

# VersaPass<sup>®</sup> Best Practices

THE IMPACT OF PRINT CONTENT AND USAGE



**memjet**<sup>®</sup>

Beautiful Precision, Simplicity, and Affordability.

**VERSA**PASS<sup>®</sup>

## CONTENTS:

|   |          |
|---|----------|
| <b>The Impact of Nozzle Usage and Print Content</b>                   | <b>3</b> |
| PRINTING WITH A PAGE WIDE PRINTHEAD                                   |          |
| IMAGE CONTENT - USAGE & WEAR  |          |
| <b>6 Techniques for Optimizing Nozzle Utilization</b>                 | <b>6</b> |
| #1 IMAGE LAYOUT CONFIGURATION   |          |
| #2 IMAGE ROTATION   |          |
| #3 SHIFTING THE IMAGE POSITION  |          |
| • PRINTHEAD LIFE IS DETERMINED BY THE NOZZLES<br>THAT FIRE MOST OFTEN |          |
| • EXAMPLES OF REPETITIVE VERTICAL ELEMENTS                            |          |
| • NOZZLE UTILIZATION & IMAGE CONTENT                                  |          |
| • PEAK TO AVERAGE RATIO   |          |
| #4 PAGE ORIENTATION   |          |
| #5 INTERLEAVING JOBS  |          |
| #6 NOZZLE SMOOTHING   |          |

## THE IMPACT OF NOZZLE USAGE AND PRINT CONTENT

Image content and nozzle utilization are by far the largest variables that affect printhead life. These best practices will help you gain a better understanding of the relationship between them and provide six techniques to help you maximize printhead life.



## PRINTING WITH A PAGE WIDE PRINTHEAD

- Not all nozzles will see the same number of ejections
- Nozzles where there is no content see little usage
- Nozzles where content is present will be exercised frequently
- This can result in uneven wear across the printhead

Image content can be used as a tool in maximizing printhead life









## IMAGE CONTENT - USAGE & WEAR

Uneven wear leads to early replacement. The same principle that applies to wear patterns on a tire, is also true for your printhead.

---

The following pages include techniques to combat uneven wear so you can save time and money by reducing your intervention rate and getting the most life out of our printhead.



| Wear Pattern  |             |
|---|-------------|
|    | Center Wear |
|    | Edge Wear   |
|    | Side Wear   |
|    | Toe Wear    |
|  | Cupping     |
|  | Flat Spots  |

## 6 TECHNIQUES FOR OPTIMIZING NOZZLE UTILIZATION

Techniques for adjusting print content to even out nozzle usage & optimize the life of a printhead are:

1. IMAGE LAYOUT CONFIGURATION
2. IMAGE ROTATION
3. IMAGE SHIFTING
4. PAGE ORIENTATION
5. JOB INTERLEAVING
6. NOZZLE SMOOTHING



*\* Not every technique will be applicable to every print job or application. Once you understand the fundamentals, you can strategize during job layout and job costing to maximize printhead life.*

## #1 IMAGE LAYOUT CONFIGURATION

Using content sized to the width of the printhead can yield more ink usage/impressions per printhead.



## #2 IMAGE ROTATION

Rotating the label from 4in x 6in (10cm x 15cm) orientation to 6in x 4in (15cm x 10cm) orientation will yield more impressions per printhead by utilizing about 25% more of the printhead.





## #3 SHIFTING THE IMAGE POSITION

Physically shifting the image position over time to take advantage of the full width of the printhead will yield more ink usage and impressions per printhead.



