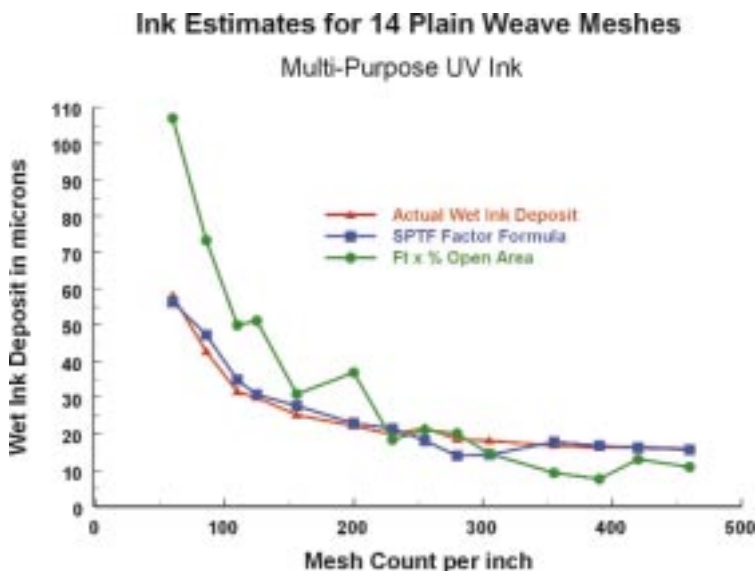


Figure 1



analysis and estimation, as well as ordering the proper amount of ink. Some inks are extremely expensive, and savings can add up quickly. By accurately knowing how much ink is needed for a job, ink won't be wasted or end up sitting on a shelf. This saves money. Secondary benefits include reducing storage space and saving in hazardous waste disposal.

The other scenario is when too little ink is mixed for a job. When this occurs time must be taken to mix yet a second batch of ink for the same job, which obviously costs extra money. This can be especially troublesome in color matching situations. The next mix may not be exactly the same as the first, creating a color matching nightmare. Mixing the right amount the first time is the most cost-effective option.

Manufacturers can also benefit from having an accurate method available to help their customers determine the ink deposit a mesh will produce, and determine the amount of ink required for a job. Passing this kind of accurate information to the printer would be a feather in any manufacturer's/distributor's cap. Additionally, ink mixing and dispensing systems that incorporate ink estimating could use this formula to give those that purchase them an even greater advantage. Incorporating

premium research and technology will certainly give those products an edge over the competition.

THE DIFFERENCE

The Ink Calculator software, developed by SPTF, is one of the most comprehensive and accurate ink estimating systems currently available. It is the accumulation and application of years of inter-related research projects that have sought to uncover the fundamentals of the screen printing process. In fact, there are probably more projects incorporated here than in anything else SPTF has ever done. These projects include some of the very first research conducted at SPTF more than ten years ago.

The basis for the software's estimates is SPTF's ink estimation formula that was developed beginning in 1991. Our data shows that the formula estimates wet ink thickness from any mesh more accurately than other formulas currently used. The formula used in the software contains

improvements that expand its capabilities from previous versions that have been published. These improvements were derived from the information generated in an ink deposit study on 27 different mesh counts completed last year. The SPTF formula, when compared to a commonly used estimate can be seen in Figure 1. As shown, when plotted against actual wet ink deposit measurements, the SPTF formula calculates a closer match.

Also unique to the calculator is an option to add the effect stencil thickness has on ink deposit when printing fine detail. In the past many have added the stencil thickness directly to the ink deposit thickness. Research has indicated that the relationship is not direct. An initial experiment was completed, and a preliminary relationship defined based on several stencil thickness ranges. As a result, factors have been developed to represent the additional ink generated by the stencil. These factors have been included in the SPTF Ink Calculator program.

An extensive explanation of how SPTF's ink estimation method was developed or how it works can be

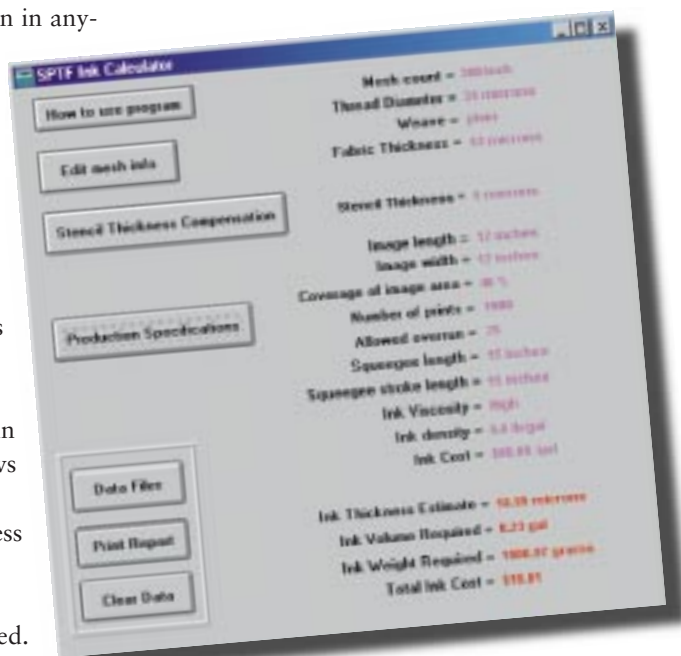


Figure 2

found in several other previously published reports and articles. A detailed step-by-step description of all the methods and calculations used to estimate ink in the software is outlined in the April 1998 issue of the SGIA Journal. Other reports and articles are listed at the end of this article and can be obtained by contacting SPTF.

