maple and popular. When used with either a water reducible or solvent based sealer, the sanding required to bring the grain back down cut through the sealer. Because of this grain raise, the water reducible stain was considered unacceptable.

Overall, grain raise was evident on all of the panels tested. Closed grain woods such as popular, maple, and birch exhibited the smallest amount of grain raise. Open grained woods such as oak or softwoods such as southern yellow pine had more grain raise than the closed grain woods. Veneers and MDF had the greatest degree of grain raise. The veneers and MDF presented the greatest problem due to the inability of the water from the coating to absorb very far into the substrate. The water was concentrated at the surface by the sealing action of the adhesives used in their manufacture.

Flat Line Spray Finishing Equipment. In order to reduce the amount of grain raise from a water reducible seal coat, it is important to quickly evaporate the water. To more efficiently and effectively evaporate the water, the cost of an automated painting and material handling system was investigated. Four companies were asked to supply budgetary estimates of equipment costs for an automated painting and material handling system. The request for proposal outlined a system able to stain, seal, and top coat approximately 25,000 square feet per day.

Only two of the companies provided the requested information. Both of the companies that responded represent top-of-the-line European wood finishing equipment manufacturers.

The system described in proposal #1 would stain, seal, and top coat on separate passes through the line. This equipment was listed as having a production capacity of 71,200 square feet per shift, but would have an effective capacity of approximately 24,000 square feet per shift if three passes are required. The cost for this equipment was $650,000.

Proposals #2 and #3 would need to be purchased together. Proposal #2 was for a stain line, and proposal #3 was for a seal and top coat line. Both lines were listed as having a production capacity of 71,200 square feet per shift. Since the seal and top coat line would require two passes, the effective capacity would be 35,600 square feet per shift. The cost for these two lines was $1,650,000.
Proposal #4 was similar to proposal #1 in that three passes would be required to stain, seal, and top coat a product. The listed production rate was 25,800 square feet per shift, but would have an effective production rate of 8,600 square feet per shift.

Freight, installation, and training would add between 14 percent and 18 percent to the equipment costs listed.

Proposal #4 included an option to convey the parts on a Mylar belt. Any over-spray that was deposited on the belt has later scrapped off and recovered for reuse. This option was not considered very viable for a number of reasons. If the coating was left on the Mylar belt long enough it would begin to skim over. This would require that the recovered coating be filtered to remove solids. Also, the belt was exposed to the shop during the load and unload portions of the section. This allows contaminants to be introduced to the recovered coating. This recovery system is only applicable where a single coating is used in a shop with filtered air. This option was not considered viable for a job shop environment.

UV Curable Coatings. Four UV curable coatings were tested. Two of the coating were applied by roll coating and the other two coatings applied by spray application. All four coatings were supplied by Akzo Coatings.

One roll applied coating was a water reducible, clear finish. This material caused excessive grain raise and was discontinued after a single test. The other UV coatings were tested with favorable results. The roll coating material was particularly impressive. The smooth finish achieved with a sealer coat over medium density fiberboard (MDF) eliminated the need to sand between coats. Excessive coating material could be returned to the original container. This reduced the amount of waste generated and simplified equipment cleanup. After scrapping out any excess material, the wetted parts were wiped with methyl ethyl ketone to remove the last of the coating residue.

Roll coating/UV curing equipment. Budgetary equipment costs for a roll coating/UV curing finishing line were also included in the proposals submitted for the flat line finishing lines. Two budgetary estimates were supplied by the manufacturers.

The equipment in proposal #1 would be able to stain, seal, and top coat in one pass. This equipment would be able to coat up to 45,500 square feet of product per day. The equipment cost was $700,000.

Proposal #2 also was able to stain, seal, and top coat in a single pass. Production capacity was listed as 30,000 square feet per day. The equipment cost was $400,400. Freight, installation, and training added approximately 17 percent to the total price for the system.

Economic Analysis and Results. Based on the results of the testing, several coatings were selected for implementation into production. The material costs and solvent emissions for these coatings and the coatings they replaced on selected product lines are summarized in the Appendix.

The Appendix compares the material cost and the solvent emission rates of the new coatings with those that were replaced. To obtain an even basis for comparison, the material costs and solvent emission rate comparisons were made based on the amount of solids applied. Where more than one coating is used in a category, an approximation of the percent used in production is given.

Clear Finishes. Three of the low VOC, clear finishes evaluated under the grant project have been adopted for use at Artistic Finishes. These three finishes are currently being used to coat products that were formerly coated with the Sadolin, Danspeed 80, and the Sherwin Williams W/W Conversion Varnish. The effect of this change, adjusted for production ratios, is that material costs have been reduced by 16.5 percent and VOC emissions reduced by 91.1 percent.
Several advantages have been noted with use of the UV curable coatings. Because the coating can be cured in seconds, no grain raise is experienced, and dust inclusion in the coating is reduced. The absence of grain raise and dust greatly reduces, and in many cases eliminates, the need to sand between sealer and top coats. Also, the fast cure time reduces the amount of floor space taken up by racked product. After curing, the product can be immediately stacked. Beyond the processing advantages of UV curable coatings, their use resulted in reductions in VOC emissions of 92 to nearly 100 percent. Material costs for the UV curable coating were considerably lower than conventional coatings by between 21.2 to 49.1 percent.

