

FlowLab 1.2.10 User's manual for
057:020 Fluid Mechanics and Transport Process

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Quick Reference of how to use FlowLab 1.2.10

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1. Folder structure of FlowLab

1.1 Working directory

Usually, working directory is named as 'myflowlab' in the PC you are using, and the work that is being executed is housed in '.scratch.(JOB-ID)' folder under 'myflowlab' as seen in Figure 1.1. It is strongly recommended that the '.scratch.(JOB-ID)' folder **should be deleted after your work is saved to your own directory that is made under myflowlab** (see 1.2 for more detail) since it wastes the capacity of the hard-disk a lot.

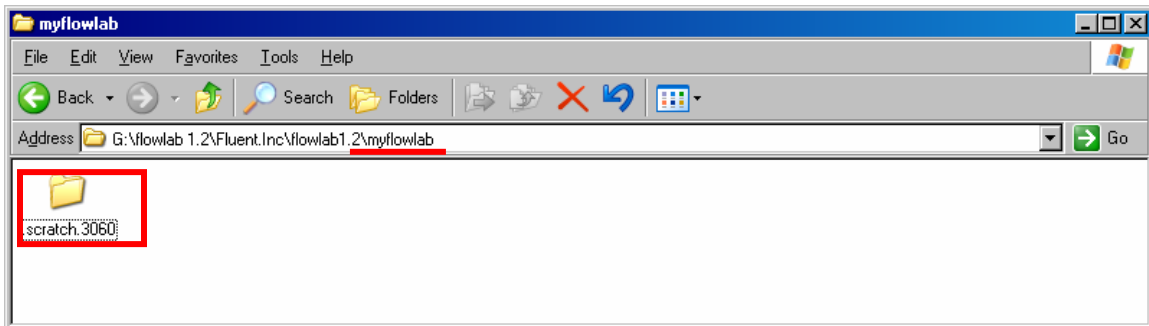


Figure 1.1 - Example of working directory

1.2 Saving your job with unique name

You must save your own work in this directory **with unique name** as seen in Figure 2. To save your work, 'File'→'Save as...'→type in your own job-name→'Accept'. Then, go to 'myflowlab' and confirm if your own job is saved with unique.

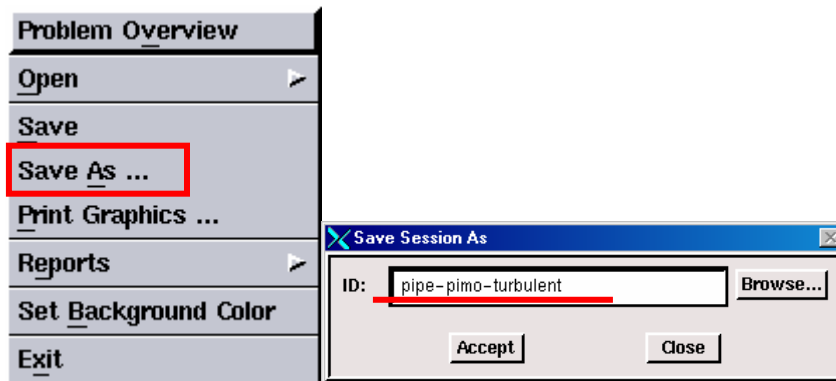


Figure 1.2 - Example of saving directory

2. Save the figures and data with appropriate format

2.1 Save the XY-plots figures with printer-friendly format

In the XY-plots window (see the Figure 2.1.1 and Figure 2.1.2),
Hardcopy → choose the export format (i.e. extension) of a figure → check 'Printer Friendly Colors' box on → Browse... → go to your own save-dir (because default setting might be working directory) → type the file name in 'File Name' box → Ok → Save

