

VISUAL COMMUNICATIONS JOURNAL

SPRING 2020

VOLUME 56

NUMBER 1

EXPLORE PRINT

A Method for Creating and Using Time Standards for Cutting Tables

*by Dan Wilson, D.I.T. and Nicholas Carey, M.S.
Illinois State University*





Acknowledgements

Editor

Gabe Grant, Eastern Illinois University

Associate Editor

Dan Wilson, Illinois State University

Editorial Review Board

Cynthia Carlton-Thompson, North Carolina A&T State University

Bob Chung, Rochester Institute of Technology

John Craft, Appalachian State University

Shaun Dudek, University of Wisconsin–Stout

Charles Weiss, Clemson University

Tom Schildgen, Arizona State University

Mark Snyder, Millersville University

James Tenorio, University of Wisconsin–Stout

Renmei Xu, Ball State University

Cover Design

Madelyn Wieman, Western Technical College, LaCrosse, Wisconsin
Instructor, Kenneth Hey

Page Design, Formatting, and Prepress

Janet Oglesby, Can Le

Printing, Bindery, and Distribution

Harold Halliday, University of Houston
University of Houston Printing and Postal Services

About the Journal

The Visual Communications Journal serves as the official journal of the Graphic Communications Education Association, and provides a professional communicative link for educators and industry personnel associated with design, presentation, management, and reproduction of graphic forms of communication. Manuscripts submitted for publication are subject to peer review. The views and opinions expressed herein are those of authors and do not necessarily reflect the policy or the views of the GCEA.

Article Submission

Please follow the guidelines provided at the back of this *Journal*.

Membership and Subscription Information

Information about membership in the Association or subscription to the *Journal* should be directed to the GCEA Vice-President of Membership.

Reference Sources

The *Visual Communications Journal* can be found on EBSCOHost databases.

ISSN: Print: 0507-1658 Web: 2155-2428

GCEA Board of Directors

President – Thomas Bell

Millersville University

40 E. Frederick St.

Millersville, PA 17551

717-871-7220

president@gceaonline.org

President-Elect – Rion Huffman

Pittsburg State University

1701 S. Broadway

Pittsburg, KS 66762

620-235-4848

presidentelect@gceaonline.org

Vice-President of Publications

Pradeep Mishra

Arkansas State University

P.O. Box 1930

State University, AR 72467

(870) 972-3114

firstvp@gceaonline.org

Vice-President of Membership

Laura Roberts

Mattoon High School

2521 Walnut Avenue

Mattoon, IL 61938

217-238-7785

secondvp@gceaonline.org

Secretary – Sara Smith

University of Northern Iowa

2900 Campus St ITC #38

Cedar Falls, IA 506140178

319-273-2746

secretary@gceaonline.org

Treasurer – Dina Vees

Cal Poly University

Graphic Communications

San Luis Obispo, CA 93407

805-756-1127

treasurer@gceaonline.org

Immediate Past Pres. – Lexa Browning-Needham

J. B. Johnson Career & Technical Center

at Alton High School

4200 Humbert Rd.

Alton, IL 62002

618-474-2205

pastpresident@gceaonline.org

A Method for Creating and Using Time Standards for Cutting Tables

by Dan Wilson, D.I.T. and Nicholas Carey, M.S. • Illinois State University

This research was undertaken to test and publish a general method that could be applied to develop more accurate time standards for cutting tables. It is intended for those involved in production scheduling and cost estimating. It was also written for teachers of graphic communications production management who may need to fill in a missing gap in the literature related to printing estimating. Cutting table estimating should be part of any course on printing estimating because in recent years a growing number of print facilities have adopted wide format inkjet devices to manufacture products such as short-run packages, labels, point-of-purchase displays, and signage. These products are finished on cutting tables—machines that cut material into geometric and non-geometric shapes for assembly. These kinds of products, once the purview of specialized sign shops, are now product lines commonly offered to clients by graphic communications companies across the spectrum of markets, including commercial printers, label and package printers, in-plant printers, and design studios.

