

Software Instructions

The **SprayScan mPT** mobile patternator is a portable spray characterization instrument that allows a user to quickly and easily receive information on the coverage, pattern, and distribution of a spray.

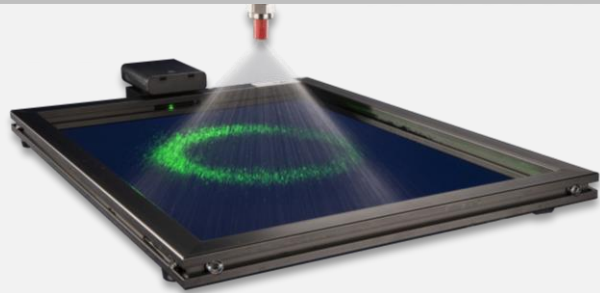


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1.1 Best Practices

When recording the spray, there are a few things to keep in mind:

- Use a black background behind the spray to reduce noise and other features in the data image.
- A dense spray plume above or below the laser plane may obscure spray area. Therefore, try to acquire the image from a camera position that minimizes this effect.
- Capture the video from either directly in **front of, or behind**, the laser. This will result in the brightest spray pattern being recorded, which leads to a more accurate analysis. However, over-saturating the image intensity is also bad and therefore the camera may need to be raised or lowered.
- Use a tripod, or another other way to mount/stabilize the frame. The bottom of the frame has 4 removable rubber feet that are compatible with standard mounting hardware (tripods, etc.).

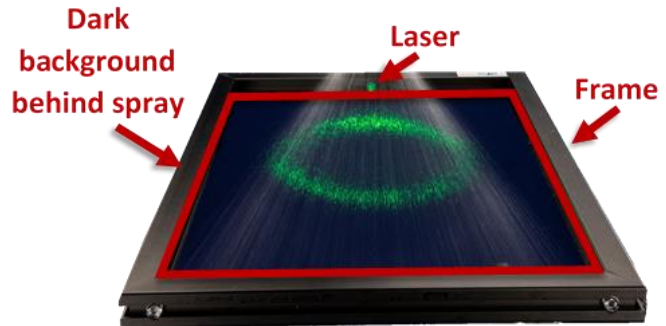


Figure 1: Data Collection



2.1 Load Data

Video and image files can be imported into the SprayScan mPT software.

Compatible video files: *.mp4, .mpeg, .flv, .wmv, .mov*

Compatible image files: *.jpg, .jpeg, .png*

2.2 Video Processing Options

The video processing method can be specified in the software preferences window ([section 7](#)). The two options in the preferences window are intensity averaging ([section 2.21](#)) and intensity summation ([section 2.2.2](#)).

2.2.1 Averaging

By default, the video processing option is set to “Averaging”. This method averages together the intensity values for the first 100 (or fewer) frames of the video. Averaging the video frames together results in a more accurate representation of the spray plume.

2.2.2 Summation

The “Summation” method adds the intensity values from each frame in the video together. This can be used for displaying all of the particles observed in a video. This option works well when a particularly sparse spray is imported.





3.1 Frame Selection

The software will attempt to auto-detect the frame of the SprayScan mPT, which is represented by a blue polygon. Some user adjustment may be required to position the polygon directly overtop the frame. To perform this adjustment, simply click and drag the inner corners of the frame until the blue polygon and the **inside of the frame** are aligned, see Figure 2. In this window, when clicking onscreen, the nearest point (of 4) is activated and transferred directly to the cursor's position.

Verify the length and width of the SprayScan mPT frame being used. The standard inner frame dimensions are 11"x 15". If necessary, these values can be changed by typing new values into the X & Y dimension boxes.

Press once the frame is fully defined.