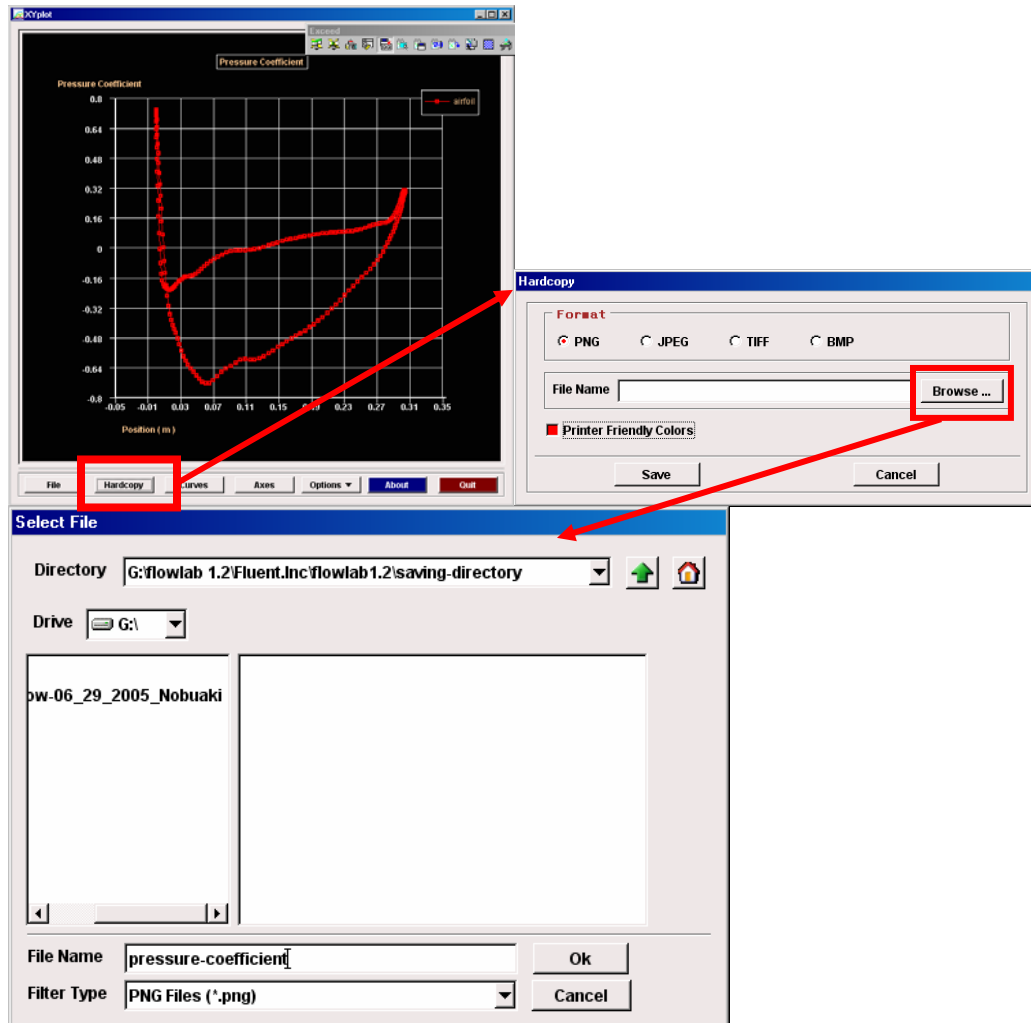


Figure 2.1.1 – Example of exporting XY-plots figure

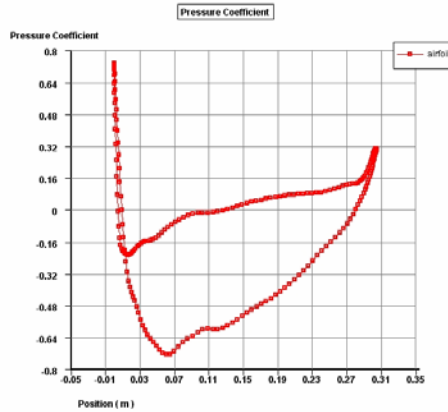


Figure 2.1.2 – Example of Printer-friendly XY-plots figure

2.2 Save the contour/streamline/vector plot

In the main window (see Figure 2.2.1),

File→Print Graphics→in the ‘Destination’ section, choose ‘File’→choose the export format of the figure (Make sure that the ‘File Name’ box is **blank!!**)→Browse...→type in the correct path of your own save-dir in the ‘Filter’ box→Filter→type in the name of the figure that you want to save in the last line of the file-path seen in ‘Selection’ box→Accept→Accept

