



**Technical Bulletin #107**

# **AnaJet Ink Usage & Cost Test Report**

**3/18/2008**

**By**

**Paul Joseph & Don Rasmussen**

**AnaJet, Inc.**

**320A Kalmus Drive  
Costa Mesa, CA 92626  
U.S.A.**

**US**

## Summary

A series of tests were made to determine the amount of ink used in printing shirts with AnaJet apparel printer. A total of forty prints were made with ten representative images on white and black shirts, and the amount of ink used was measured.

The results show that good prints can be made at a normal ink level setting with moderate ink usage. Increasing the ink level setting (“heavy ink”) increases the ink consumption dramatically, without necessarily improving the print quality. However, a heavy ink setting improves the print vibrancy (“pop”). This “pop” is commercially attractive at the cost of lesser quality image and higher ink consumption rate.

The results also show that the amount of ink consumed is highly dependent on the specific graphic image even at the same level of ink setting. We feel that due to the high sensitivity of ink usage to a number of variables which are not easily understood, the presented ink consumption rate should be viewed only as a general guidance. For a specific image printing, the usage and cost may vary significantly from our studies.

Inks used for head cleaning and other maintenance are not accounted for here, since such wastage can vary widely depending on the maintenance habits of the operator. Generally the more maintenance, the less wasted ink.

Table below summarizes the actual measured ink use and costs.

### INK USAGE and COST SUMMARY

Representative Image Size: 10” x 8.5”

Ink Price: Colored CMYK Inks \$64/110ml cartridge; White Ink \$74/110ml cartridge

**Ink Cost Summary: White Shirt: ~ \$0.40 (\$0.60 at heavy ink setting)**

**Black Shirt: ~ \$1.50 (\$2.25 at heavy ink setting)**

White shirt Normal Ink Mode: 0.68gm colored ink: \$0.39 per shirt avg. (\$0.29 ~ \$0.52)

White shirt Heavy Ink Mode: 1.03gm colored ink : \$0.60 per shirt avg. (\$0.35 ~ \$0.99)

Black Shirt Normal Ink Mode: 2.13gm white ink; 0.24 gm color ink:  
\$1.57 per shirt avg. (\$0.86 ~ \$2.14)

Black Shirt Normal Ink Mode: 3.08gm white ink; 0.19gm color ink:  
\$2.17 per shirt avg. (\$1.16 ~ \$2.90)

US

**CAUTION:** If an AnaJet printer operator is experiencing a higher level of ink use than indicated above, he most likely is using excessive amount of ink without the benefit. Higher than normal ink setting results in higher vibrancy “pop,” with the loss of detail and color accuracy. For dark shirt printing, higher level of white ink also results in loss of wash-fastness. Generally it is recommended not to use more a than needed ink level.

## **Introduction**

The objective of this series of test was to measure the amount of ink used for representative images printed on both white and black t-shirts with AnaJet Digital Apparel Printers. From the consumed ink, one can easily compute the ink cost. The representative images are what the AnaJet Marketing Department determines as something similar to typical graphics used in AnaJet customers' revenue generating printing. Readers are cautioned that ink usage for a specific job can vary significantly depending on the image, ink level settings, fabric and a host of other factors. Our findings are to be used only as a general guide for ink consumption, not to be relied on for a specific job.

We measured the actual ink consumption by empirical method by measuring the inks in an actual print. We have seen others providing ink consumption data from counting ink drops relying on software. This method is flawed due to the fact that the ink drop sizes are not properly accounted for, when you have variable ink drop size printer like AnaJet. The total ink usage is highly dependent on the ink drop sizes which are dynamically determined, in addition to the ink drop counts. For this reason, we determined the best method is measurement of inks actually on the prints.

## **Equipment & Materials**

Printer: AnaJet FP-125 Serial Number 1403

Software: AnaJet Print Driver version 2.22, EK Print Studio version 2.0

Scale: Tanita Model 1477, 0-100 gm, resolution: 0.1 gm 0-50, 0.2 gm 50-100

Swatches: From Gildan Ultra Cotton

Inks: White - Anabright Ink2 ABA-WH2  
Yellow – Anabright Ink ABA-YL2  
Magenta – Anabright Ink ABA-MG2  
Cyan – Anabright Ink ABA-CY2  
Black – Anabright Ink ABA-BK2

## **Procedure**

1. Cut swatch approximately 12 X 15 inches from Gildan Ultra Cotton white or black t-shirts.
2. Black shirts: Weigh swatch and record weight.
3. Using EK Print, set ink levels and passes to normal mode, set image size to 10 inch in the largest direction.
4. Print white layer, weigh and record.
5. Print color layer, weigh and record.
6. Repeat steps 2 thru five for each test image
7. Set levels to high ink mode.
8. Repeat steps 4 and 5 for each test image

9. White shirts: Weigh swatch and record weight.
10. Using EK Print, set ink levels and passes to normal mode, set image size to 10 inch in the largest direction.
11. Print color layer, weigh and record.
12. Repeat steps 9 thru 11 for each test image
13. Set ink level to heavy.
14. Repeat step 9 and 11 for each test image.