## *PRINthead LIFE IS DETERMINED BY THE NOZZLES THAT FIRE MOST OFTEN*

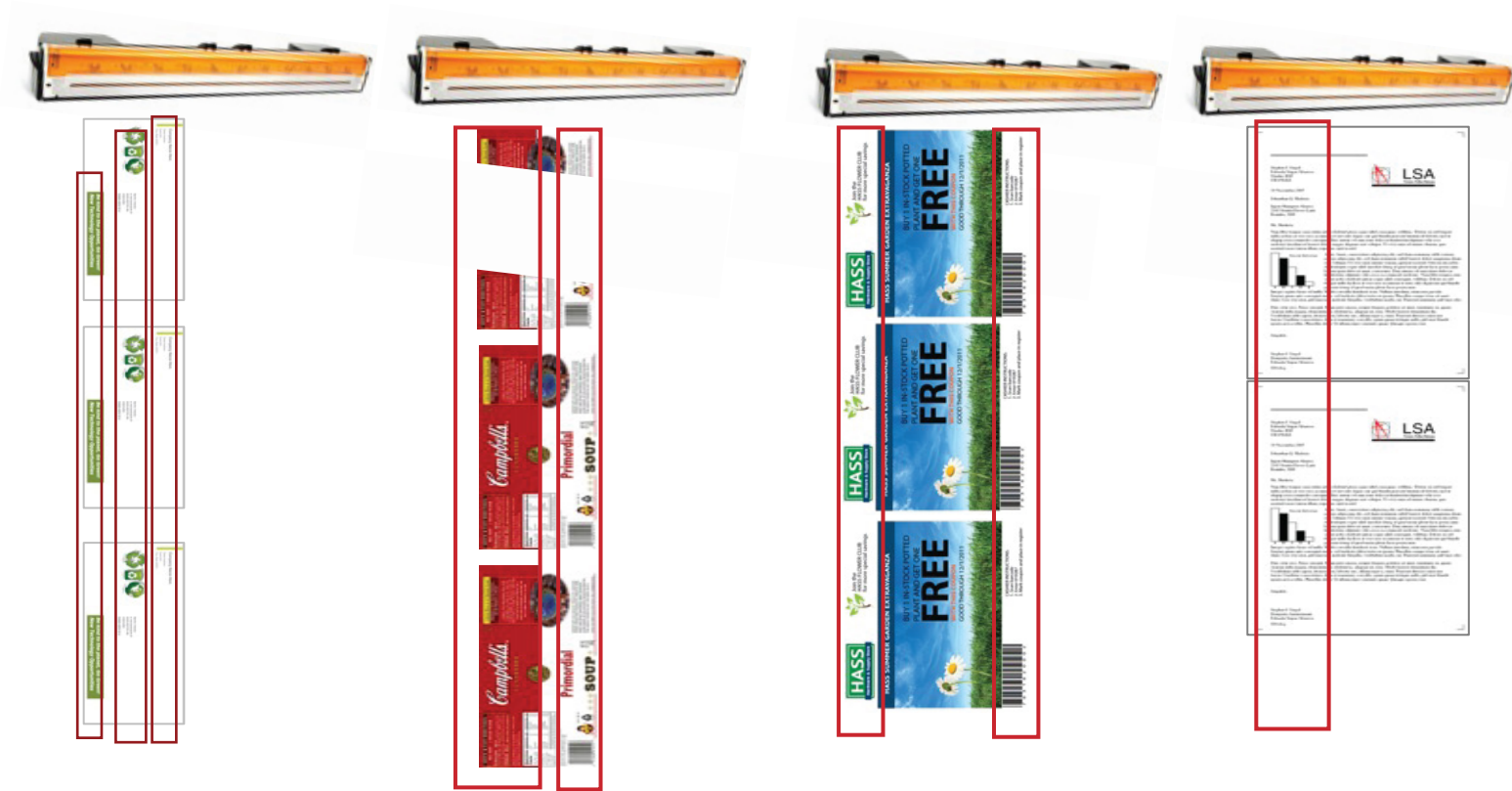
---

Image attributes known to cause high nozzle usage:

- Repeated content which is printed on only a portion of the printhead width (partial width printing)
- Repetitive vertical elements (page or image borders, table borders, barcodes, logos, addresses)
- Repetitive left-justified text

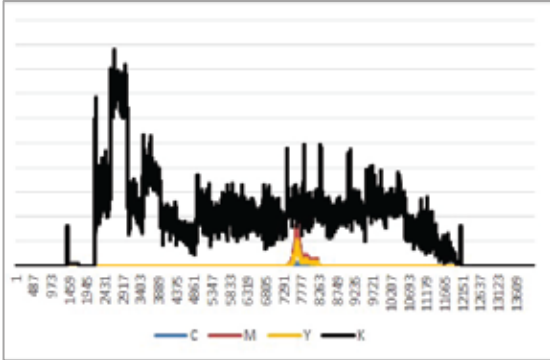
These repetitive vertical features disproportionately contribute to printhead life

# EXAMPLES OF REPETITIVE VERTICAL ELEMENTS



# NOZZLE UTILIZATION & IMAGE CONTENT

The nozzle usage graph to the right demonstrates the frequency each nozzle fires to print this image. The left side of the graph shows high nozzle usage, and this aligns with repetitive vertical elements and the left justified text.