Estimating the time and cost of wide format inkjet print devices is straight forward and well represented in the literature (Idealliance, 2019; Ruggles, 2008). In most cases the estimator assigns a setup time for the inkjet device, and printing time is estimated based on a standard print rate per square foot (or square meter) provided by the manufacturer. The amount of time estimated to be required for the job is then multiplied by an hourly rate. By contrast, estimating time and costs for cutting tables is largely absent from the literature, and unlike inkjet estimating, predicting production time on cutting tables is highly problematic, with most print facilities having crude and inaccurate methods for estimating cutting time, and inaccurate job costing results.

Use of Time Standards in Estimating

In practice, client job specifications are gathered by a sales representative or through a web portal, and then used to generate an estimate of cost and job price. The cost estimate is made by analyzing the production

steps required, and then predicting how much time will be required for each production step based on a time standard. Further, the resulting time predictions are used as a basis for scheduling production (Field, 2009).

Production operations are rationalized into cost centers, with each cost center a different operation or machine. Cost centers will be unique to a given business, but print-related examples might include an Esko Spark 2420 Flexo Platemaker, HP FB550 wide format printer, MBO 2356 buckle folder, Kongsberg X46 cutting table, or a hand inserting operation. Each cost center requires unique operations that take time to carry out. Time standards are required to predict how much time a production operation will take, and so allow the prediction of costs for quote generation as well as the creation of a production schedule (Field, 2009; Idealliance, 2019; Merit, 2000; Ruggles, 2008; Silver, 1991).

If the operation involves a machine, the time standard is typically straight forward because machines run at a constant, predictable rate. For example, an HP Indigo press may run at a rate of 136 sheets per minute, so knowing the number of sheets that need to be printed allows for an accurate prediction of time. This is an example of a machine standard. While machine standards are predictable and automated, manual standards are not. A manual standard (“manual” meaning requiring human manipulation) is used to predict time for an operation that is carried out by a human, and so are inherently inconsistent and much less predictable. Operations such as press makeready (setting up a press for printing) or creating a layout with illustration software are examples of manual standards (Idealliance, 2019; Ruggles, 2008).

Therefore, having accurate time standards play a big role in managing print production efficiently. If time estimates are not accurate, the projected production schedule might leave production workers too little time to complete a job, or with not enough to do (Field, 2009). Accurate time standards are also critical to projecting costs accurately. If costs are projected inaccurately, a job may be priced too low and result in profit lost. It should be noted that estimating costs requires not only accurate time standards, but also accurate hourly rates (Idealliance, 2019; Ruggles, 2008). Hourly rates will not be discussed in this paper.

While literature searches revealed no useful information on predicting cutting table production time based on

job specifications, much has been published on estimating time and cost of finishing operations such as cutting with a guillotine cutter and folding with a buckle folder (Idealliance, 2019; Merit, 2000; Ruggles, 2008; Silver, 1991). An overview of the key concepts is provided here to illustrate how comparatively few variables need to be considered for guillotine cutting and buckle folding, compared to cutting with cutting tables.

Applying Guillotine Cutter Time Standards

Guillotine cutters are used to cut stacks of paper along a straight line, resulting in rectangular products. To estimate time and cost, the estimator only has to deal with a few variables, including (1) the total number of sheets of paper to be cut, (2) the number of those sheets in a stack that can be cut at one time (usually 4-in thick and commonly called a “lift” or “load,” with the number of sheets in the stack based on the paper caliper), and (3) the number of cuts that need to be made per stack. Once this information is known, the estimator uses time standards for setting up the job, time per lift, and time per cut. The total time required is added together and multiplied by the hourly rate for the guillotine cutter. For example:

- (step a) Start with the total number of sheets to be cut. *1400 sheets to cut*
- (step b) Calculate the number of sheets per 4-inch lift based on stock caliper (caliper ÷ 4-in)
.008 caliper ÷ 4-in lift = 500 sheets per lift
- (step c) Calculate the number of lifts to cut
(# sheets ÷ # sheets per lift)
1400 sheets ÷ 500 per lift = 2.8 (round up to 3 lifts)
- (step d) Count the number of cuts to make (cuts per lift x # of lifts)
8 cuts per lift x 3 lifts = 24 cuts
- (step e) Calculate the time required for cutting (time per lift x # of lifts) + (time per cut x # of cuts)
(2 minutes per lift x 3 lifts) + (15 seconds per x 24 cuts) = 12 minutes ÷ 60 = .20 hours
- (step f) Add the setup time required for the cutter (manual standard)
.25 hours required for an average setup + .20 hours cutting = .45 hours

