



White Paper

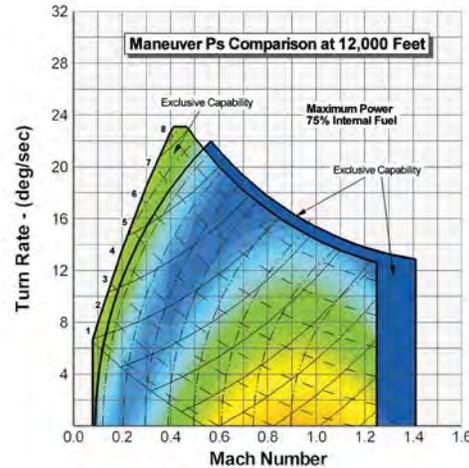
Presenting a Polished Image: How to Effectively Communicate Results

Sooner or later, we all need to share the results of our work with key players both inside and outside our organizations. When those results are significant, it's especially important that they're communicated accurately and presented in the best light possible.

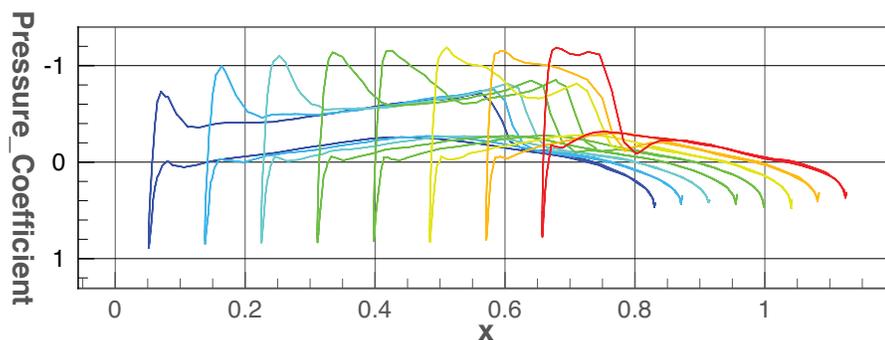
At Tecplot, Inc., we've been in the business of helping scientists and engineers communicate their CFD results for almost 30 years. We've condensed some of that accumulated knowledge into a brief paper designed to help you present your results more effectively in print, online, and on screen.

Specifically, this paper will show you how to:

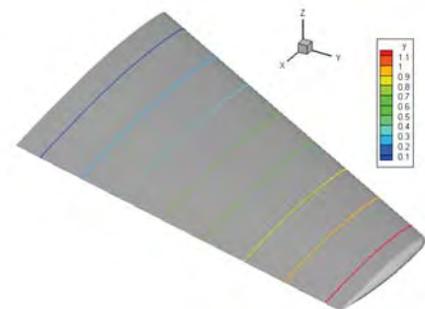
- Create visually exciting plots and layouts that will engage your audience's interest
- Use and combine colors to quickly and effectively communicate your data
- Choose fonts that allow your audience to easily scan and understand numerical or narrative information
- Select image formats that are best suited for digital, print, and online presentations



2D Mach turn rate. This one is called the "doghouse plot."



Link slices between 3D and XY Plots in Tecplot 360





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File Output Formats

Digital

If you want to share your results on screen in a presentation, an e-mail, or an informal report, export your image in the Portable Network Graphics (PNG) format. The small file size makes it light enough for e-mail and the Web, while the quality on screen is indistinguishable from the original plot. The file format also is highly compatible with operating system image viewers, office applications, e-mail applications, and modern Web browsers.

Alternate formats that produce acceptable on screen quality include Graphic Interchange Format (GIF) and Joint Photographic Experts Group (JPG or JPEG). GIF files are most commonly used for graphic images while JPG files are used for photos. With a few exceptions, both are "lossy format" files, which can yield lower quality visuals than the "lossless" PNG format. JPG files also can degrade in quality if edited and saved too many times. If you know that your audience may be using older applications that don't support PNG, select the JPG or GIF formats.

Print

If you intend to publish your images digitally as a PDF or physically as a printed piece, go with the Encapsulated PostScript (EPS) format whenever possible. While PNG is a pixel-based image, EPS is a vector image, which maintains its smooth definition when scaled. The Windows Metafile (WMF) format also works well for Windows-only applications. However, EPS and WMF files are limited in that they don't support translucency and the file sizes can be large.

Tagged Image File Format (TIFF or TIF) files are widely accepted as photo files within the printing industry. This format can handle device-specific color spaces, such as CMYK, and can support transparencies. However, TIFF and TIF files can be very large.

Raster Images vs. Vector Images

Raster images (PNG, TIFF, TIF, JPEG, JPG, GIF, SWF-Flash, and AVI) are based on pixels and do not scale very well. Vector files (EPS, WMF) are line-based and maintain a smooth definition when scaled.