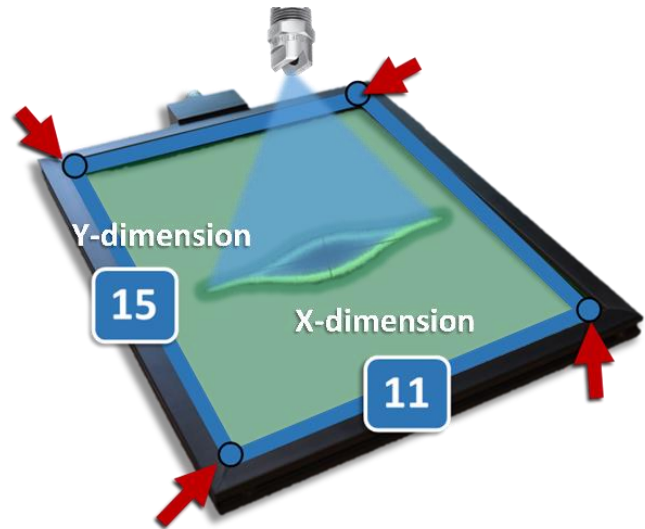


Figure 2: Frame Selection

3.1.1 Frame Calibration

The frame calibration feature can be used to save the position points of the frame within the figure window. When loaded, a frame calibration file can be used to replace the Frame Selection step ([section 3.1](#)). When this feature is used, the physical positioning of both the laser and camera cannot be changed. If either of these items is changed, a new calibration file must be used.

When is selected:

The user will be asked to save a frame calibration file (.fmpt file extension) after the Frame Selection ([section 3.1](#)) step is complete. The .fmpt file contains information on the location of the frame points and the size of the frame.

When is selected:

The user will choose a previously created frame calibration file to load into the software. Once the file is loaded, the software can run without any user input on the frame size or location.

3.2 Spray Selection

Once the frame is characterized, an image of the illuminated spray plume will load onto the screen. Similar to the Frame Selection step ([section 3.1](#)), a blue rectangle will encompass the target area, for this spray. If necessary, click and drag to adjust this rectangle until it fully contains the spray area.

Press once the spray is fully defined to continue.

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Spray Contour Settings



After the spray is fully defined, the distribution result will automatically load. The **Figure Display Settings** window allows for customization of the spray distribution display.

4.1 Grid Toggle



This toggle adds and removes the X and Y grid lines from the plot window.

4.2 1D Distribution



This toggle generates a 1D plot of the data. This plot is a 1-dimensional representation of the 2-dimensional data. It is how the spray would look in a mechanical patternation system.

4.3 Spray Smoothing



This toggle adds and removes a smoothing factor to the spray contours.

4.4 Spray Rotation



This button allows users to rotate the spray area about its center point. The area can be rotated a full 360°.

4.5 Spray Outline



This button shows and removes a red outline, which indicates the effective spray area. This button toggles on with the spray rotation (section 4.4).

4.6 Colormap Selection



This button allows the user to choose between five different, predefined colormaps.

4.7 Refresh Plot



This button reset the layout of the plot to its default settings.

4.8 Threshold Adjustment

The threshold value can be directly adjusted by dragging the marker, located on the colorbar.