Applying Buckle Folder Time Standards

Estimating the time and cost of buckle folders also requires just a few variables to be known, including (1) the number and configuration of the folds to make per product, (2) the length of the flat sheet (before folding), (3) the number of products to fold, and (4) the surface speed (rate) of the folding belts. In practice, then estimate is for a given product is based on the setup time, which will vary based on the number of folding gates to adjust and whether score or perforation wheels will be required. The rate of a folder depends on two factors:

1. The surface speed of the belts on which the paper rides.
2. The length of the paper product to be folded.

A folder is normally set to a standard surface speed when running, for example 300 ft/min. However, the number of folded sheets per hour (fph) is affected by the flat length of the paper to be folded. This requires a conversion, for example:

(step a) sheet length in inches + gap between ÷
12-inches per foot = # feet
*11-in sheet length + 2-in gap = 13-in ÷
12-in = 1.08*

(step b) #feet ÷ 300 feet per minute
*300 feet per minute ÷ 1.08 feet = 277 folded
sheets per minute*

(step c) sheets per minute x 60 = sheets per hour
277 x 60 minutes = 16,620 per hour

(step d) Determine the time required for folding
(the total number of products to be folded
divided by the folded products per hour).
*20,000 products ÷ 16,620 folded products
per hour = 1.2 hours of folding time.*

(step e) Add the setup time required for the folder
(manual standard)
*.5 hours required for an average setup + 1.2
hours for folding = 1.7 hours*

Cutting Table Time Standard Variables

The cutting table is a production machine used to cut, crease, or router vector shapes out of large sheets of

material. Products for which cutting tables are used include POP displays, labels, decals, and packages. As the use of wide format inkjet has grown as a print production process in recent years, so too has the cutting table as a companion finishing operation. In practice, vector graphics files (containing the outline of edges of the objects in the layout) are extracted from the layout and processed by the cutting table controller. A cutting head moves on a track to make the cuts. Various interchangeable cutting tools may be used to cut a wide range of materials, including paperboard, corrugated board, sheet polymers, cloth, wood, and sheet metal (Esko, 2019).

Cutting Table Manual Standards

In practice, developing manual time standards for cutting table setup is similar to any other machine. First, standard operating procedures (SOP) are agreed upon and followed by each operator. The SOP is a step-by-step procedure that is followed each time a job goes through setup. After the SOP is prepared, the setup time is measured over several jobs and the time requirements are recorded and averaged. Like most production machines, a cutting table requires setup time for each job. The setup of the cutting table generally involves these steps, which should be recorded for time to come up with an average manual time standard:

(step a) importing the outline file to the controller console.

(step b) making console settings for the job.

(step c) inserting the cutting head cutting tool.

(step d) laying the material on the table bed and setting its thickness and position.

(step e) making and inspecting a test cut.

Cutting Table Machine Standards

Unlike guillotine cutting and buckle folding, cutting table time standards are impacted by a wide range of difficult-to-evaluate variables. Therefore, unlike the other production machines, the machine standard for a cutting table does not allow for simple, accurate calculations of production time. To understand this, consider the factors that affect the cutting rate:

1. The straight-line cutting speed of the tool

Each cutting tool is matched to the material to be cut, and each tool is rated at a different straight-line cutting speed. The speed at which cuts are made on a cutting table is measured in inches per minute (or centimeters per minute) to cut in a straight line. For example, a psaligraphy tool used to cut paperboard might be rated at 1180 inches per minute (3000 cm/min), while high frequency reciprocating knives that move in a rapid up and down slicing motion (and used for materials such as foam board) may be rated at an even slower speed, such as 984 inches per minute (2500 cm/min). Slower yet are milling tools (used to router wood) is rated at an even slower straight-line rate, such as 236 inches per minute (600 cm/min).