The vertical elements are using a small number of nozzles that are fired more frequently than the rest of the page. This results in uneven wear to the printhead, similar to what we saw with partial width printing.

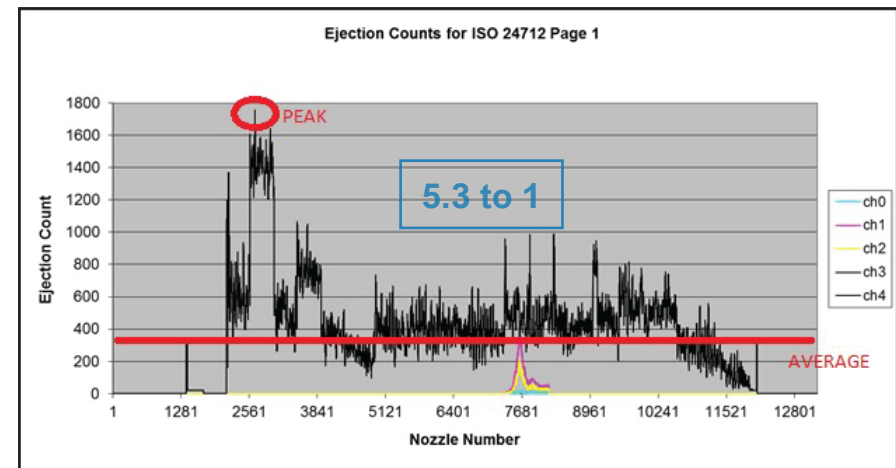
## PEAK TO AVERAGE RATIO

Memjet engineers developed a mathematical formula to describe this graph and it is called **Peak to Average Ratio (P:A)**.

1. **Determine the Peak Value.** In this example, it is ~1750 (circled in red). This means that a particular single nozzle is fired 1750 times as part of the creation of the page content.
2. **Determine the Average Value.** In this example, the value is ~ 300, represented by the red line across the graph. This is the average number of firings across all black nozzles when printing the page.
3. Then, divide the **Peak Value** by the **Average Value** and you will get a Peak to Average Ratio of ~5.3:1.