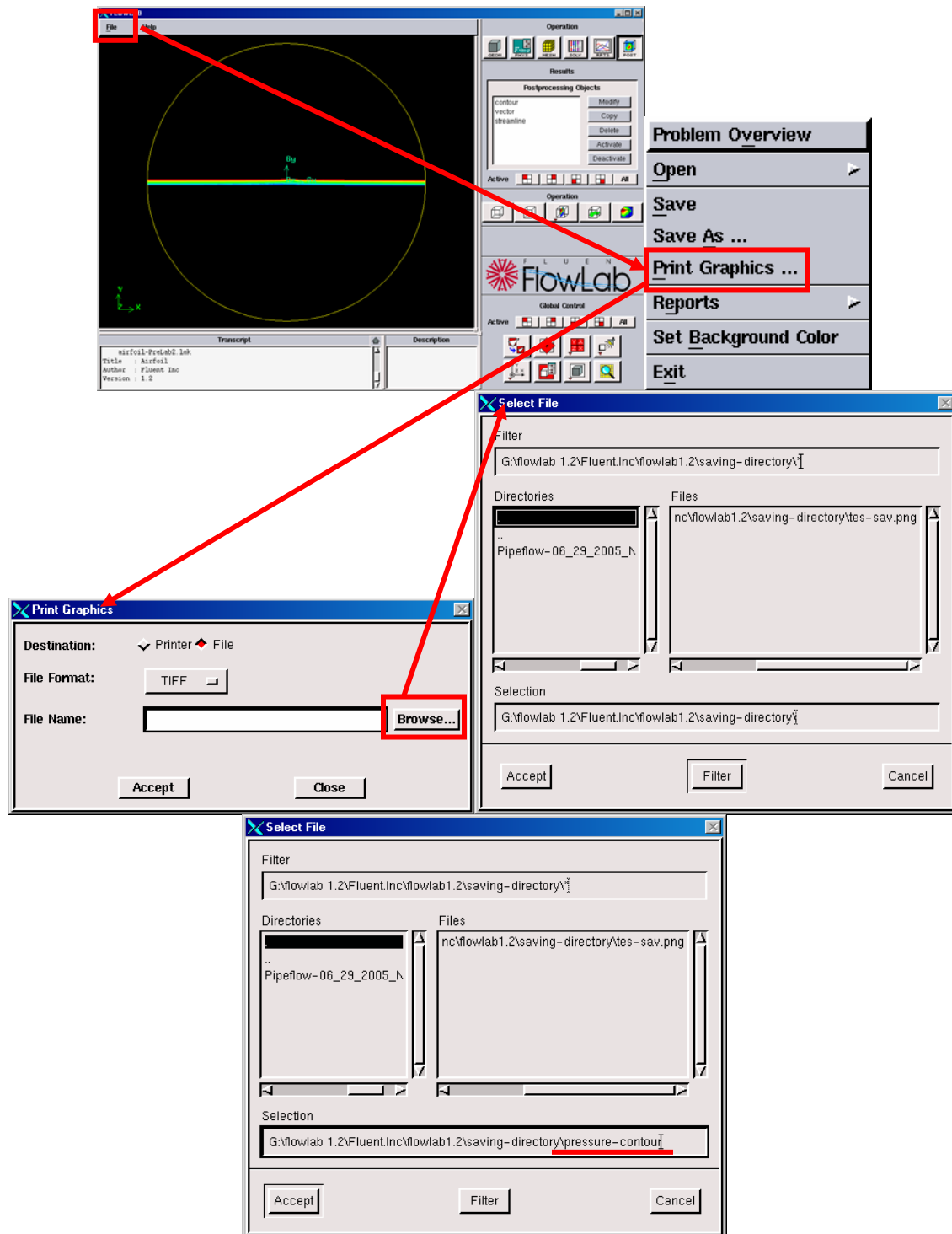
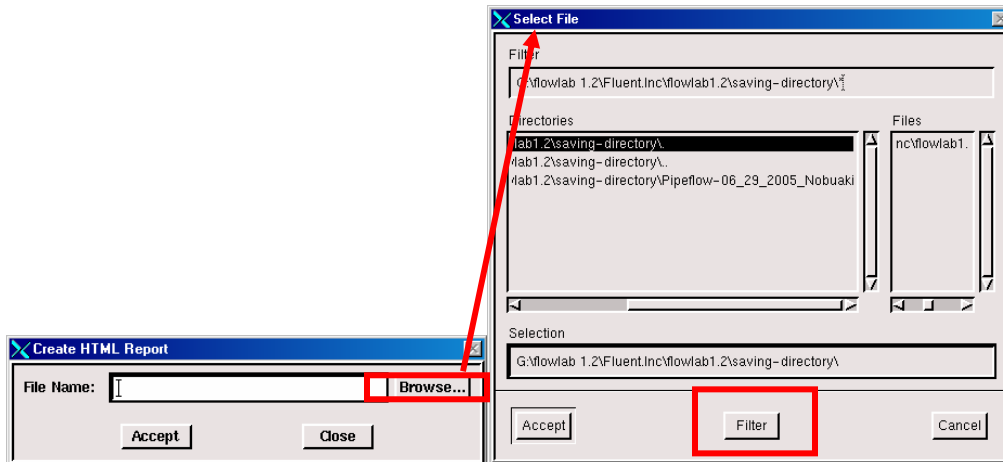
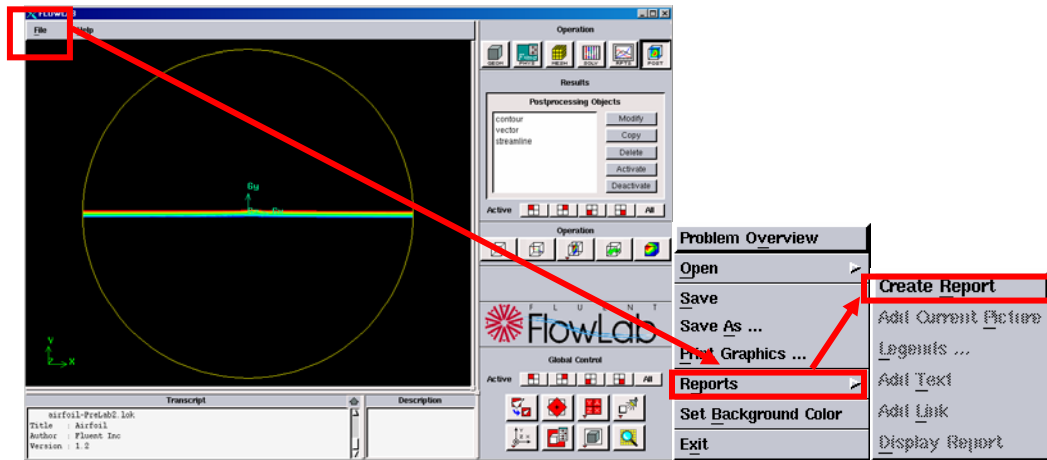


Figure 2.2.1 – Procedure of exporting contour/streamline/vector figure

Save the report file by HTML format

In the main window (see Figure 2.3.1)

File→Reports→Create Report→Browse...→ (Make sure that the 'File Name' box must be **blank!!**)→type in the correct path of your own save-dir in 'Filter' box→Filter→type in the name of the report file that you want to save in the last line of the file path seen in 'Selection' box→Accept→Accept



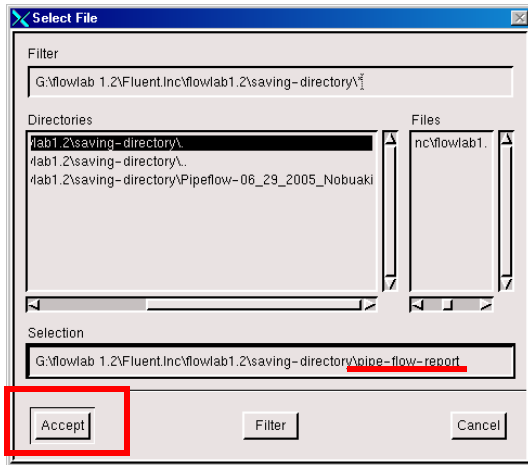


Figure 2.3.1 – Procedure of exporting report file by HTML format

3. Importing and exporting the data

3.1 Importing the experimental data (i.e. EFD data) to CFD solution

Before importing the experimental/analytical data, those data must be derived by the **acceptable format so that FlowLab can read**. The format is seen in Figure 3.1.1. In Figure 3.1.1, you must type in the title of the data to be imported in section 1, type in the label of the data in section 2, and type in the label name that will be seen in XY-plots window in section 3. Make sure that the extension of the file to be imported must be **‘.xy’** or **‘.dat’**.