## **Ink Settings**

Ink level setting in the EKprint Studio is very important. Two modes for printing were used: Normal ink mode and Heavy Ink mode.

### **For white shirts:**

Normal ink usage mode was set to “heavy drop size; ink level 2.”

Heavy ink usage mode was set to “medium drop size; ink level 3.”

### **For black shirts:**

Normal ink usage mode was set to white ink= “heavy drop size; ink level 2,” and color ink = “light drop size; ink level 2.”

Heavy ink usage mode was set to a white ink= “medium drop size; ink level 3” and color ink= “light drop size; ink level 2.”

## **Test Images**

The test images are typical of those images used in revenue generating prints among AnaJet printer customer shops. Ten images were used, five for black shirts and five for white, see appendix A for photos of images printed:

1. Image Name: Bees – File Name: anabeewhitecopy.tif, 8.7 in X 10 in
2. Image Name: Beer – File Name: beer5-blacktextfinalversion.tif, 8.3 in X 10 in
3. Image Name: Bear – File Name: babybib2.tif, 8.34 in X 10 in
4. Image Name: Eagle white – File Name: anaeagle.tif, 7.05 in X 10 in
5. Image Name: Surfboards – File Name: surfboards.tif, 7.93 in X 10 in
6. Image Name: Pirate - File Name: piratemach2.tif, 10 in X 9.7 in
7. Image Name: Fish – File Name: anafish.png, 7.8 in X 10 in
8. Image Name: Eagle black - File Name: anaeagle.tif, 7.05 in X 10 in
9. Image Name: Logo – File Name: obbclogo.tif, 10 in X 10 in
10. Image Name: Fireman – File Name: fire4.tif, 10 in X 9.4 in

## Results

The average ink usages are tabulated as shown in the Appendix B Tables. Here is the summary.

White Shirt Normal Ink Mode: 0.68gm color ink

White Shirt Heavy Ink Mode: 1.09 gm color ink

Black Shirt Normal Ink Mode: 2.13 gm white ink, .24 gm color ink, total 2.37 gm.

Black Shirt Heavy Ink Mode: 3.08 gm white ink, .19 gm color ink, total 3.27 gm.

## Discussions

The objectives of these tests were achieved and ink used was measured. However care must be exercised in performing similar tests to insure that the measurements are made as soon as the images are printed to avoid moisture loss especially in low humidity environments. Additionally nozzle checks should be made just prior to and after a series of tests to insure full ink flow. If any clogged nozzles are found, all the nozzles have to be opened prior to resumption of test prints.

**Variation due to ink settings:** For white shirt printing, the average ink consumption is 0.68 gram for normal ink setting, and 1.09 gram for heavy ink setting, an increase of 60%. For black shirts, the average total ink consumption is 2.37 grams and 3.27 grams, respectively. It is an increase of 38%. These are very significant variations due to different ink settings. The normal ink setting prints very good quality image with good ink saturation. At heavy ink setting, the ink saturation is higher, but the image quality is not necessarily higher. At heavy ink settings, the image tends to lose details and the colors are not true with the original design. However operators seem to like to print at heavy ink setting as it generally prints more vibrant colors, which may have higher commercial appeal.

**Variation due to images:** The details are interesting. For white shirts at the normal ink setting, the ink consumption ranges from 0.5 to 0.9 grams depending on the type of image and coverage for comparable size images. At the heavy ink setting, the ink consumption ranges from 0.6 to 1.7 grams. Therefore there are significantly higher variations among different images at a heavy ink setting. For Beer and Bear graphics, the ink consumption increased by about 20% by going from normal to a heavy setting; however for Bee graphic, the ink consumption more than doubled. Therefore there is no linear relationship in the increase of ink usage when the ink level is changed. This is due to the fact that Raster Image Processor such as EKprint Studio goes through complex algorithm during processing the image, and places the ink dots for the best viewing results. During this process, unexpected large variations in ink drop units can occur. It is not very predictable, depending on image.