As a rule of thumb, the lower the P:A ratio, the longer the printhead lasts

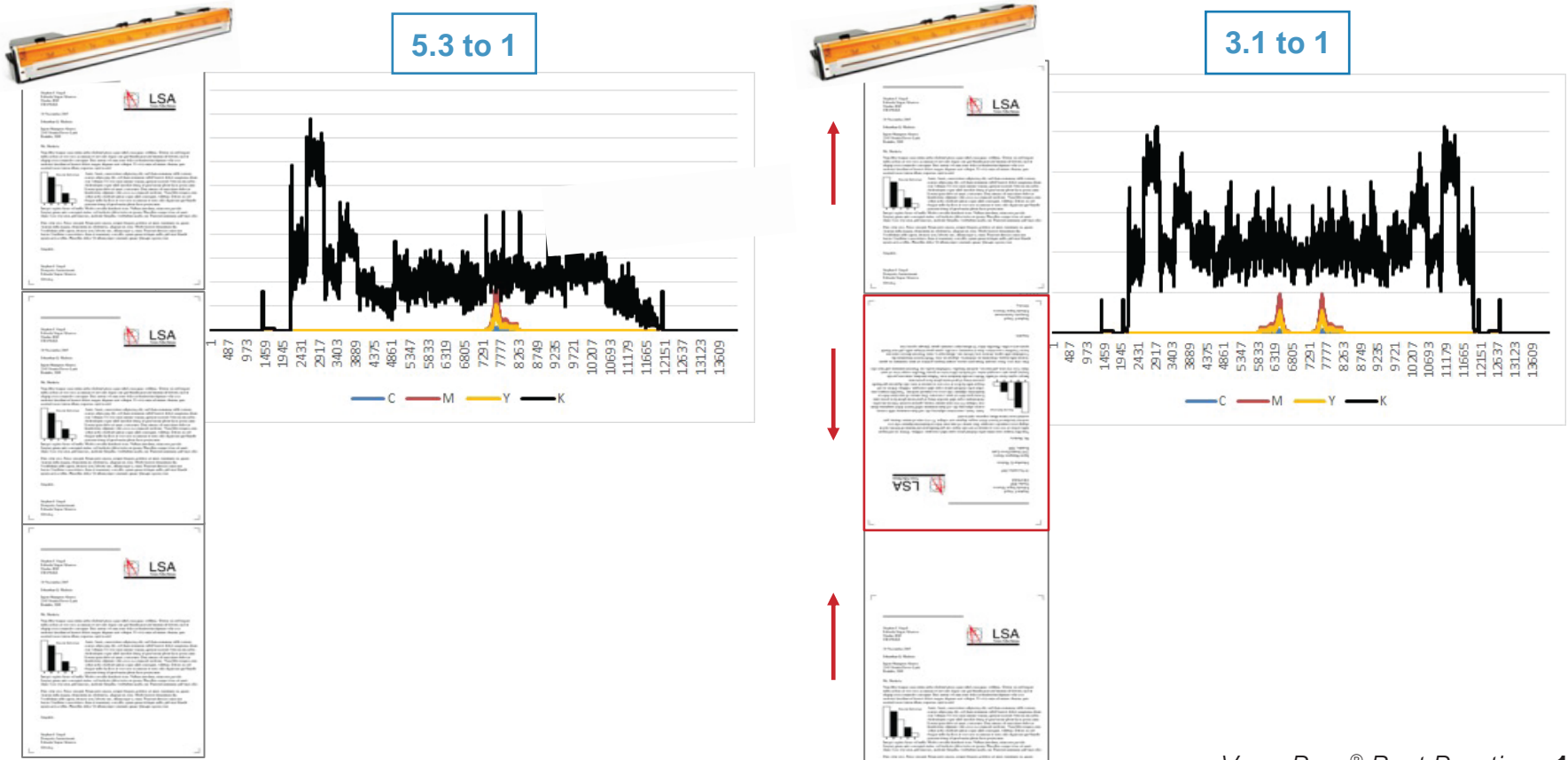
What we discovered through testing was that we can drive this ratio lower by using the various techniques explained on the following pages.



# #4 PAGE ORIENTATION

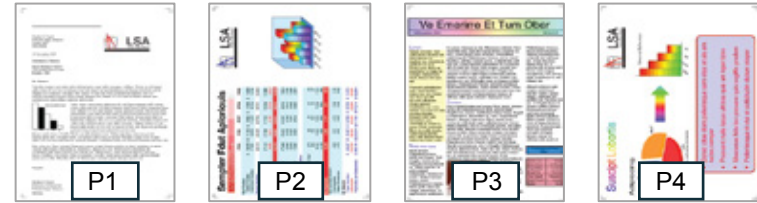
This case study looks at the ISO test document and how a combined **“Normal + Rotated”** page orientation would change the nozzle utilization.

By simply rotating every other page, the nozzle usage is more even across the printhead and we have lowered the peak to average ratio from 5.3:1 to 3.1:1 providing **~70% more printed impressions.**



## #5 INTERLEAVING JOBS

Interleaving jobs means splitting large jobs into smaller batches.



### Single-run large job sizes:

**Job A (30K copies)** →

**Job B (30K copies)** →

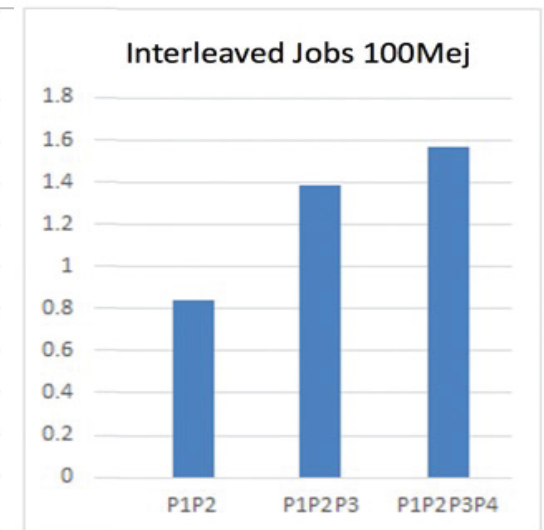
Job C (30K copies)

### Interleaved jobs:

**Job A (10K) & Job B (10K) & Job C (10K)**

**Job B (10K) & Job C (10K) & Job A (10K)**

and so on...