ESTIMATION ACCURACY

As with any estimation method, accuracy is based on the quality of information entered and on the method's general accuracy. Screen printing has so many variables it is safe to assume that no estimation method would give 100% accuracy. Estimation is simply an educated guess based on past performance. Testimonies from field tests have been extremely favorable, but by no means perfect. The formula is not specifically accurate for mesh counts below 110 threads/inch, nor has it been tested on textile applications.

The main critical condition of the software is that its accuracy relies heavily on entering the correct area of image. With today's technology, creating a software program to calculate this from either a scanned image or computer image should be straightforward. Perhaps it already exists and the screen printing industry is largely unaware of it.

Couple this software with some program that can scan and determine the image area percent accurately and it will be a dream come true for some screen printers. The technology certainly exists. The industry just needs to apply it into a complete software package to benefit.

A TOUR

The software is entirely Windows based and extremely user friendly. The main working screen (Figure 2) has several buttons that give access to the

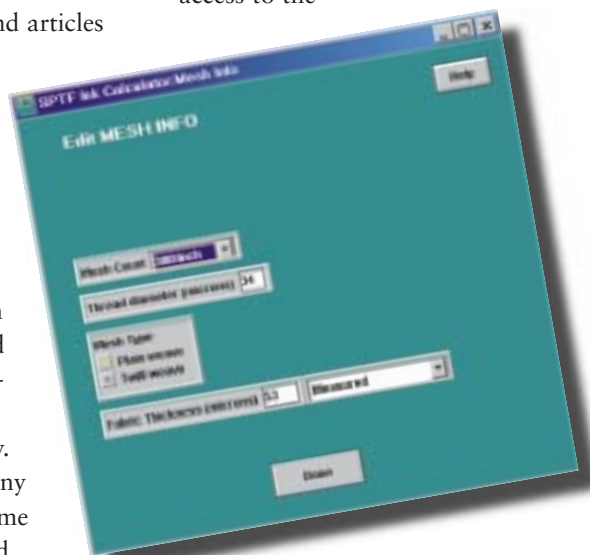


Figure 3

data entry screens or carry out certain operations. The "How to Use Program" button opens a complete help section explaining all the terms and operations of the program. The next three buttons, "Edit Mesh Info," "Stencil Thickness Compensation" and "Production Specifications" open up windows for data entry. The entered data is then displayed in the right column of the main window (Figure 2).

In the Edit Mesh Info screen (Figure 3), the mesh count, thread diameter, weave type, fabric thickness, and fabric thickness source are entered. These specifications are used to estimate the wet ink thickness the mesh will produce using SPTF's unique formula. Once the information is entered, the calculated value is automatically

displayed on the fourth line from the bottom (Figure 2). If the mesh data is changed the program immediately recalculates the wet ink thickness. This can be handy during mesh selection.

The Stencil Thickness Compensation screen allows the user to enter the actual stencil thickness (over and above the mesh) in cases where fine lines or halftones are the primary image (Figure 4). Stencil thickness will only increase the ink deposit thickness when the images being printed are small (300 microns or less). Larger images allow the squeegee to force the mesh into direct contact with the substrate, thus eliminating the stencil thickness from increasing the resulting ink deposit.

As stated previously, the addition to ink deposit from the

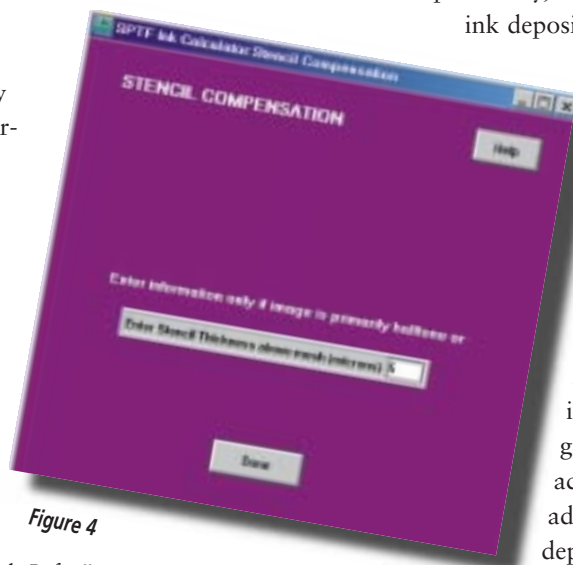


Figure 4

stencil is not one to one. Research has produced a number of factors that are automatically applied in the program to account for the additional ink deposit.

