

PSYCHROGEN® 2.0 ©Airquest Limited 2010

Overview and User Guide

Table of Contents

	Page
1. Unique Features	2
2. General Description	3
3. Controls & Functions	5
4. Drawing the Chart	6
5. Using the Chart in 'Chart Mode'	10
6. Some pre-loaded examples of common psychrometric processes	11
7. Using the Chart in 'Process Mode'	14
8. Using the Calculator	18
9. Using the Multi-Alt Chart facility	20
10. Mixing of Streams	21
11. Variation of Property Values with Pressure	23
12. Using the Compressed Air facility	25
13. Customisation features	27
14. Save & Load Feature	27
15. Sources of Help	27
16. Hints and Tips	28
17. Updates	30
18. List of Features	31

An overview of the features, controls, methods and examples

PsychroGen 2.0 is a unique psychrometric charting program which fully meets the requirements of professionals, but has been primarily designed to assist in the teaching and learning of psychrometry. It has several innovative features intended to stimulate the interest of students as well as practitioners in a difficult topic and to encourage them to acquire a deeper and intuitive understanding of the complex relationships between the various psychrometric properties. Additionally, by being able to present these relationships for up to four different atmospheric pressures on the same graph, the effect of pressure on the various psychrometric properties is easily investigated and appreciated. In addition to the normal features expected from a dynamic psychrometric chart, PsychroGen 2.0 has the following unique features as well.

1. Unique Features

- Plot and view psychrometric properties on any selection of X and Y axes (as shown in the Charting Options matrix).
- Plot property values (again on any selection of X & Y axes) for up to four different pressures on the same chart, providing a unique view of how the various psychrometric properties vary with pressure (or altitude).
- A calculator that can display up to 9 property values when ANY two independent properties (see the chart availability matrix for the possible input combinations) and the atmospheric pressure or altitude is specified.
- Full flexibility in how charts are created (one or more properties at a time, or all at the same time), drawing only the specific property lines of interest.
- Full flexibility in the choice of axis parameters, ranges, graduation intervals, atmospheric pressures or altitudes, colours and sizes of lines and points.

Charting Choices Available on PsyGen 2.0

	Dry Bulb Temperature	Humidity Ratio	Relative Humidity (%)	Wet Bulb Temperature	Specific Enthalpy	Specific Volume	Dew Point	Percentage Saturation (%)	Vapour Pressure
Dry Bulb Temperature									
Humidity Ratio									
Relative Humidity (%)									
Wet Bulb Temperature									
Specific Enthalpy									
Specific Volume									
Dew Point									
Percentage Saturation (%)									
Vapour Pressure									

Psychrometric Chart
 Mollier Diagram
 Additional on PsyGen 2.0
 Unavailable

Note: The options marked by the green circles are available only in PsychroGen®2.0

All other features are common to both PsychroGen® 1.0 & PsychroGen® 2.0

2. General Description

The Application has 4 distinct sections (Psychrometric Chart, Calculator, Multi-Altitudes, and Compressed Air). One of the main objectives of the Application is to make it easier to understand the standard psychrometric chart, and its construction and use. Most of the charts that can be created by this Application have never before been available in this form, and many of these can stimulate and encourage a deeper understanding of psychrometry and psychrometric properties. Some of these charts could turn out to be rather challenging, nevertheless quite interesting, to explain.

- (a) **Psychrometric Chart:** This section contains the means to draw a comprehensive set of charts (including the standard Psychrometric Charts and Mollier Diagrams). Charts may be drawn with any two independent properties on the X and Y axes. *The selections available for the X and Y axes are (1) Dry Bulb Temperature, (2) Humidity Ratio, (3)Relative Humidity, (4) Wet Bulb Temperature, (5) Specific Enthalpy, (6) Specific Volume, (7) Dew Point and (8)%Saturation.*

The property values at any point on the chart can be directly read out from a dedicated panel. Points can be marked and Lines can be drawn between selected points. The colour and thickness of the points and lines can be easily selected by the user. The chart itself can be customised as regards atmospheric pressure, range of the various properties, colours of the various curves, which curves are to be visible or not etc. Points and Lines may be deleted either individually or wholly. Literally all aspects of the chart are customisable by the user.