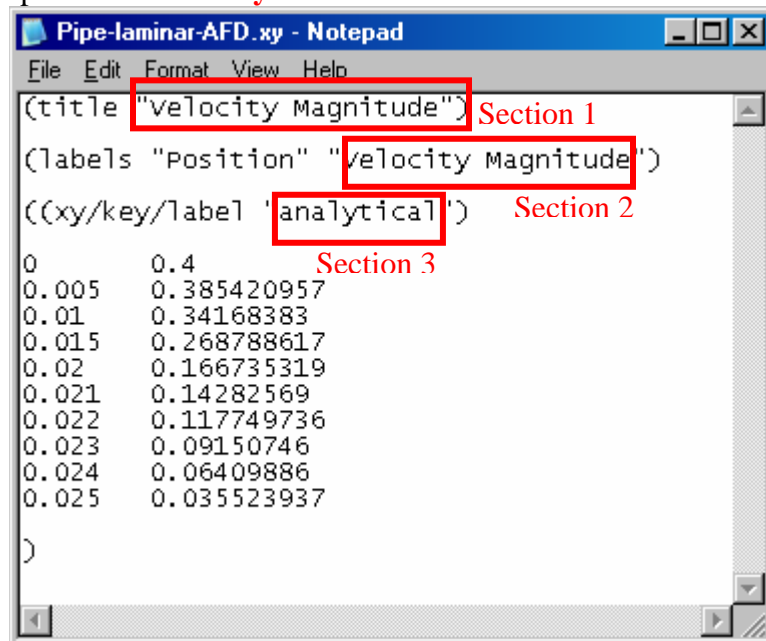


Figure 3.1.1 – Sample format of the data to be imported

After you create the experimental/analytical data with acceptable format seen in Figure 3.1.1, in XY-plot window (see figure 3.1.2),

File→check ‘Import Data’ box on→Browse...→go to the directory where the data to be imported exists, and choose the file→Ok→Import

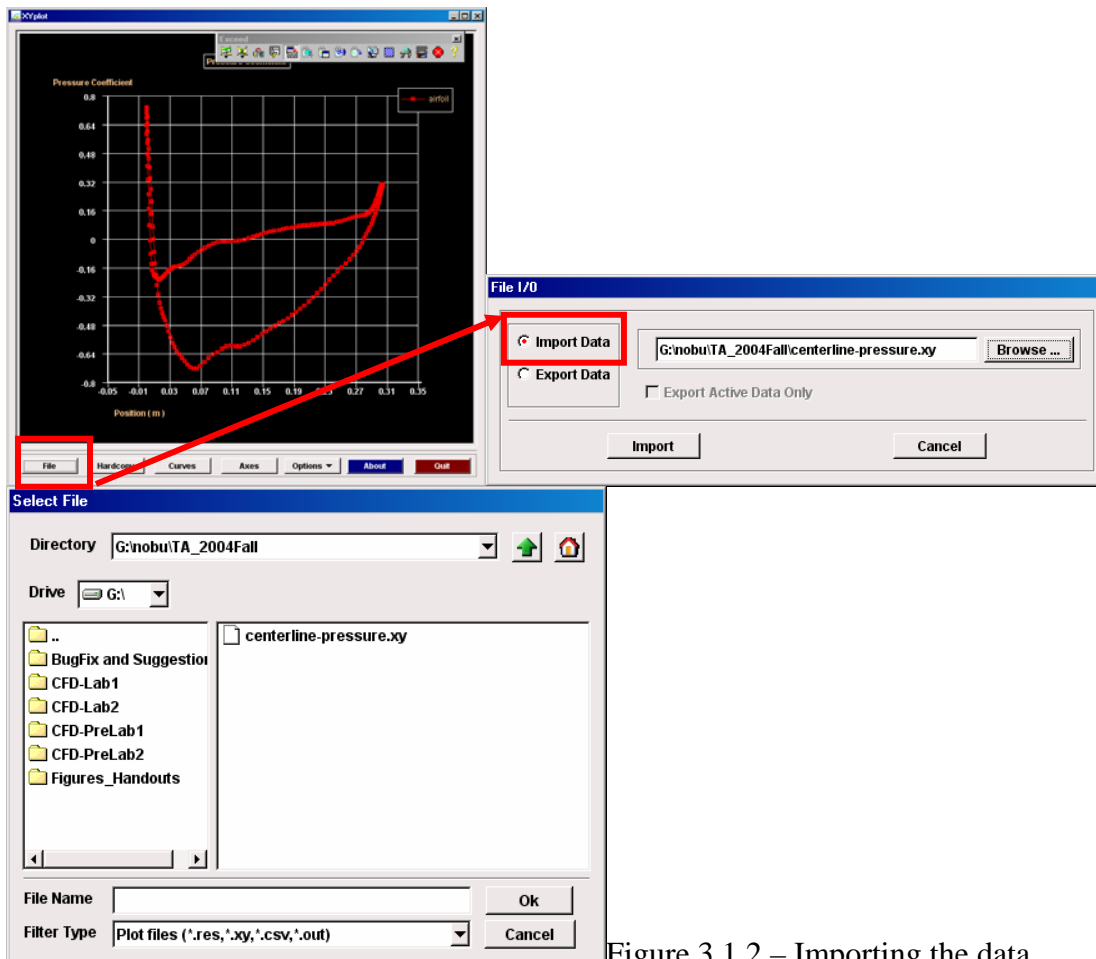


Figure 3.1.2 – Importing the data

3.2 Exporting CFD results

In XY-plots window (see Figure 3.2.1, Figure 3.2.2 and Figure 3.2.3),

File→check ‘Export Data’ box on→Browse...→go to your own save-dir and type in the file name that you want to export, then press Ok→Export→confirm the message window as seen in Figure 3.2.2→go to your own save-dir and confirm that the data is exported with ‘.csv’ format as seen in Figure 3.2.3.