When outputting raster images, export the exact size you need and create new output for every desired display size. Avoid stretching raster images beyond your target image or you will start to lose resolution and quality.

Color

Using color

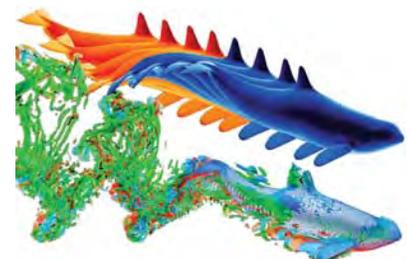
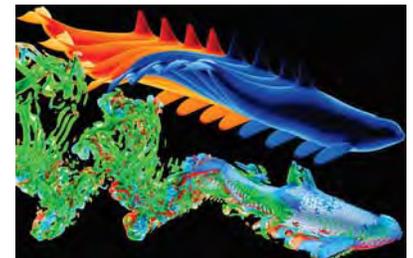
Use color to draw the eye to important data and away from less significant but visually prominent objects. For example, avoid using lots of color at the sides of your plots. White space is good, too — let your data speak for itself. Remember that dark backgrounds may look good on your monitor, but could display poorly when projected.

Color Selection

Contrasting background colors provide optimum readability, but use a white background if you're working with multiple and varied colors. Do not use saturated colors like blue and orange next to each other because the eye has trouble focusing on both simultaneously. While many engineers may still prefer the saturated small rainbow by default, you can often give your plot a communicative edge simply by de-saturating the included colors.

Make sure your choices are color blind friendly. Some types of color blindness inhibit the ability to distinguish between hues. Using other visual clues such as luminosity (the light or darkness of the color) can help.

Converting colors to grayscale can help you see the varying levels of luminosity in your chosen colors. Try converting your color scale to grayscale and seeing if you can distinguish between the values that the color portrays.





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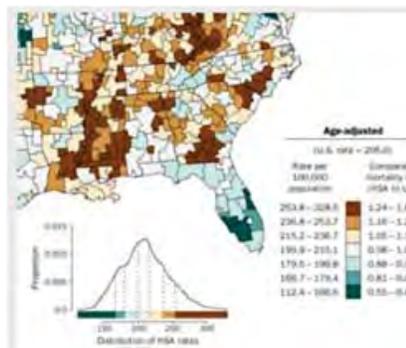
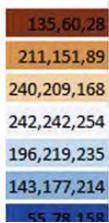
Color Scales

Color mappings—using different colors to show different variable values—can communicate information more or less successfully depending on color choice. Many scientists map small-to-large variable values to small-to-large light wavelengths, but the brain does not interpret colors of varying wavelength as a scale (for example, red does not look “shorter” than violet). Thus the typical rainbow of colors is not very effective in communicating a small-to-large scale of variable values. Rainbow colors work well for “quantitative” color mappings—in which the variable values do not imply a numerical relationship, such as latte flavors like chocolate, caramel, and hazelnut—other color scales portray scalar variable values more easily. Mappings that portray scalar variable values more intuitively show a sort of gradient, such as light to dark (sequential), or the change of one color into another color (divergent and two-color). Choose a mapping type that makes it easy for others to understand your data. The following mappings represent a sampling from ColorBrewer software. For more overview on these scales, visit www.colorbrewer.org.

Divergent mappings emphasize extremes of the data spectrum while also highlighting critical values in the middle of the range. The lightest color appears as the middle value, and the darkness of each color increases according to the value’s distance from the center value. Use these divergent scales especially when the data range uses zero as the middle value, or adjust the range so that the lightest color falls along the zero point (such as the national average or the accepted value).

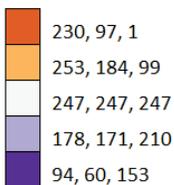
1. Earth and Sea

This adjusted two-color divergent scale has yellow added in the middle for increased differentiation. It is especially good correlating colors to a natural phenomenon, such as elevation. It is friendly to red-green color blindness, modern HD monitors and color printing.



2. Warm to Cool

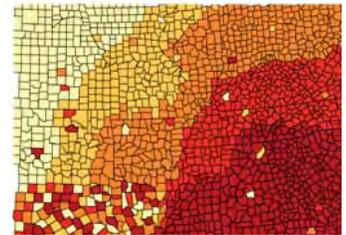
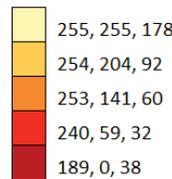
This mapping uses a divergent scale with a warm color on one end and a cool color on the other. It is (red-green) color blind friendly, and works well modern HD monitors. It also may be good for color printing, depending on the printer,



Sequential mappings are appropriate for displaying data that progresses from low to high values. Steps of lightness (changes in luminosity) order these mappings, with lighter colors for lower-valued data. The linear progression of luminance makes these mappings friendly to color blind, gray scale and printing situations.