Examples of various psychrometric processes are already built into the chart (Cooling and Heating with humidification or de-humidification, Cooling and Heating with sensible heat transfer only, Adiabatic Heating and Cooling, illustrations of Apparatus Dew Point and Bypass and Contact Factors, Sensible Heat Ratio and the capability to draw process lines at a given S.H.R). The user can also draw any process lines they choose to. All the process examples may be viewed against any selection of X & Y Axis parameters.

Colour schemes, sizes of points and lines, ranges and intervals selected for the various properties etc. may be 'saved' and 'reloaded' allowing users to develop appropriate presentation schemes for various occasions (Printing, overhead projection, highlighting various features etc.)

Charts may be drawn in S.I. or I.P (U.S, Imp, British) units.

A 'Process Mode' allows up to 3 points to be marked on the chart and any/all property value lines passing through those 3 points to be drawn.

- (b) **Calculator:** Calculates all the property values when the Atmospheric Pressure (or Altitude) and ANY 2 independent property values are specified. Both S.I. and I.P Units are supported. The results of hundreds of calculations (with varying pressures and other property values) can be shown on screen. Ideal for calculations involving air streams at different pressures. The properties available are: dry bulb temperature, moisture content (humidity ratio), wet bulb temperature, relative humidity, percentage saturation, specific volume, specific enthalpy, dew point and vapour pressure.

- (c) **Multi-Altitudes:** Enables the display of the various property values for up to 4 different atmospheric pressures (or altitudes) on the same chart. The 100% Relative Humidity lines can be plotted in different colours to identify the altitudes to which they correspond. Provides an effective way of understanding of how the various properties and their relationship to each other vary with the atmospheric pressure. As these curves may be plotted not only against the normal X and Y axes parameters but against any selection of X and Y Axis parameters, it will help in developing an in-depth understanding of the dependency of the various psychrometric properties

and the atmospheric pressure. Ideal for graphic analysis of mixing of airstreams which are at different pressures. The mixture could be used at either of the two pressures or at a different pressure.

- (d) **Compressed Air:** As pressure increases, at any given temperature, the amount of moisture that can be held in air as vapour decreases, i.e. the saturation temperature is lowered. For example, if a sample of air, say taken at sea level, at a temperature of 30 deg.C and with a relative humidity of 50%, is compressed to about 2 bar, it can be calculated that at 30 deg.C, it has a relative humidity close to 100%, i.e. it is close to saturation. This chart provides the facility to plot the variation of saturation temperature against humidity ratio and pressure over a wide range of pressure. This feature is ideal for calculations involving compressed air, where it becomes possible to easily determine the amount of condensate produced at any given pressure if the starting condition is known. This type of chart enables the user to very quickly and easily determine the behaviour of compressed air over a wide range of temperatures and pressures.

NOTE:

This guide does not cover all the features of PsychroGen[®] and it is expected to be used in conjunction with the other sources of help available (tooltips on the various controls, and more importantly, with the 'How To' facility on the various tabs).

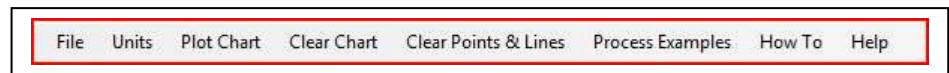
3. Controls and Functions

In general each screen has 4 sections:

- A central area that displays the chart or, on the calculator, the result columns
- A section on the left hand side containing all the control elements
- A menu bar containing all the 'action' commands
- A section on the top which contains the 'readout' panel displaying the property values at the mouse-pointer position.