*** ‘.csv’ format=‘Comma Separated Values’ format. **It can be read by Excel.*****

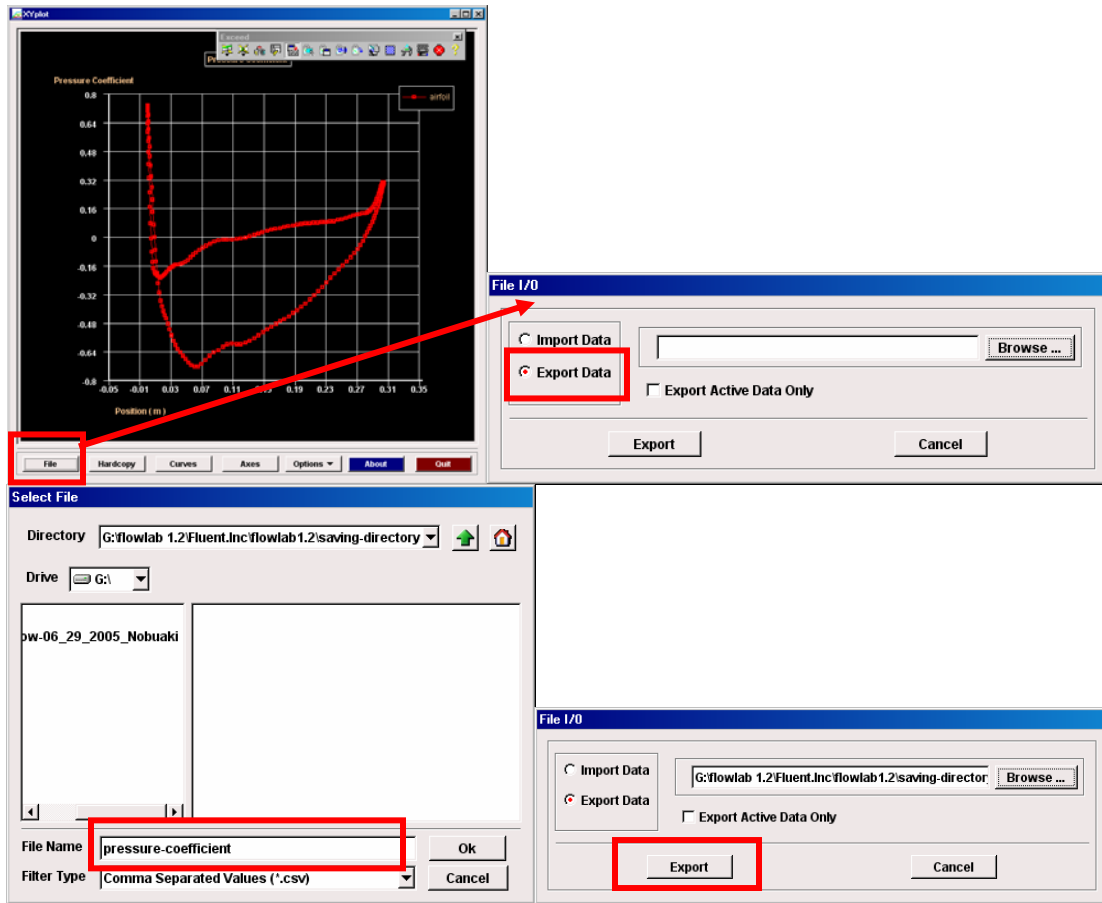


Figure 3.2.1 – Exporting the data

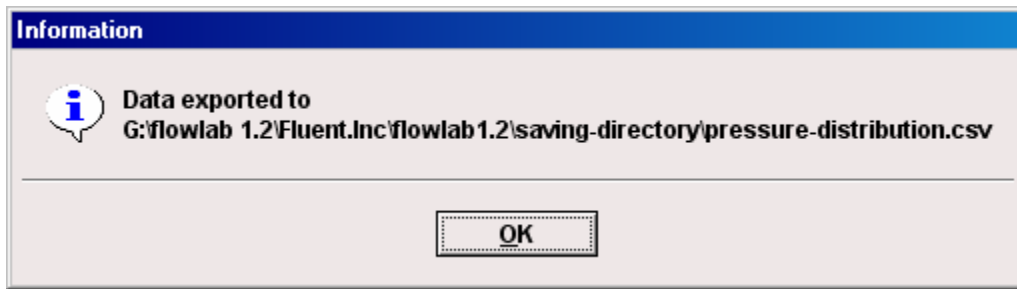


Figure 3.2.2 – Message of exporting data succeeded

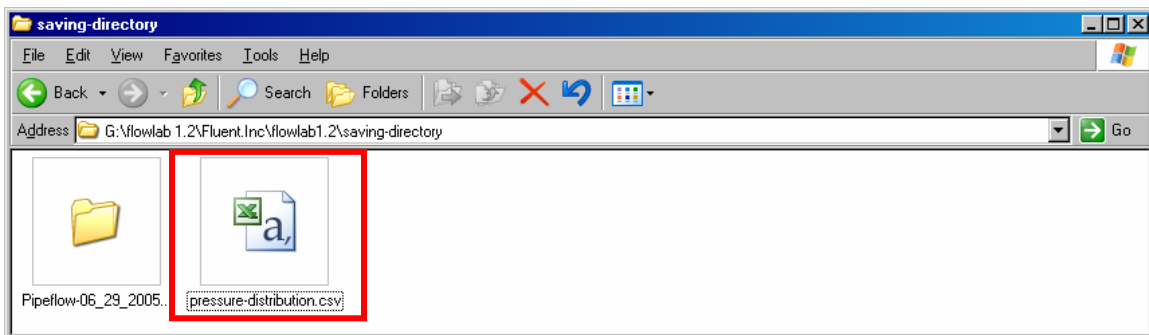


Figure 3.2.3 – Example of exported '.csv' file

4. Make the figures nice

4.1 Turn off the major and minor rules in XY-plots window

In XY-plots window (see Figure 4.1.1),

Axes → in 'Option' section, turn the 'Major Rules' and 'Minor Rules' boxes off in both x and y axis → DO NOT forget to press 'Apply' **every time after you make a change in each axis.**