2 The shape to be cut

Unfortunately, the straight-line cutting rate provided by the manufacturer is not very helpful for predicting time in practice, because products to be cut on cutting tables are most often composed of many curves and angles. The speed of the cut will vary depending on the complexity of the shape. This is due to the manner in which the cutting tool changes cut direction. Each time the tool needs to pivot, the head mechanism must pause, lift the tool, turn to a new trajectory, drop the tool back onto the material, and proceed cutting (lift-turn-drop). To cut an arc, this sequence may be repeated hundreds of times, slowing the cutting rate considerably. In other words, the more complex the shape, the more split-second pauses and the slower the cutting.

3. The size of the shape to be cut

Consider a simple circle. If the circle has a large diameter, such as 36-in, the arc is quite gentle and will not require the cutting knife to lift-turn-drop, thus the rate will match the straight-line rate. However, if the circle has a small diameter, such as 2-in, the arc is quite acute and will require dozens of lift-turn-drop cycles, slowing down the cut rate considerably.

4. The variety of tasks to be performed during the cut (cut, crease, kiss-cut, perforations)

Most packages and many point-of-purchase displays require not just cutting, but also creasing and perhaps perforating. Each of these cutting table tasks are done in one operation, but at different straight-line speeds, and so need to be considered as mutually exclusive for a time standard.

A Method for Estimating Cutting Table Production Time

An estimator often will create an estimate based on a template that has been produced previously. This will allow for exacting time predications so long as the previous production information is stored and accessible in the MIS. However, for new jobs, the estimator may have nothing more to go on than a description of image of the product, it's overall size, and quantity. In this case, estimating the time of cutting requires a method that will provide accurate and repeatable results. Described here is a method developed during research in the Print Media Lab at Illinois State University. The method will be explained, followed by examples. Then, data will be presented to show how factors can be customized for use in developing time standards within any facility and for any cutting table.

1. Group products

Unlike other machine standards, developing time standards for the cutting table involves grouping the most common types of jobs produced at a given facility according three variables: (1) material (cutting tool), (2) shape, and (3) size. The assumption is that each group of products will be affected by similar factors, and therefore have similar cut speed reductions. It is recommended to develop visual design references in each group to allow the estimator to quickly and intuitively assign a new job to its most logical group. Figure 1 and Figure 2 show examples of product groups which will have similar

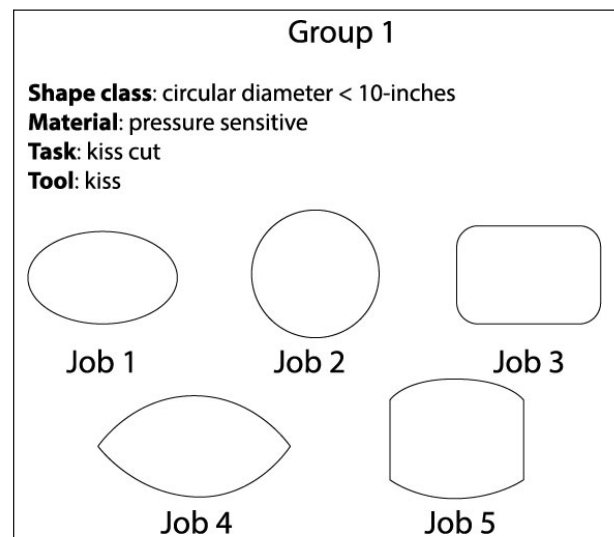


Figure 1: Group one includes jobs of small circular designs to be kiss cut from pressure sensitive stock

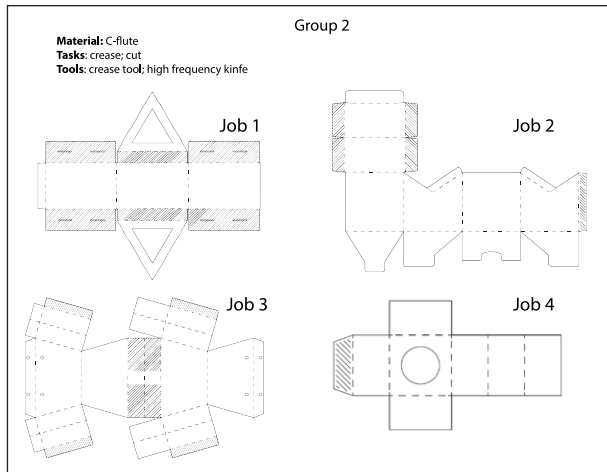


Figure 2: Group one includes jobs of package designs to be creased & cut from c-flute stock