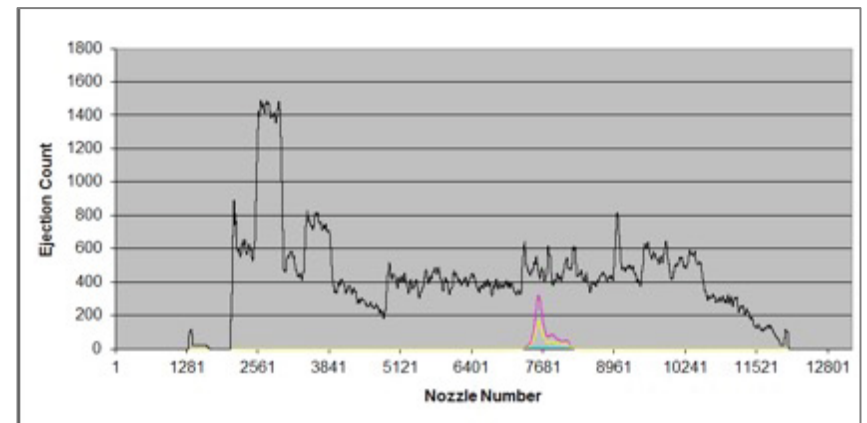
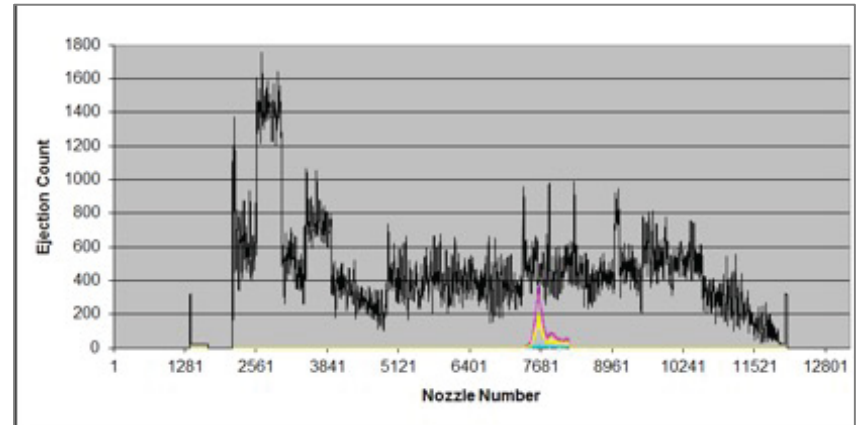
The longest printhead life is achieved when all four images are run as interleaved jobs

## #6 NOZZLE SMOOTHING

In this case study, nozzle smoothing has reduced the peak to average ratio from 5.3 down to 4.5, giving **~18% improvement in ejection life**.

- Nozzle smoothing shifts the margin of an image by 1/1600th of an inch incrementally.
- This technique creates some wander to the image margin and requires some tolerance in the application. This example shows a wander of ~1mm.

This is a software feature available in the VersaPass platform. Contact your technical support to determine if this technique will benefit your application.





## OPTIMIZING PRINTHEAD LIFE - THE TOOLBOX



Use Authentic Memjet Inks – the inks are designed and tested to meet the lifetime specs of Memjet applications



Use Memjet Best Practices to ensure optimal print quality



Don't skimp on regular maintenance intervals – nozzle health directly impacts printhead performance, print quality and printhead life



Control the environment – keep the temperature and humidity of the printing system within the specified range



Minimize exposure to paper dust and external debris, replace the MFR as recommended



**Use techniques for increasing the variation of print content to optimize printhead life**



*FOR MORE VERSAPASS TECHNOLOGY BEST PRACTICES,  
OR TO PROVIDE FEEDBACK ON THIS RESOURCE:*

Visit [www.memjet.com/versapass-resources](http://www.memjet.com/versapass-resources)



Follow us on LinkedIn [@memjet-technology](https://www.linkedin.com/company/memjet-technology)