The control panel on the 'Psychrometric Chart Tab



The menu bar on the Psychrometric Chart



The 'readout' panel on the Psychrometric Chart



Mode Selector



The speed selection slider. Higher speeds result in lower resolution and slower speeds give higher resolutions



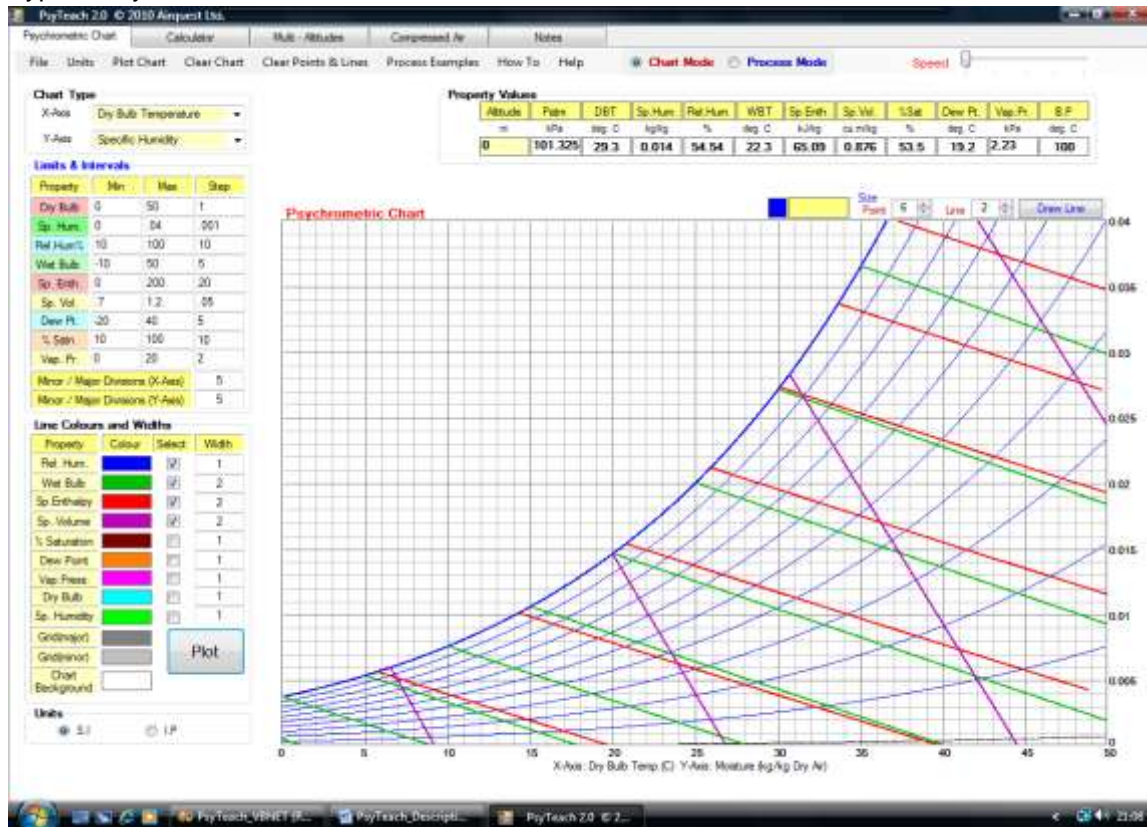
Points and Lines: Size and Colour Specification

The above are the main controls on the Psychrometric Chart Tab. The Multi-Altitudes and Compressed Air Tabs also have similar control elements. A 'page' view of some of the others are given on the following pages