Entering the stencil thickness in this screen when large image openings are printed will result in an erroneous estimate. Therefore, stencil thickness should only be entered when fine lines or halftones are the primary image.

The Production Specification window calls for the user to enter important information about the job being printed (Figure 5). The image size and percent image area determine the area of the image being printed. As discussed in the previous section, the user

may need to guess at the percent image area. The accuracy of that guess will have a large bearing on how precise the estimate is. The number of prints will also need to be input here.

If desired, the squeegee length, squeegee stroke length and ink viscosity can be entered to include the amount of set up ink needed to pull one print on press. This is more important when very thick inks are used or when the image is large. Leaving these data fields blank will simply exclude this ink from the estimate.

The ink density must be entered if the user wishes to have the estimate given in weight. Several options are given for determining ink density in the help menu, or can be found in the SGIA Journal article entitled "Estimating Ink...the SPTF Way." The unit cost of the ink is needed if an estimate on the ink cost is desired. And, finally, the program prompts the user for the units to express the ink weight and ink volume.

Once data is entered, the calculator automatically computes the quantity of ink needed for the job and displays all the calculations on the last three lines of the main screen (Figure 2). If the data is changed the program modifies the calculation. A complete report detailing all entered and calculated information can be printed out on command. Estimates can even be saved to files for future use. Each estimate only accounts for one color in the job, and must be repeated to estimate ink for each additional color.

TECHNOLOGY TRANSFER

If you're a printer that needs to estimate ink in production, the benefits of this program should be clear. Manufacturers and distributors should consider getting the program into the hands of their technical representatives to help serve their customers. Incorporating this technology into

products is also an important aspect to advancing the industry.

Transferring technology is one of SPTF's primary missions, and so we have made this program easy to acquire. The SPTF Ink Calculator program is available free of charge to all

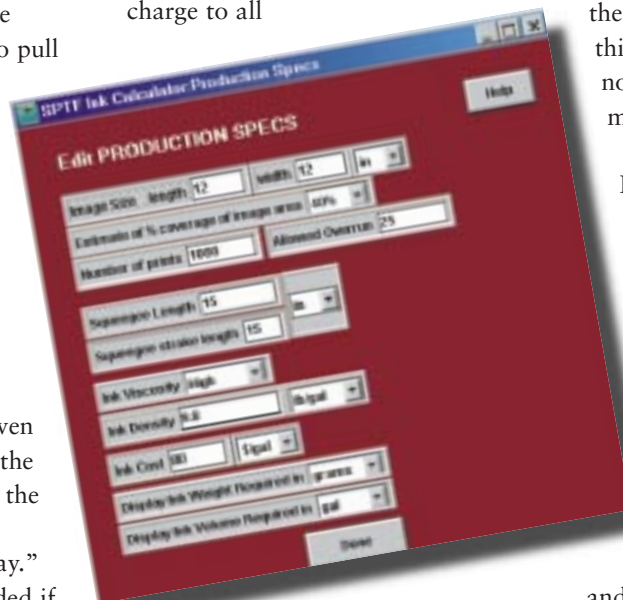


Figure 5

SPTF Investors, and can be downloaded from SGIA's website. Letters have been sent to all SPTF investors informing them of the special section on the website where the program can be downloaded. In the future, the program will also be included in the updated SPTF CD. Those who are not SPTF investors are encouraged to contribute to the operational or endowment fund to obtain access to the program. The minimum investment is \$100. In addition, SPTF would be happy to provide additional information to any manufacturers that would like to sell or incorporate the software into their products. Please call the SPTF at 703-385-1335 with questions about obtaining more information.

FUTURE OPPORTUNITIES

This is just one example of how SPTF is bringing technology, innovation and information to the screen printing industry. Additional advancements have been the topics of past

SGIA Journal articles and include the Electronic Off-Contact Gauge, Rapid Tensioning, Screen Printer's Tack Tester, and Multi-Material Tester. Some twelve research reports and six magazine articles on various subjects have also been published in the last 10 years. The benefit of all this cutting edge information can not be understated. And there is more to come.

The Screen Printing Technical Foundation has been a unique industry resource for technology, innovation and information for years.

But these components must be applied for them to be of benefit. Simply having them isn't enough. Learning and changing are the only way improvements will come. Therefore, it is also the approach taken to the

available technology, innovation and information that makes a difference. Change your approach and attitude, if you haven't already, and begin to adopt and apply what is already available. The potential of profitable change will remain unrealized until you do. ■

Additional Reports and Articles related to this subject:

"Estimating Ink Deposit in Screen Printing: Improving Your Accuracy," SPTF Practical Application Bulletin, 1995.

"Using Electronic Coating Thickness Gauges Effectively in the Screen Printing Process: Are Your Measurements Accurate?," SPTF Practical Application Bulletin, 1996.

"Research for the Real World" by Dawn Hohl, Screen Graphics, March/April 1997.

"Estimating Ink...The SPTF Way", SGIA Journal, April 1998.