factors affecting cut speed. To apply this method to a specific facility, the classes of jobs would be modified to suit. Note that the circular shapes are classified as “small circular.” It is recommended to have the diameter cut-off at 10-inches, i.e. small circular shapes have diameters 10-inches or less, and large circular shapes have diameters or 10-in or more. As explained previously, this is necessary due to the fact that the lift-turn-drop knife cycles increase for smaller circular shapes, slowing the cut rate. Depending on the accuracy required, more size categories could be created. Note also that Group 1 is classified according to material and tool (as these factors also affect cutting rate).

Figure 2 includes package jobs on c-flute material. Because packages have mainly quadrilateral cuts and creases, with rarely a circle or curve, size categories are unnecessary. The cuts will be mainly straight, though with some pivoting of the cutting tool for each change of angle. There will be two different rate factors, one for the cutting tool and one for the creasing tool. In practice, both tools are added to the cutting table head and the creasing is completed first followed by the cutting. Each will need to be estimated for time separately and then added together.

2. Estimate linear cutting distance

For any given job, the overall distance of cutting will need to be estimated. For geometric shapes, the cutting distance can be estimated with reasonable accuracy.

Sticker example: The following example will show the overall cutting distance for 50 of the circular kiss cut stickers shown in Group 1 (Figure 1). Assume that the

design has a 3-in diameter. The overall cutting distance would be found in this way:

- (step a) determine the perimeter distance to be cut
(diameter of design = 3-in x pi)
 $3\text{-in} \times 3.14 (\pi) = 9.42\text{-in circumference}$
- (step b) multiply the perimeter per object by the number of objects to be cut
 $9.42\text{-in per decal} \times 500 \text{ decals} = 4710 \text{ linear inches.}$

If an object to be cut is not quite circular (oval or spheroid as shown in Figure 1) the height and width can be averaged to come up with a working diameter. This will result in a less exact estimate, but should be close.

Package example: Next consider the package designs in Group 2 (Figure 2) which are composed mainly of straight cuts and creases (triangles or quadrilaterals). Each cut and crease can be measured (or estimated for length) and then added together to determine the overall linear cutting distance. Since creasing and cutting are done in two successive operations and at different rates, the distances will be put into separate categories. The following figure illustrates this concept. Note that creases are the dotted lines, and cuts are the solid lines. For cuts in this case, there are 8 segments of 4-inches; 8 segments of 3-inches; and 16 segments of 2-inches. Adding these together yields a linear distance of approximately 64-inches for cutting:

$$\text{(step a) } (8 \times 4) + (8 \times 3) + (16 \times 2) = 64 \text{ linear-inches per package}$$

For creases, there are 8 segments of 4-inches and 3 segments of 3-inches. Adding these together yields a linear distance of approximately 41-inches for creasing:

$$\text{(step b) } (8 \times 4) + (3 \times 3) = 41 \text{ linear-inches per package}$$

Next, assume that we have 10 packages to cut.

$$\text{(step c) } 10 \text{ packages} \times 64 \text{ linear inches of cutting per package} = 640 \text{ linear inches}$$

$$\text{(step d) } 10 \text{ packages} \times 41 \text{ linear inches of creasing per package} = 410 \text{ linear inches}$$

(step e) Use a rate factor to calculate the cutting time.

The straight-line speed of the cutting tool will be used as a baseline. However, the rate of the cut will vary based on the shape and shape size (number of lift-turn-drop cycles). By grouping similar products by tool and

shape we can assume each product will have a similar rate factor. The development of rate factors is explained in the next section.