For the black shirt printing, the variation between different graphics are more pronounced, ranging from white ink consumption of 1.1 to 3.1 at the normal setting. White ink consumption of 1.65 to 4.2 at a heavy setting. Colored ink consumption ranging from 0.1 to 0.4 at the normal setting, and from 0.1 to 0.3 at a heavy setting.

**The test results show that the ink consumption is very sensitive to the ink level settings, type of image and image size. Black garment printing consumes more than three times a comparable white shirt printing.**

Because of the resolution of the electronic scale used, a new series of measurements with a more accurate scale should result in more precise figures. Further testing with a broader range of images might be beneficial for some users in better assessing the costs.

## **Conclusions**

The results show that prints at a normal ink level setting provide good image quality at a moderate ink usage level. Increasing the ink level setting increases the ink consumption dramatically, without necessarily improving the print quality. However at a heavy ink setting, the print vibrancy (“pop”) is improved. This “pop” may be commercially attractive at the cost of lesser quality image and higher ink consumption rate.

The results also show that the amount of ink consumed is highly dependent on the specific graphic image even at the same level of ink level setting.

We feel that due to the high sensitivity of ink usage and costs to a number of variables which are not easily understood, the presented ink consumption rate should be viewed only as a general guidance. For specific image printing, the usage and cost may vary significantly from our studies.

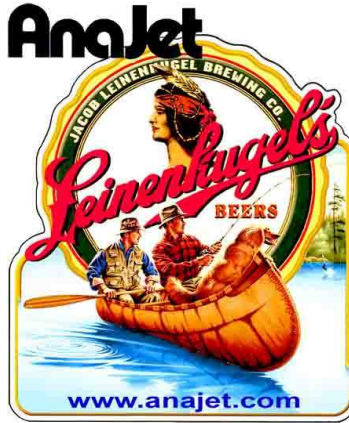
# Appendix A

## White Shirt Test Images

BEE (10 x 8.7 in)



BEER (10 x 8.3 in)



BEAR (10 x 8.34 in)



SURFBOARDS (8.68 x 10 in)



EAGLE (10 x 7.05 in)



**Black Shirt Test Images**

**PIRATE (10 x 9.07 in)**



**FISH (7.8 x 10 in)**



**LOGO (10 x 10 in)**



**EAGLE (10 x 7.05 in)**



**FIREMAN (10 x 9.74 in)**



## Appendix B

White Shirt: Normal Ink Settings (Heavy 2)

	Sample 1		Sample 2		Average	
Bee	0.8		0.8			0.8
Beer	0.9		0.9			0.9
Bear	0.4		0.6			0.5
Eagle	0.4		0.6			0.5
Surfboards	0.8		0.6			0.7
Total Average						0.68

White Shirt Heavy Ink Setting (Medium 3)

	Sample 1		Sample 2		Average	
Bee	1.6		1.8			1.7
Beer	1.4		1.4			1.4
Bear	0.6		0.6			0.6
Eagle	0.7		0.6			0.65
Surfboards	1.0		1.1			1.1
Total Average						1.09

Black Shirt Normal Ink Setting (White Heavy 2; Color Light 2)

	Sample 1		Sample 2		Average		Total Average
	white	color	white	color	white	color	
Pirate	2.6	0.2	2.8	0.2	2.7	0.2	2.9
Fish	3.1	0.1	3.1	0.1	3.1	0.1	3.2
Logo	2.4	0.4	2.6	0.4	2.5	0.4	2.9
Eagle	1.1	0.2	1.1	0.2	1.1	0.2	1.3
Fireman	1.2	0.4	1.3	0.2	1.25	0.3	1.55
Average					2.13	0.24	
Total							2.37

Black Shirt: Heavy Ink Setting (white Medium 3; Color Light 2)

	Sample 1		Sample 2		Average		Total Average
	white	color	white	color	white	color	
Pirate	3.0	0.2	3.0	0.2	3.0	0.2	3.2
Fish	4.2	0.2	4.2	0.1	4.2	0.15	4.35
Logo	3.9	0.3	3.5	0.3	3.7	0.3	4.0
Eagle	1.8	0.1	1.5	0.1	1.65	0.1	1.75
Fireman	3.0	0.2	2.7	0.2	2.85	0.2	3.05
Average					3.08	0.19	
Total							3.27