Pigmented Finishes. Two low VOC, pigmented finishes evaluated under the grant project are currently in use at Artistic Finishes. These low VOC coatings are the Akzo Coatings, black AK-Qua base coat and top coat. These two coatings have replaced the Akzo Coatings, black catalyzed base coat and top coat. The result of this conversion has been a slight increase in material cost of 2.9 percent and a reduction in VOC emissions of 84.7 percent.

Stains. One UV curable stain evaluated under the grant project is currently in use at Artistic Finishes. The Forest UV stain supplied by Akzo Coatings has replaced a solvent-based stain on one product line. The solvent-based stain was the Sher-wood wiping stain supplied by Sherwin Williams. The applied cost of the Forest UV stain was approximately twice the cost of the Sher-wood stain when compared based on the pounds of solids applied. However, the Forest UV stain resulted in a 57 percent reduction in solvent emissions when compared to the Sher-wood stain.

Conclusions. A number of low VOC options have been introduced into the wood finishing industry over the past several years. Several of these options have matured to the point where they are providing acceptable appearance and physical characteristics. Other options have not overcome the technical limits necessary to secure a place in the market.

The water reducible coatings of the previous decade were not acceptable due to a milky or cloudy appearance and poor physical properties. Several of these coatings are still being introduced. Generically, the lacquer-based coatings tested were not acceptable for these reasons. However, some water reducible coatings being introduced to the market have superior physical characteristics and acceptable appearance. These new water reducible coatings are classed as catalyzed and plural component coatings. The cost of materials for this class of water reducible coatings, related to the weight of solids applied, was comparable to conventional and high solids coatings. Approximately an 80 to 90 percent reduction in VOC emissions from the coatings can be achieved with water reducible coatings versus conventional coatings.

Water reducible stains were a disappointment. These stains, especially if used in conjunction with a water reducible sealer, caused excessive grain raise on both open and closed grain wood. The sanding required to smooth the surface cut through the sealer coat. The next coating applied started the grain raise problem again.

Ultraviolet curable coatings are another technology that has shown excellent results during the course of this project. Although limited to interior applications or as a sealer or filler coat for exterior applications, the use of these coatings is already moving into a sizable portion of the wood finishing market. The material cost per pound of solids applied is again comparable with and in some cases cheaper than conventional coatings. VOC emissions from the coating are reduced from 90 percent to almost 100 percent when compared to conventional coatings.

Spray applied UV curable stains, while still containing a high solvent content, are able to reduce solvent emissions by almost 60 percent. The cost of the UV curable stains, while considerably higher than solvent-based stains should not be prohibitive because of the smaller impact their cost has on the entire cost of finishing.
Low volatile, alternative solvents for use in equipment cleanup are available, but their use has several drawbacks. The cost for these solvents is approximately six times the cost of more commonly used solvents. On-site recycling to reduce the impact of the high raw material costs requires a vacuum assisted still. Adding a vacuum assist increases the capital and operating cost of the still to the point where there is no advantage to on-site recycling. Finally, the alternative solvents will swell or degrade many of the synthetic materials used in painting equipment.

Bibliography.


Appendix
Coating Cost and Solvent Emissions Summary

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Coating</th>
<th>Material Cost ($/lb. solids)</th>
<th>Solvent Content (lb. VOC/lb. solids)</th>
<th>Production (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGH VOC COATINGS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear Finishes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sadolin</td>
<td>Danspeed 80</td>
<td>$12.38</td>
<td>5.1</td>
<td>80</td>
</tr>
<tr>
<td>Sherwin Williams</td>
<td>Water White Conversion Varnish</td>
<td>$7.06</td>
<td>2.6</td>
<td>20</td>
</tr>
<tr>
<td>Pigmented Finishes</td>
<td>Black Catalyzed Basecoat</td>
<td>$5.10</td>
<td>1.1</td>
<td>60</td>
</tr>
<tr>
<td>Stains</td>
<td>Sherwood Stain</td>
<td>$29.33</td>
<td>37</td>
<td>100</td>
</tr>
<tr>
<td><strong>LOW VOC ALTERNATIVES--IMPLEMENTED BY ARTISTIC FINISHES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear Finishes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Akzo</td>
<td>High Gloss UV Topcoat-RC</td>
<td>$6.30</td>
<td>0.002</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>High Gloss UV Topcoat</td>
<td>$9.75</td>
<td>0.4</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>High Gloss AK-Qua Topcoat</td>
<td>$10.00</td>
<td>0.66</td>
<td>20</td>
</tr>
<tr>
<td>Pigmented Finishes</td>
<td>Black AK-Qua Basecoat</td>
<td>$6.61</td>
<td>0.26</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Black AK-Qua Topcoat</td>
<td>$12.50</td>
<td>0.62</td>
<td>40</td>
</tr>
<tr>
<td>Stains</td>
<td>Akzo</td>
<td>Forest UV Stain</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>