Sticker example: For the circular sticker example above, the length is 9 linear inches. Example rate factors are shown in table 2. We'll use the rate factor for group 1 products, .09 (or 9% of straight-line speed). So, cutting time is estimated to be:

$$\text{(step a) } 1180 \text{ inches per minute (straight line speed)} \times .10 \text{ (rate factor)} = 118 \text{ inches per minute}$$

$$\text{(step b) } 4710 \text{ linear inches} \div 106.2 \text{ inches per minute} = 39.9 \text{ minutes}$$

Package example: Using the rate factor for a package requires two separate steps, since there are two separate tools (with two different straight-line rates and rate factors) being used. Given the length values derived from figure 3, and using the rate factor for the estimated time required for creasing and cutting, we can calculate as follows:

$$\text{(step a) } \textit{Cut with high frequency knife: } 984 \text{ inches per minute (straight line speed)} \times .16 \text{ (rate factor)} = 159 \text{ inches per minute}$$

$$\text{(step b) } 640 \text{ linear inches} \div 159 \text{ inches per minute} = 4 \text{ minutes}$$

$$\text{(step c) } \textit{Crease with crease tool: } 1181 \text{ inches per minute (straight line speed)} \times .49 \text{ (rate factor)} = 576 \text{ inches per minute}$$

$$\text{(step d) } 410 \text{ linear inches} \div 576 \text{ inches per minute} = .7 \text{ minutes}$$

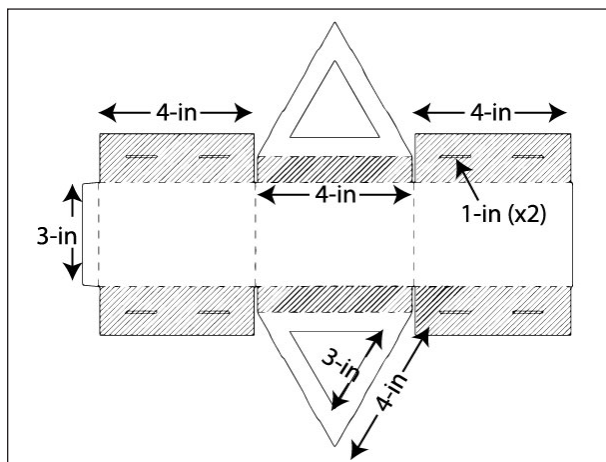


Figure 3: Estimating the cutting and creasing length of a package design

A Method for Creating Rate Factors for Cutting Tables

This method allows for the development of predictive time standards for cutting tables. As described previously, the jobs need to be grouped according to those factors that affect speed, namely cutting tool, shapes, and sizes that will slow the cut speed. Two groups are provided in this paper to illustrate the methodology, (a) kiss-cut circular designs smaller than 10-inches in diameter and (b) packages on c-flute material. A dozen or more unique groups would likely need to be developed for a production operation.

Limitations of the Time Standards Data

Note that this data is based on a Kongsberg X20 cutting table, and since other cutting tables will have unique rates, this data should not be expected to be applicable. Also, note that this example includes data from just four jobs, which may be too few to provide for an accurate time factor, but it does provide a starting point. Time standards will improve in accuracy as more jobs are completed and estimated cutting time is modified by actual cutting time.

Methodology for Developing Machine Time Standards

Table 1 shows a spreadsheet for calculating a rate factor for a product group. Each job's cutting length in linear inches is calculated and recorded, as well as the overall length based on the number of pieces to cut. Next calculated is the time it would take if the cutting were done at the machine rated straight-line speed (estimated length \div straight-line speed/in). The cutting table controller will provide a record of the actual cutting time for each job. This actual time is divided by the predicted straight-line time to determine a rate factor (a factor to reveal how much the cutting time slowed) for each job (actual time \div predicted time). Next, a mean of the rate factors is calculated. Next, the product of the rate factor and the straight-line speed (rate factor \times straight-line speed) provides an estimate of the actual speed/in that can be expected for products placed into this group.

The same process would be applied to the package design jobs in group 2, with the exception that two rounds of calculations would be completed: one for the cuts and one for the creases. This is necessary because each requires a different tool running at a different rate of speed.