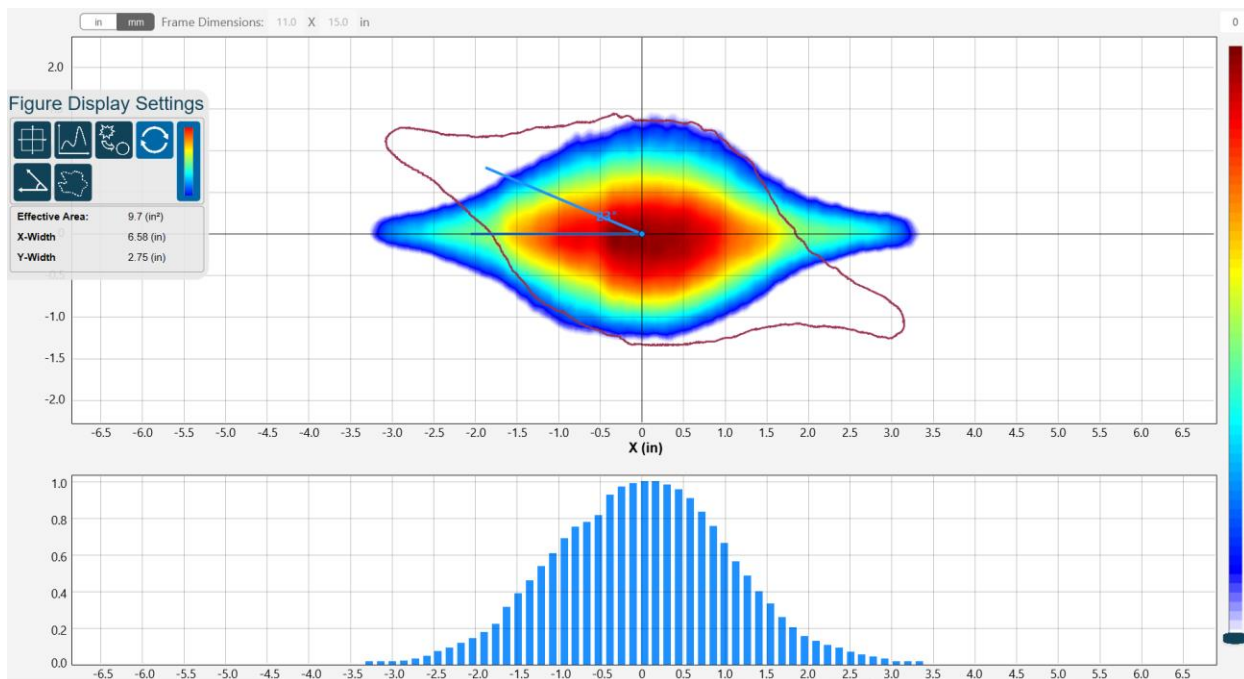


Figure 3: Spray Contour with Figure Display Settings window

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Data Export



5.1 Export Options

There are four different ways to save the data:

- An image of the Spray Contour plot (.png)
- An image of the Spray Area (.png)
- A 2D dataset of the Spray Distribution matrix (.txt)
 - These text files can be loaded directly into the Spray Comparison Tool ([section 6](#))
- A PDF containing information on the spray (.pdf)
 - The PDF can have a header with user defined project information such as the: nozzle ID, liquid pressure, spray angle, and spray height

File Name:

Location: ...

Spray Contour Image
 Spray Area Image
 TXT File

PDF Datasheet

Datasheet Header Information

Nozzle ID:
 Liquid Pressure:

Spray Angle:
 Spray Height:

Figure 4: Data Export Menu

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Spray Comparison Tool



6.1 Import Files

Text files exported from the SprayScan mPT software can be directly loaded into the Spray Comparison Tool. Two separate must be imported into the tool before the comparison can begin.

6.2 Comparison Window

The comparison window displays the correlation coefficient, X-width, Y-width, and area values for the two loaded sprays. If the percent difference between the two values is greater than the acceptable difference, the values will be red. The acceptable difference can be adjusted in the preferences window ([section 7](#)).

6.3 Plot Window

The Spray Comparison Tool allows for a quick comparison of spray patterns. Simple comparisons will help reveal problems and if necessary, indicate if a different nozzle is required to achieve the desired coverage. Comparisons are shown through five different plot options.