4. Drawing the Chart

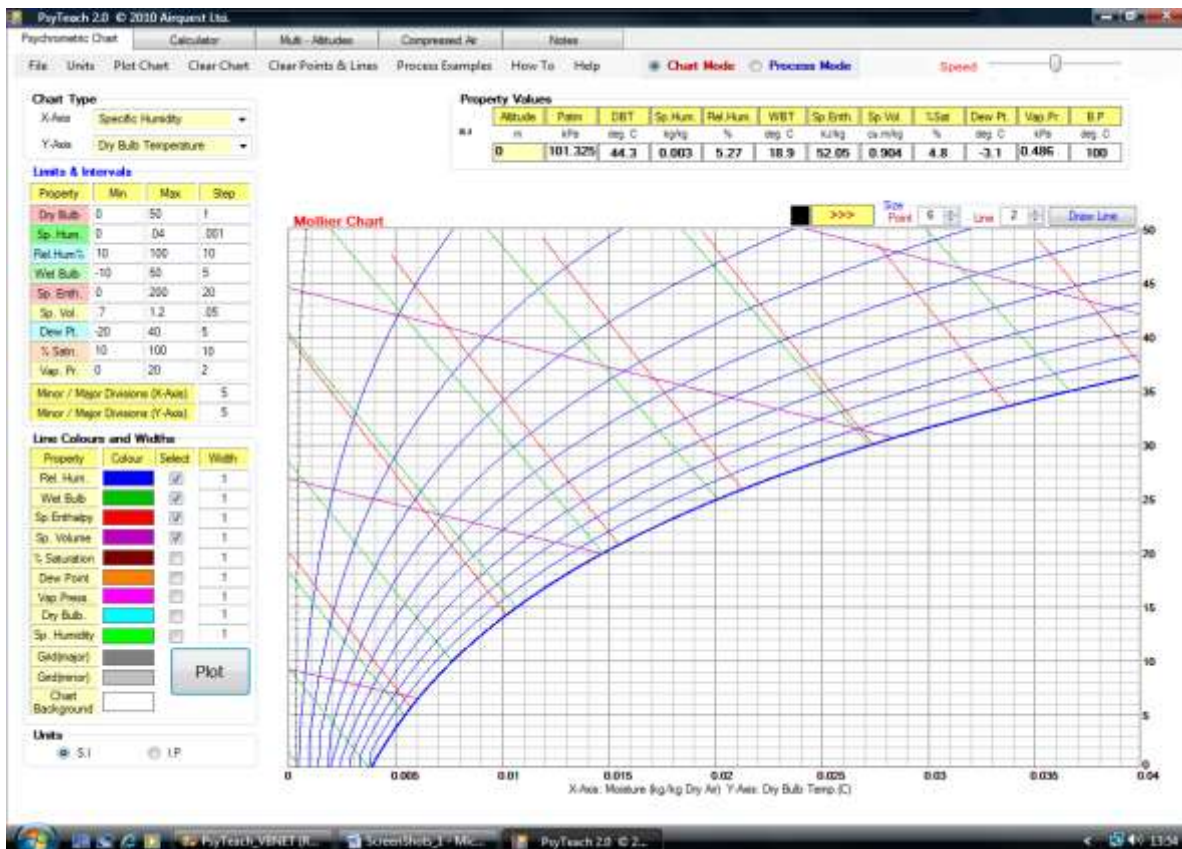
1. Select the '**Chart Mode**' option (on the menu bar)
Note: *All the features of the Chart are controlled by the items located in the 5 panels on the screen (Chart Type, Limits & Intervals, Line Colours and Widths, Units and Property Values).*
2. In the '**Chart Type**' panel, specify the desired X and Y co-ordinates. Selecting Dry Bulb Temperature for the X-Axis and Humidity Ratio for the Y-Axis results in the standard Psychrometric Chart. Selecting Humidity Ratio for the X-Axis and Dry Bulb Temperature for the Y-Axis results in the standard Mollier Diagram).
3. In the '**Limits & Intervals**' panel, select the minimum and maximum limits of the properties on the X and Y axes and also the intervals at which the lines should be plotted. In the lowest 2 text boxes in that panel, enter the number of minor divisions within a major division. For instance, specifying 5 for X-axis and 10 for the Y-axis would result in every 5th vertical line and every 10th horizontal line being highlighted.
4. In the '**Limits & Intervals**' panel, select the minimum and maximum limits and intervals of the other property lines you wish to draw on the chart. For instance, if the Wet bulb Temperature lines are to be drawn between -10 and 50 degrees, at intervals of 5 degrees, then enter -10, 50 and 5 in the relevant text boxes.
5. In the '**Property Values**' panel (at top right of the screen), enter either the Altitude or the Atmospheric Pressure (in the appropriate units as displayed in the panel). If this is not specified, the default altitude value of 0 (sea level) will be used.
6. The '**Line Colours and Widths**' panel provides the means to select the colours and widths of the various property curves that are to be shown in the chart. Right-clicking the mouse in any of the coloured panels allows the colour to be changed. Any property curve will be displayed on the chart only if the corresponding box (in the 'Select' column) is checked. If necessary, this enables the chart to be built up by drawing only one set of property lines at a time. The thickness of the curve is determined by the value in the 'Width' column.
7. In the '**Units**' panel, select S.I or I.P (English/U.S) as required. The units may also be selected from the 'Units' menu item.
8. The Speed 'slider' at top right allows determines the speed of plotting. Speed and quality are inversely related.
9. Finally click the '**Plot**' button (or the 'Plot Chart' menu item) to draw the chart.