Table 1: Calculating rate factor and cutting speed based on measured time data for group 1

Group and Jobs		Operation 1 Distance Calculations					Rate Factor Calculation		
Group 1	Material	Tool	Speed in/min	Linear Inches (diameter x pi)	Quantity	Estimated Length (linear inches x quantity)	Predicted time at straight-line speed (estimated length/speed/in)	Actual measured time	Rate Factor (actual time/predicted time)
job 1	Sticker	kiss	1181.1	9	500	4500	3.8	29	0.13
job 2	Sticker	kiss	1181.1	13	1000	13000	11.0	110	0.10
job 3	Sticker	kiss	1181.1	9	1300	11700	9.9	95	0.10
job 4	Sticker	kiss	1181.1	7	800	5600	4.7	82	0.06
			Actual speed/min (speed in/min * rate factor)						Average (rate factor)
			116						0.10

Table 2: Calculating rate factor and cutting speed based on measured time data for group 2

Group and Jobs		Crease Operation					Rate Factor Calculation		
Group 2	Material	Tool	Speed in/min	Linear Inches (diameter x pi)	Quantity	Estimated Length (linear inches x quantity)	Predicted time at straight-line speed (estimated length/speed/in)	Actual measured time	Rate Factor (actual time/predicted time)
job 1	C-Flute	Crease	1181.1	41	10	410	0.35	0.80	0.43
job 2	C-Flute	Crease	1181.1	65	10	650	0.55	0.75	0.73
job 3	C-Flute	Crease	1181.1	82	6	492	0.42	1.00	0.42
job 4	C-Flute	Crease	1181.1	25	8	200	0.17	0.30	0.56
job 5	C-Flute	Crease	1181.1	40	15	600	0.51	1.20	0.42
job 6	C-Flute	Crease	1181.1	35	12	420	0.36	1.00	0.36
			Actual speed/min (speed in/min * rate factor)						Average (rate factor)
			576.3						0.49

Group and Jobs		Crease Operation					Rate Factor Calculation		
Group 2	Material	Tool	Speed in/min	Linear Inches (diameter x pi)	Quantity	Estimated Length (linear inches x quantity)	Predicted time at straight-line speed (estimated length/speed/in)	Actual measured time	Rate Factor (actual time/predicted time)
job 1	C-Flute	High Freq	984.3	64	10	640	0.65	5.0	0.13
job 2	C-Flute	High Freq	984.3	80	10	800	0.81	7.5	0.11
job 3	C-Flute	High Freq	984.3	120	5	600	0.61	3.0	0.20
job 4	C-Flute	High Freq	984.3	40	8	320	0.33	2.5	0.13
job 5	C-Flute	High Freq	984.3	55	15	825	0.84	5.5	0.15
job 6	C-Flute	High Freq	984.3	60	12	720	0.73	4.5	0.16
			Actual speed/min (speed in/min * rate factor)						Average (rate factor)
			159.5						0.16

Methodology for Developing Setup (Manual) Time Standards

Set-up time will vary depending on the individual performing the set-up, as well as inevitable technical issues that occur during the process. However, the process for setup can be rationalized into a SOP to assure minimum of variation from job to job, and so maximize time consistency. Table 3 shows an example of a planning chart for measuring setup time. Each step can be timed separately and then tallied to reveal the total setup time required per job. Note that many jobs require multiple sheets to be cut. Thus, once the cutting of the job begins there will be intervals of manually changing the sheet and restarting cutting. This too must be measured and factored for accurate time standards. As with the machine standards previously described, each job would require ongoing measurement of time to allow for increasingly accurate revisions of the time standard used in estimating.

Table 3: A form for timing standard operating procedures for cutting table setup		
Step	Operation	Time Minutes
1	Review job ticket	2:30
2	Select and install correct tool	3:00
3	Retrieve and position first sheet of stock	4:30
4	Check graphics layers for appropriate order	2:00
5	Locate and set first registration mark	1:30
6	Drop knife and test/reset for proper depth	2:00
7	Stop, remove cut sheet	3:00
	Set-up time	18:00
	Additional sheets (if necessary, and per sheet) position new sheet, restart	3:00

Conclusion

While the methodology described herein is a model that can be customized and applied generally, there will inevitably be many unique issues that will arise in specific production operations. For example, various makes and models of cutting table will be rated differently for cutting speed. The quality of the cuts at full speed may need to be examined, with cutting speed modified to maximize quality. Also, prepress personnel will need to

develop standard operating procedures when preparing graphics to be cut to assure that the cutting table operations go smoothly. This includes assuring proper graphics layers and register marks.

