Designation: F2406 – 04 (Reapproved 2012)

Standard Practice for Determining Yield of Solid Ink Sticks[1]

This standard is issued under the fixed designation F2406; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers a procedure to determine the yield in number of pages per solid ink stick used in a solid ink/phase change printer for printing an 8 by 10 in. image area on a letter size page at 50 ± 0.5 % fill of each individual color. This practice requires an accurate gram scale to weigh the solid ink sticks and the printed pages, a personal computer able to print a 50 ± 0.5 % fill of each color, as well as a test printer.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *ink stick yield (Y)*—amount of pages that can be printed from one ink stick.

2.1.2 *solid ink stick*—consumable used in a hot-melt printing device to apply color to a page.

3. Summary of Practice

3.1 A solid ink/phase change printer utilizing a solid ink stick is set up to determine yield in number of pages per solid ink stick used in a solid ink/phase change printer. A test page with 50 ± 0.5 % print output of each color for control is used. The solid ink stick is weighed. A specified number of prints are created on the printer using the solid ink stick. The amount of ink used to print the specified number of sheets is calculated. The results can be used to estimate the total page yield per solid ink stick at various percent coverages. A comparison can be made between the solid ink stick used for the control and any other solid ink stick tested using this practice.

4. Significance and Use

4.1 This practice can be used for the evaluation of OEM and compatible ink sticks.

4.2 This practice is suitable for research and development and quality acceptance evaluations.

4.3 This practice is suitable to extrapolate ink yield (*Ye*) of each color at other percent coverages (*Ce*) from the calculated yield (*Y*) using the following formula (see Table 1):

$$50\,\%\ \text{Coverage}/Ce = Y/Ye$$

or

$$Ye = Y(Ce)/50\,\%\ \text{Coverage}$$

5. Interferences

5.1 This practice does not consider the effects of the cleaning mechanism and its use of ink in lowering the effective yield of the solid ink. During normal use the printer may require the use of a cleaning cycle which will reduce the effective yield of the solid ink stick. During this test the use of the cleaning cycle during the printing should be avoided.

5.2 Changes in humidity and temperature will have an effect on the measurements of the paper being weighed. Every effort should be made to run the test in a controlled environment.

5.3 When changing ink sticks from one test of the same color to another test of the same color, at least three times the amount of ink normally stored in the reservoir should be run through the printer to insure that ink is purged from the system.

6. Reagents and Materials

6.1 Sufficient quantities of same lot paper, ink and other printer specific consumables should be available for consistency.

6.2 A reference target that can be verified to print at 50 ± 0.5 % coverage on an 8 by 10 in. image area on a letter size page.

6.3 A gram scale with 0.1 g readability, 6000 g capacity, 0.1 g repeatability, ± 0.2 g linearity and 8.5 by 11 in. platen area is required.

7. Hazards

7.1 There exist no unusual hazards related to this practice.

8. Procedure

8.1 Testing will be done with one color ink stick at a time.

8.2 Select and weigh the solid ink stick to be tested. Weight = *Wis*.

[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.03 on Research.

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TABLE 1 Summary Results

Number of pages printed at varying percents of coverage				
	ACTUAL			
	5 %	10 %	25 %	50 %
Cyan	1036.23	488.05	206.65	105.89
Magenta	1000.00	527.88	223.62	110.04
Yellow	1036.23	543.73	194.03	105.20
Black	1048.15	518.32	214.39	107.81
PROJECTED from results taken at 50 %				
Cyan	1058.90	529.45	211.78	105.89
Magenta	1100.40	550.20	220.08	110.04
Yellow	1052.00	526.00	210.40	105.20
Black	1078.10	539.05	215.62	107.81

8.3 Measure and record the temperature and humidity in the test area.

8.4 Set up the test printer. Set the printer to the factory default mode. Turn off any Energy Saver/Energy Star modes. Set printer attributes that might effect printing attributes to standard settings.

8.5 Paper used in this test should be from the same lot, if possible, and be conditioned in the printing environment for at least 24 h.

8.6 Run ten sets of 100 sheets each of conditioned paper using the 50 % test target alternatively with ten sets of 100 empty sheets of the same stock and lot. This should be done using optional high capacity trays if available to allow for continued printer operation.

8.7 Measure the weight of the 10 sets of 100 pages individually immediately upon completion of the printing of each set however at a maximum within 1 h of the time the pages were printed. Additionally, to verify accuracy, the 10 sets of pages should be weighed together and compared with the sum of the 10 sets weighed individually. All weights are to the nearest 0.1 g.

8.8 Calculate the yield of an ink stick (*Y*) using the following formula:

$$Wip/1000 = Wis/Y$$

or

$$Y = 1000(Wis)/Wip$$

where:

Wip = weight of the ink on the 1000 sample of paper determined by *Wpp* − *Wpe*,
Wis = weight of original ink stick,
Wpp = weight of paper after printing the 50 % test target on 1000 pages, and
Wpe = weight of the paper after printing 1000 blank pages.

9. Report

9.1 Report test conditions (temperature and humidity), measured weights of the solid ink sticks, printed paper weight empty, printed paper weight at 50 % coverage, printer setup conditions, printer identification and test target criteria- operating system, program used, driver used.

10. Precision and Bias

10.1 Repeatable results can be obtained given that the same printer is used and the same personal computer and settings are used.

10.2 Additionally, repeatable and reproducible results can be obtained between laboratories.

11. Keywords

11.1 computer printer; ink yield; phase change; solid ink