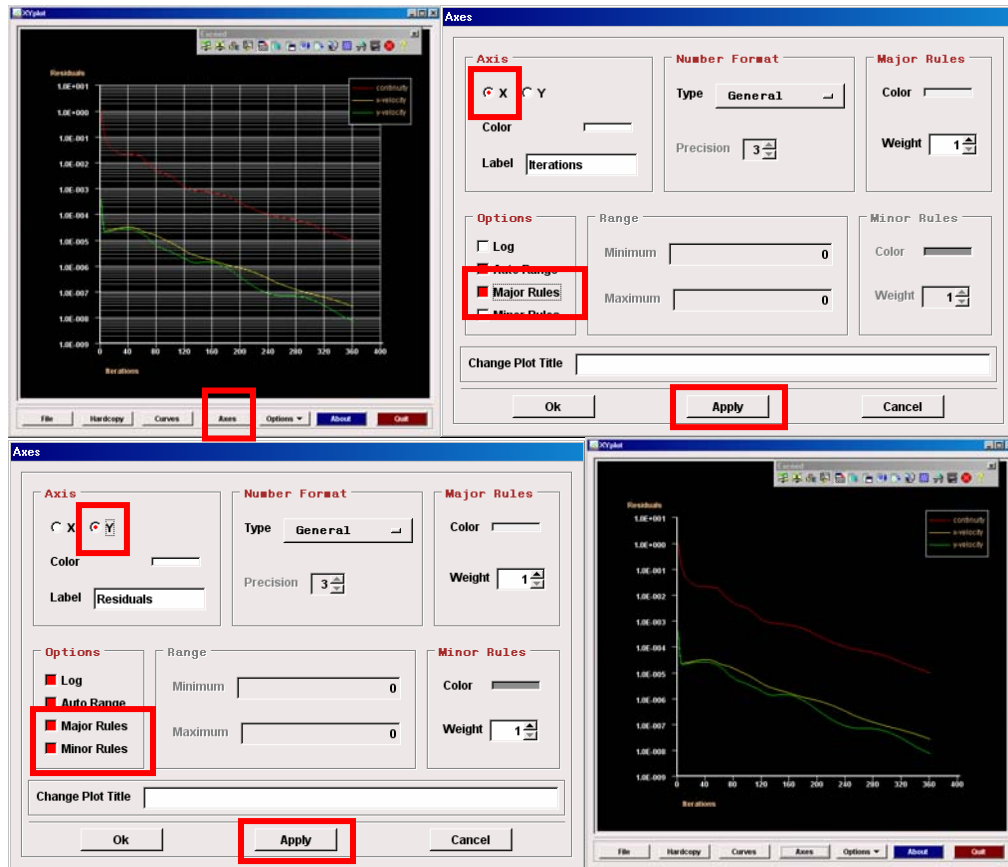


Figure 4.1.1 – Turn off the major and minor rules in XY-plots window

4.2 Don't want to show too many lines in one figure

In XY-plots window (see Figure 4.2.1),

Curves → keep pressing 'Ctrl' key and select the lines you want to show (in Figure 4.2.1, the line of continuity and y-velocity residuals are supposed to be shown.) → Apply → Ok



Figure 4.2.1 – Selecting lines to be shown

4.3 To see the color contours/vectors/streamlines

In 'Postprocessing Objects' window (see Figure 4.3.1),

Choose one of three object that you want to see → Active → Modify (Make sure that the 'Attributes' box is checked.)

***You will see red lines in both vertical and horizontal direction, however, they will disappear after you close the 'Modify Simulation Object' window. ***

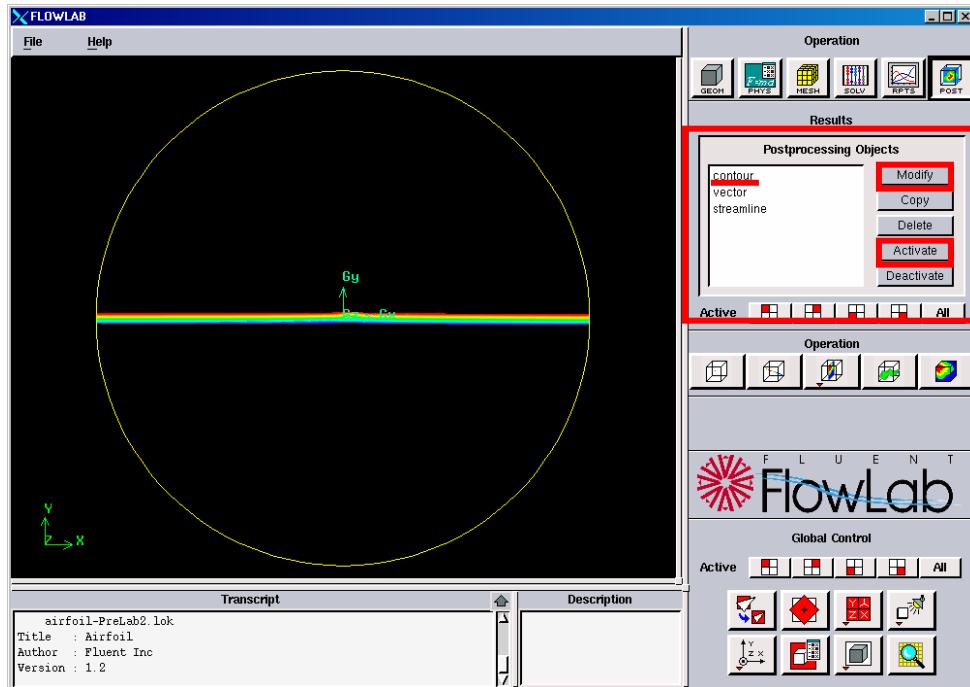


Figure 4.3.1 – Activate the postprocessing objects

To change 'contour' variables, in 'Modify Simulation Object' window (see Figure 4.3.2),

