Technical Solutions

by Jim Falk
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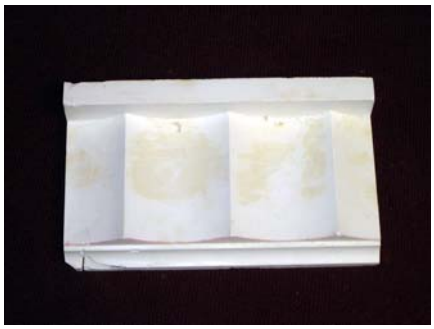
Conceptual Problem: Cutting evenly spaced 3" wide x 6"high flutes in solid wood in a continuous 6-ft section.

Specific Problem: How to cut this piece with the machinery available in the shop.

Solution: Use the radial arm saw in a non-standard way to create the flutes.

Material Used: Solid poplar lumber with Pettit brand Marine Paint #7125 and Plastic Glazing Compound as a filler.

Special Notes:
I had a client come to me with a plaster cast sample of some crown moulding that was to be used in a bathroom.



He wanted the front of the custom paint-grade vanity (which I was to make) to match the plaster crown moulding. Inaccurate as a radial arm saw inherently is, for this application, its shortcomings would be fine. The big question, at what angle should the head be rotated? As time was a factor, I decided to produce this in-house rather than subcontracting it out to a shop with CNC capability (which would have been much easier once the custom router bit was made). This technique will leave minor ridges in the cut, so filling and sanding is necessary before painting.

The first thing I did was to use the formula for figuring out the radius of the flute. Knowing the depth and width of the flute by measuring the sample, I was able to figure the radius using the formula:

$R= (((W/2)^2) + (H^2)) / 2H$
R = Radius of the flute
W = Trough width
H = Trough height

Since I am comfortable with AutoCAD, my first task was to take the radius of the flute and draw it out. I then drew a line at the depth of the flute. Because I was going to use a 10" diameter blade to make my cuts, I used the 3D capabilities of AutoCAD to rotate the large circle on the same vertical axis as the small circle, until the bottom of the flute and the two intersection lines of the depth of the flute and the original circle matched. I then measured the angle and set the saw. I realize that the cut created using this method is more elliptical than circular, but felt the error was negligible.

Wonderful! However, many cabinetmakers are not comfortable with AutoCAD, much less AutoCAD 3D. Therefore, I set out to devise a formula so the angle could be figured without using CAD. The formula I came up is:

$phi=\cos^{-1}(W/"(4H(D-H)))$

phi= The angle off parallel
W= Trough width
H= Trough height
D= Blade diameter

I sent the formula to *Mr. Walker** to verify its accuracy. He confirmed that it works, but asked if I had taken into account the width of the blade. I had not. He sent back this adjusted formula:

$phi=\sin^{-1}((2W"(DH-H^2)+T"(T^2+4DH-4H^2-W^2))/(T^2+4DH-4H^2))$

phi= The angle off parallel
W= Trough width
H= Trough Height
D= Blade diameter
T= Blade thickness at the tooth

I made the vanity fascia and completed the vanity.

The client liked it so much he decided not to have the plaster fluted moulding in the room. Instead, he wanted me to make sections of matching wood moulding! I mitered them on the bottom to make a double scallop.
We used adjustable sized corner blocks in the room so full-size flutes could be used throughout.

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Hope to see you on the web!