Typical Psychrometric Chart

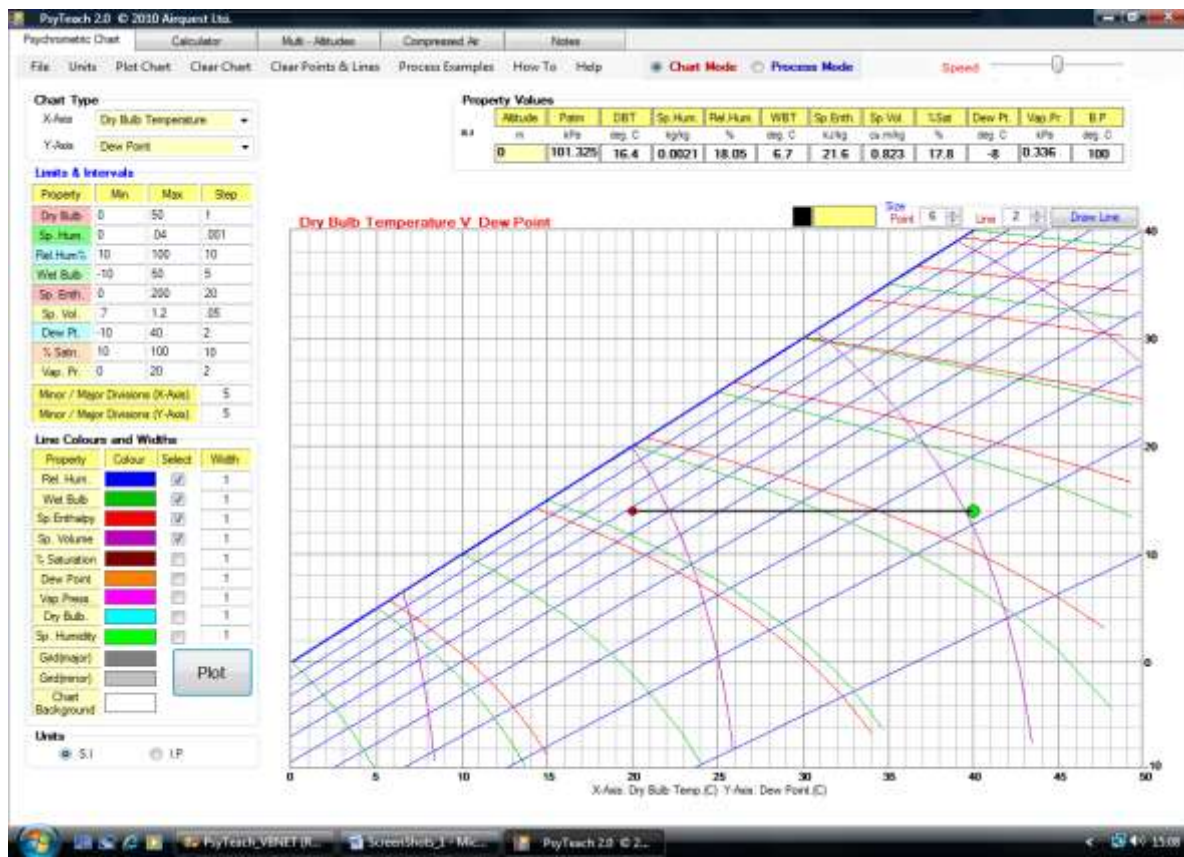


NOTE: RH of 1% is always shown by a black 'dashed' line. Most