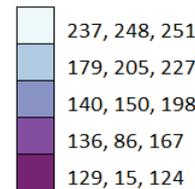
1. Warm Sequence

This scale is color blind friendly, and works well with modern HD monitors. It is also may be good for copying and color printing.



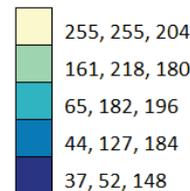
2. Cool Sequence

This scale is color blind friendly. It also is possibly friendly with modern HD monitors and color printing. It increases linearly in luminance.



3. Cool Sequence for Printing

This scale, also from colorbrewer.org, is color blind friendly, color printing friendly. Possibly friendly to modern HD monitors. Increases linearly in luminance.



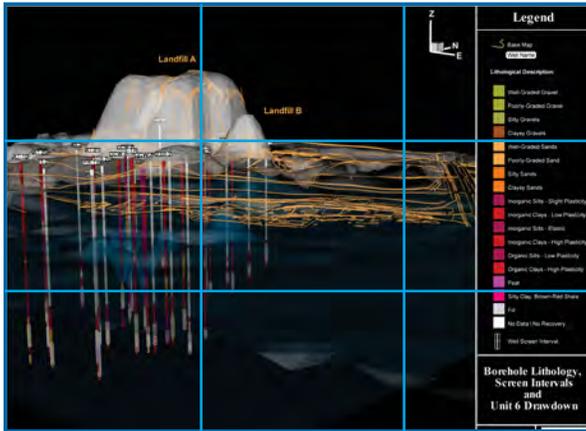


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Layout

Rule of Thirds

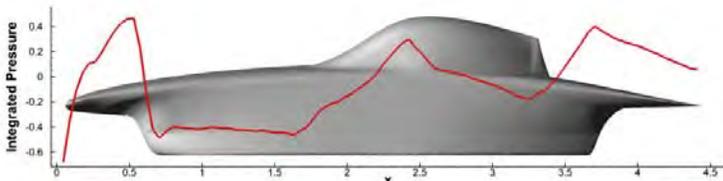
One of the best and easiest ways to create visual energy is called the "Rule of Thirds." Imagine your layout divided into thirds vertically and horizontally. Align the most important objects (titles, plots, images) in your layout along these imaginary lines and / or near the intersection points to make your layouts more engaging.



Make Room

Make sure there is enough space between the objects in your layout and the frame of your layout. Creating enough space (also referred to as "head room," "nose room," "looking room," or "air") around an object eliminates the perception that the subject is about to fall out of the frame. Make sure there is enough space in the area towards which an object is facing or moving, as well. For example, put a little more space in front of a car to show the viewer that the car has somewhere to go.

Conversely, too much space can overwhelm or marginalize an object. If you're having a challenge determining whether you've put the right amount of space around an object, cross-check your layout against the Rule of Thirds. Do the main objects align with the lines and intersection points? If they aren't aligned, adjust the position of your objects accordingly (without changing their sizes) and it will probably solve the spacing problem.



Common Layout Elements

Text & Fonts

When using multiple text blocks, create an obvious and consistent size hierarchy that makes a distinct difference between titles and sub-titles. Avoid cluttering the layout with different fonts. Your message will get lost in a jumble of fonts, so use no more than two — one for headings and one for text. As an alternative, use different fonts within the same font family, such as bold for the main title and regular for secondary headers. Avoid overlapping labels or text.

In scientific and engineering presentations, complex formulae and equations are often needed to explain your plot. LaTeX fonts are a commonly used notation that can be easily installed and used with compatible plotting software.

Keys

Include a clearly defined color legend, as well as a title block with company name, logo, and plot title. You also may want to include your name, title, and contact information.

Boxes, Rule Lines, and Arrows

These graphic tools help show off important information. Use sparingly, however, or nothing will stand out and your layout may look cluttered. When using box borders, don't forget to offset the text from the edges with some space.

Reverses

Light text on dark background draw attention and are easy to read, but tiring to the eyes. Avoid using thin fonts because they tend to disappear when reversed.

Tecplot 360 is a suite of CFD visualization tools designed to handle large data sets, automate workflows, and visualize parametric results. Integrated XY, 2D and 3D plotting helps you quickly make engineering decisions. Publication-quality images and animations can be exported in many different formats to communicate your results with detail and accuracy.

Use Tecplot 360 to visualize, analyze and communicate your CFD results:

<https://www.tecplot.com/360>