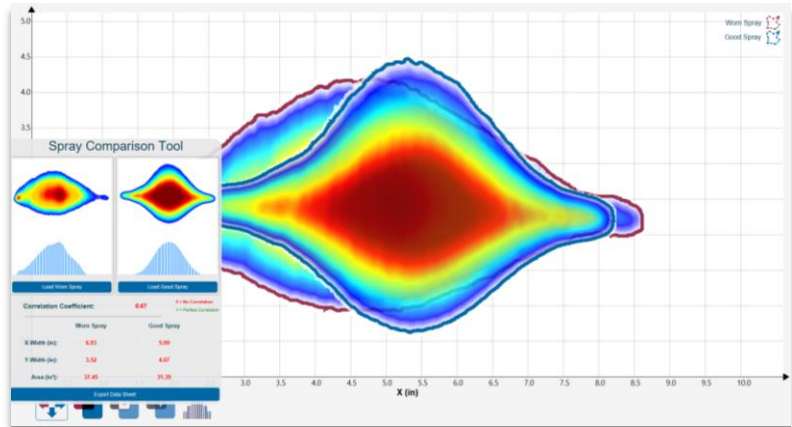


Figure 5: Spray Comparison Tool Window

6.3.1 Traditional Overlay Plot

The traditional overlay plot allows users to view both spray plumes, each with a semitransparent colormap. In this view, users can click & drag to move the spray contours independent of one another.

6.3.2 Overlay Plot

The overlay plot shows a binary overlay of the two spray plumes. Spray 1 is designated by a solid maroon color, spray 2 is designated by a solid blue color, and the overlaid portions of the sprays are designated by a solid black color.

6.3.3 Addition Plot

This plot window shows the result of the adding the intensities of the two plots together.

6.3.4 Subtraction Plot

This plot window shows the result of subtracting the intensities of the two plots from one another.

6.3.5 1D Plot

This plot window shows the 1- dimensional plots for the two sprays. In this view, users can click & drag to move the 1D plots independent of one another, along the x-axis. The percent overlap is shown in the black bar on above the two plots; the percent overlap value changes in real-time, as the plots are moved.

6.4 Data Export

Users are able to save the data from the Comparison Tool to a PDF Datasheet, see Figure 6. This datasheet contains:

- A figure of the overlaid plots ([section 6.3.2](#))
- Information from the Comparison Window ([section 6.2](#))
- A plot of each individual spray plume
- Information for each plot:
 - Filename (data source)
 - X-Width
 - Y-Width
 - Effective Radius
 - Effective Area
 - Circularity

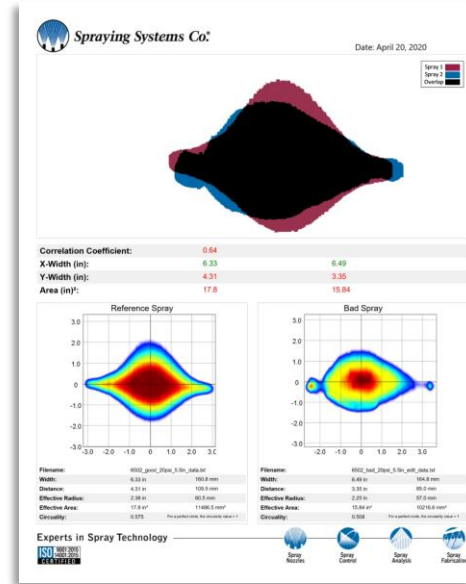


Figure 6: Spray Comparison PDF Export

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Software Preferences

In the preferences window, see Figure 7, users can personalize different aspects of the software.

For the data import, the preference options include the number of frames to process and video processing method. For the spray comparison tool, the preferences include the acceptable percent differences, and specific names for the compared sprays.

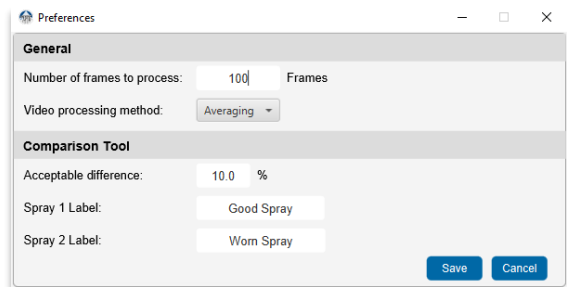


Figure 7: Software preferences window

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Example Data

Example images and text files can be found in the folder:

C:\Users\{User Account}\Documents\SprayScan_mPT\Examples

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Software Directions

The software directions can be opened directly in the software by clicking the icon in the bottom left corner of the screen.