Edit→in 'DOF' box, choose one contour variable that you want to show→Apply

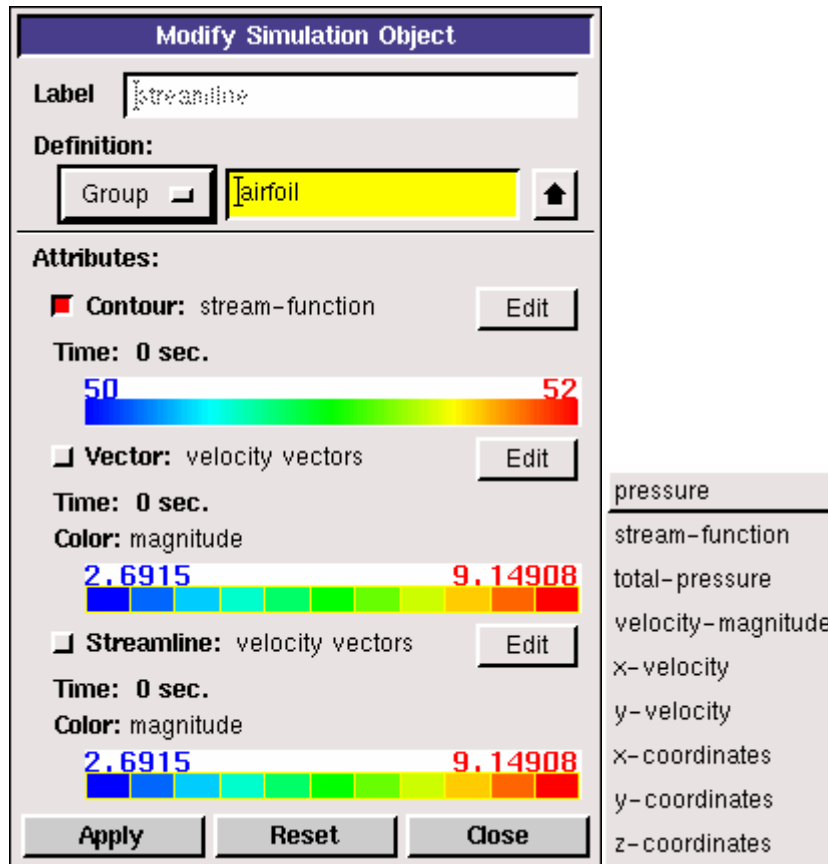


Figure 4.3.2 – Change contour variables

To change the postprocessing object (e.g. from contour plot to vector plot), in 'Postprocessing Objects' window,

'Deactive' contour first → then, choose vector → Active → Modify

In the 'Edit' mode of vector plot,

You can change the scale (i.e. length of the vector) by using 'Scale' variables as seen in Figure 4.3.3. Play around to find the appropriate size of vector to show. After specifying the scale, **DO NOT forget to click 'Apply' to update your figure.**

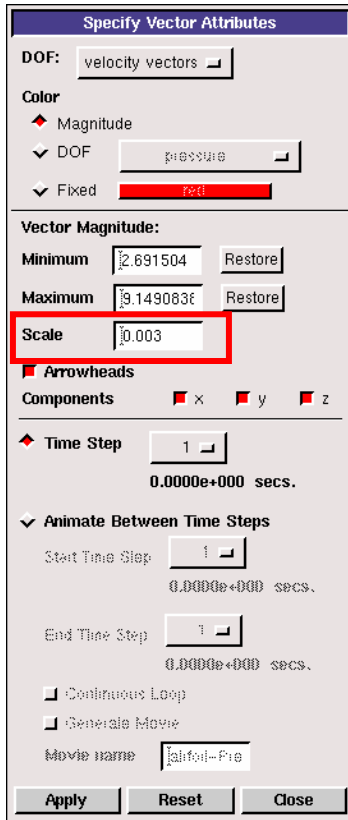


Figure 4.3.3 – Change the scale of vector

Also, you can choose any components of vectors, for instance, if you want to plot only x-component of velocity vector, you must activate only x for ‘Components’ check box as seen in Figure 4.3.4. Again, **DO NOT** forget to click ‘Apply’ to update your figure.

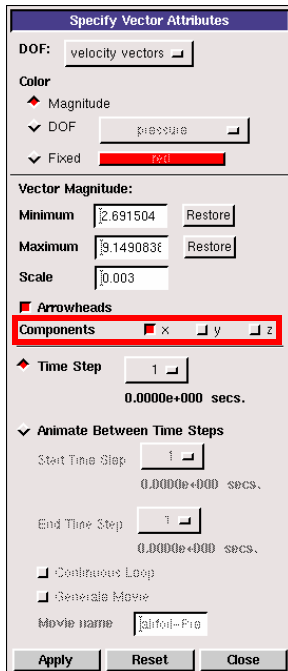


Figure 4.3.4 – Choose any components of vector

Streamline plot is equivalent to stream-function plot in ‘contour’ mode as seen in Figure 4.3.4, therefore, use stream-function plot in ‘contour’ mode and **DO NOT use ‘streamline’ mode.**

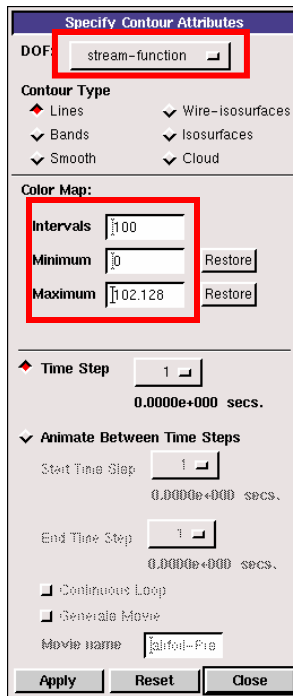


Figure 4.3.4 – Stream-function plot in ‘contour’ mode

To make the band of streamline narrow,

Edit→change ‘Minimum’ and ‘Maximum’ values of streamline as seen in Figure 4.3.4. Play around to find suitable variables of ‘Minimum’ and ‘Maximum’. The number of ‘Intervals’ is recommended as 100. Again, DO NOT forget to click ‘Apply’ to update your figure. Wide-band streamline and narrow-band streamline are seen in Figure 4.3.5.