Developing accurate time standards for cutting tables is problematic because of the many variables impacting the machine cutting speed. With cutting table technology relatively new to many the graphic communications businesses, this paper aimed to provide a roadmap for implementing a process for developing time standards that might increase the efficiency and accuracy of production schedules and cost estimates.

References

- Esko. (2019, November 15) Retrieved From: <https://www.esko.com/en/products/kongsberg-cutting-tables>.
- Field, Gary G. (2009) *Printing Production Management: Strategies for the Digital Printing and Imaging Industry*. 2nd Edition. Printing Industries Press. Pittsburgh, Pennsylvania.
- Idealliance (2019, November 15) *Print Planning & Estimating Certification Training*. Retrieved from: <https://www.idealliance.org/print-planning-estimating-certification-course-suite>. Reston, Virginia.
- Merit, D. (2000) *Printing Estimating Primer*. GATFpress. Pittsburgh, Pennsylvania.
- Ruggles, Philip K. (2008) *Printing Estimating: Costing and Pricing Print and Digital Media*. 5th Edition. Printing Industries Press. Pittsburgh, Pennsylvania.
- Silver, Gerald, A. (1991) *Printing Estimating*. 3rd Edition. Editorial Enterprises.

Visual Communications Journal Submissions Guidelines

Submittal of Manuscripts

- » All manuscripts must be received by the editor no later than **December 15th** to be considered for the spring Journal or by **June 15th** to be considered for the fall Journal.
- » Submit papers and correspondence to: Gabe Grant <gjgrant@eiu.edu> or check www.GCEAonline.org for contact information for the GCEA Vice-President of Publications.

Types of Articles

- » The *Visual Communications Journal* accepts four levels of articles for publication:
- » 1. Edited articles are accepted or rejected by the editor. These articles are not submitted to a panel of jurors. The decision of the editor is final.
- » 2. Juried articles are submitted to the editor and are distributed to jurors for acceptance/rejection. Juried articles are typically reviews of the literature, state-of-the-art technical articles, and other nonempirical papers. Jurors make comments to the author, and the author makes required changes. The decision of the review board is final.
- » 3. Refereed articles are submitted to the editor and are distributed to jurors for acceptance/rejection. Refereed articles are original empirical research. Jurors make comments to the author and the author makes required changes. The decision of the review board is final.
- » 4. Student articles are submitted by GCEA members and are accepted/rejected by the editor. These articles are not submitted to a panel of jurors. The editor's decision is final. Please be aware that poorly written student papers will be rejected or returned for editing.

Eligibility for Publication

- » Members of the Graphic Communications Education Association, or students of GCEA members, may publish in the *Visual Communications Journal*.
- » Those wishing to publish should join GCEA before submitting their paper for review.

Audience

- » Write articles for educators, students, industry representatives, and others interested in graphic arts, graphic communications, graphic design, commercial art, communications technology, visual communications technology, printing, photography, or digital media. Present implications for the audience in the article.

Manuscript Form and Style

- » Prepare manuscripts according to the APA style.
- » Submit your paper in Microsoft Word format.
- » Call out the approximate location of all tables and figures in the text.
- » List your name, highest degree, affiliation, and title on the first page only. Article text should begin on the second page.
- » Please proofread carefully before submitting.

Figures (Graphics)

- » Number and write a caption for each figure. Include captions in a list at the end of your Word document.
- » Screen captures should be as large as possible.
- » Photos should be about 300 ppi to span one column (3-inches) or 2 columns (6.5-inches).
- » Line art should be in a vector format.
- » Tables will be formatted by the designer to fit in one column (3" wide) or across two columns (6.5" wide).

Tables

- » Set up tables in separate Microsoft Word documents, one document for each table.

Publication and Format

- » The *Visual Communications Journal* is published and distributed twice a year, in the spring and in the fall. Each article of the *Journal* is published online at www.GCEAonline.org. Provided there are at least 24 pages of content, the *Journal* will be printed and mailed to GCEA members.

Notice of Limitation

- » Articles submitted to the *Journal* cannot be submitted to other publications while under review. Articles published in other copyrighted publications may not be submitted to the *Journal*, and articles published by the *Journal* may not be published in other publications without written permission of the *Journal*.