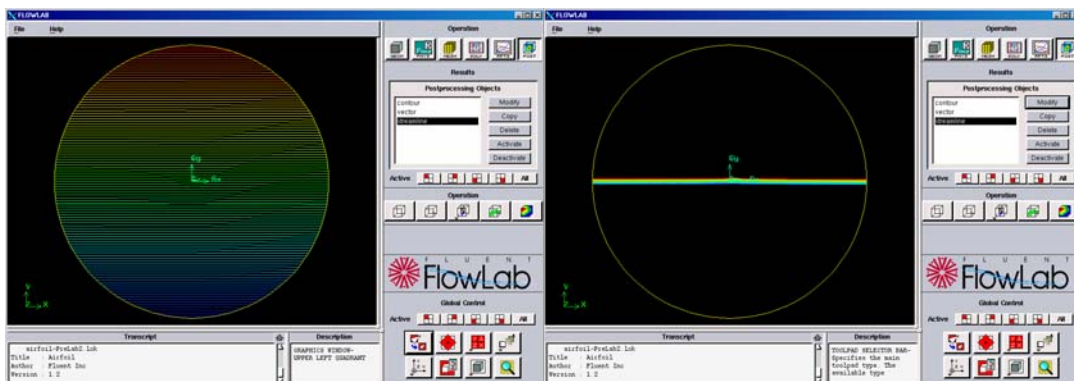


Figure 4.3.5 – Wide-band streamline and narrow-band streamline

5. Other graphical tips

To expand a part of a figure, there are two ways such as:

1. 'Ctrl' key + left button of mouse → keep pushing 'Ctrl' button and make a rectangular box to where you want to expand → let go the left button of the mouse
2. Keep pushing the right button of mouse, and move the mouse back and forth

To rotate the figure,

-Keep pushing right button of mouse, and move the mouse left and right

To move the object,

-Keep pushing center button of mouse, and move the mouse to the arbitrary direction

To recover the figure to the primary position and size,

-Use re-size and re-locate buttons as seen in Figure 5.1.1.

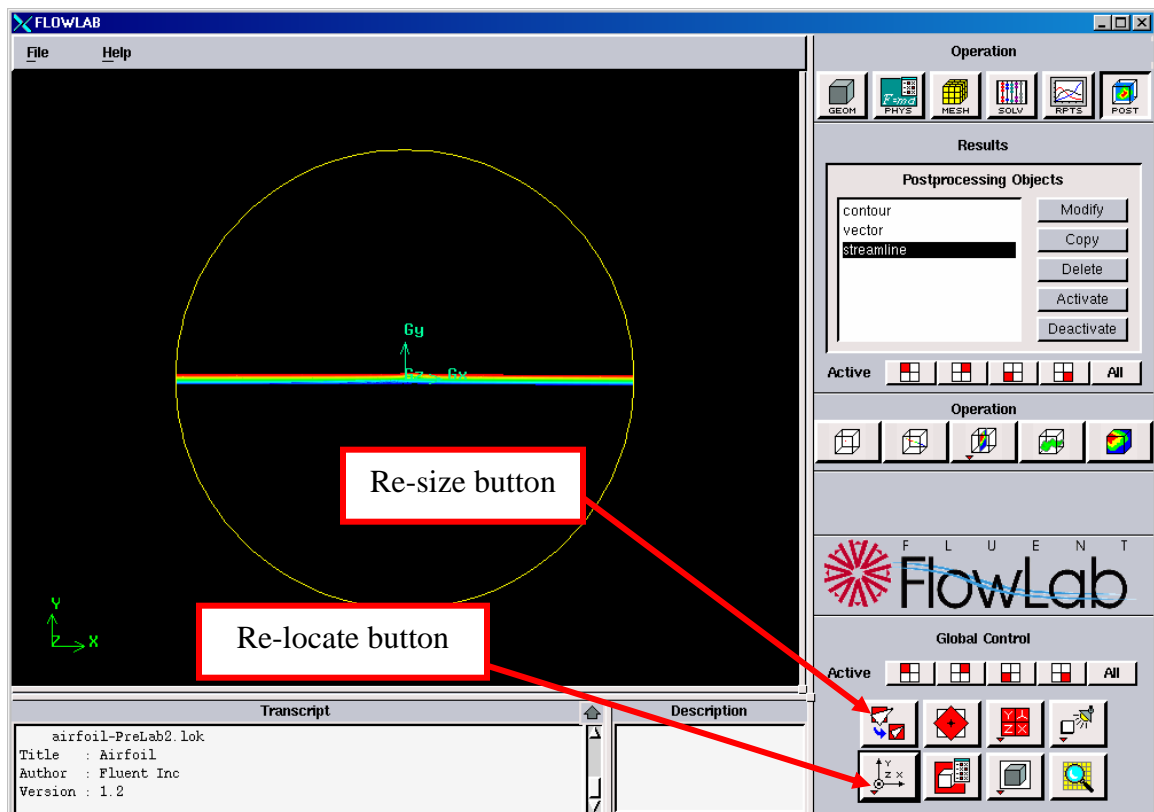


Figure 5.1.1 – Re-size and re-locate the figure