property lines are plotted only between 1% and 100%.

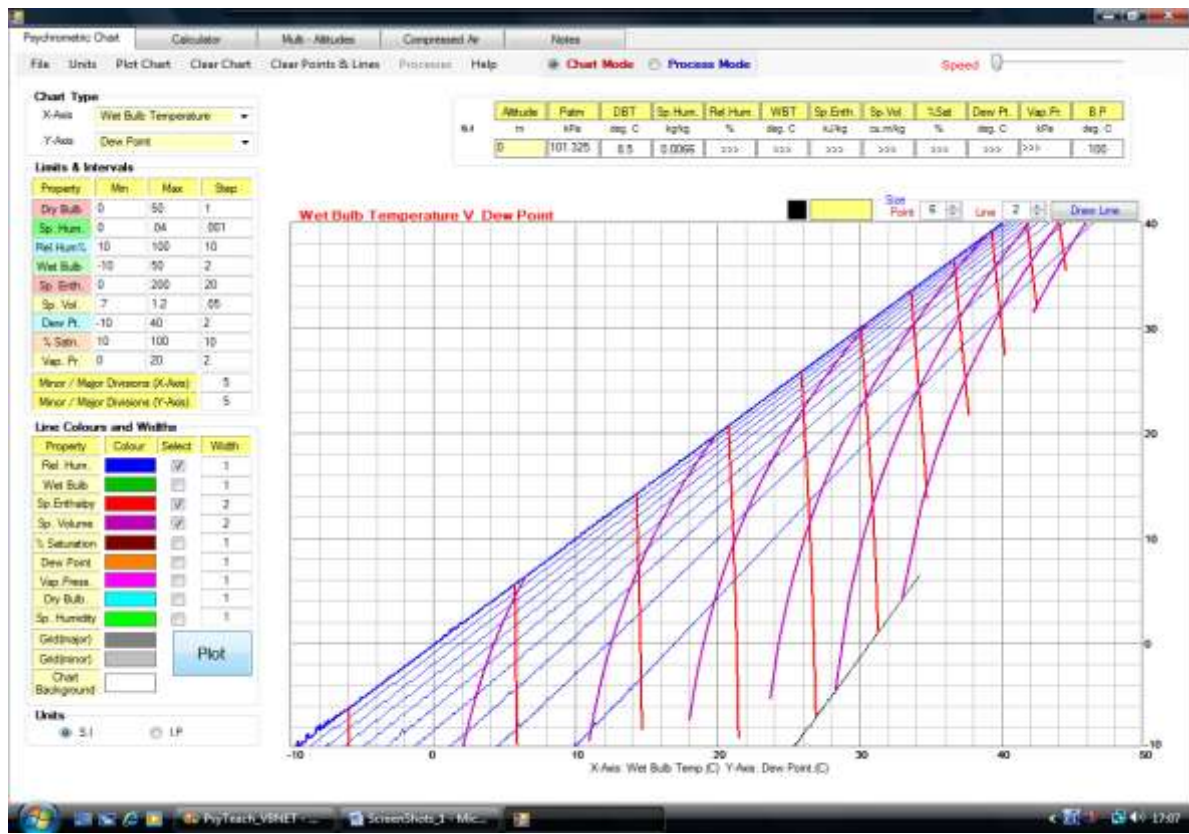
Typical Mollier Diagram



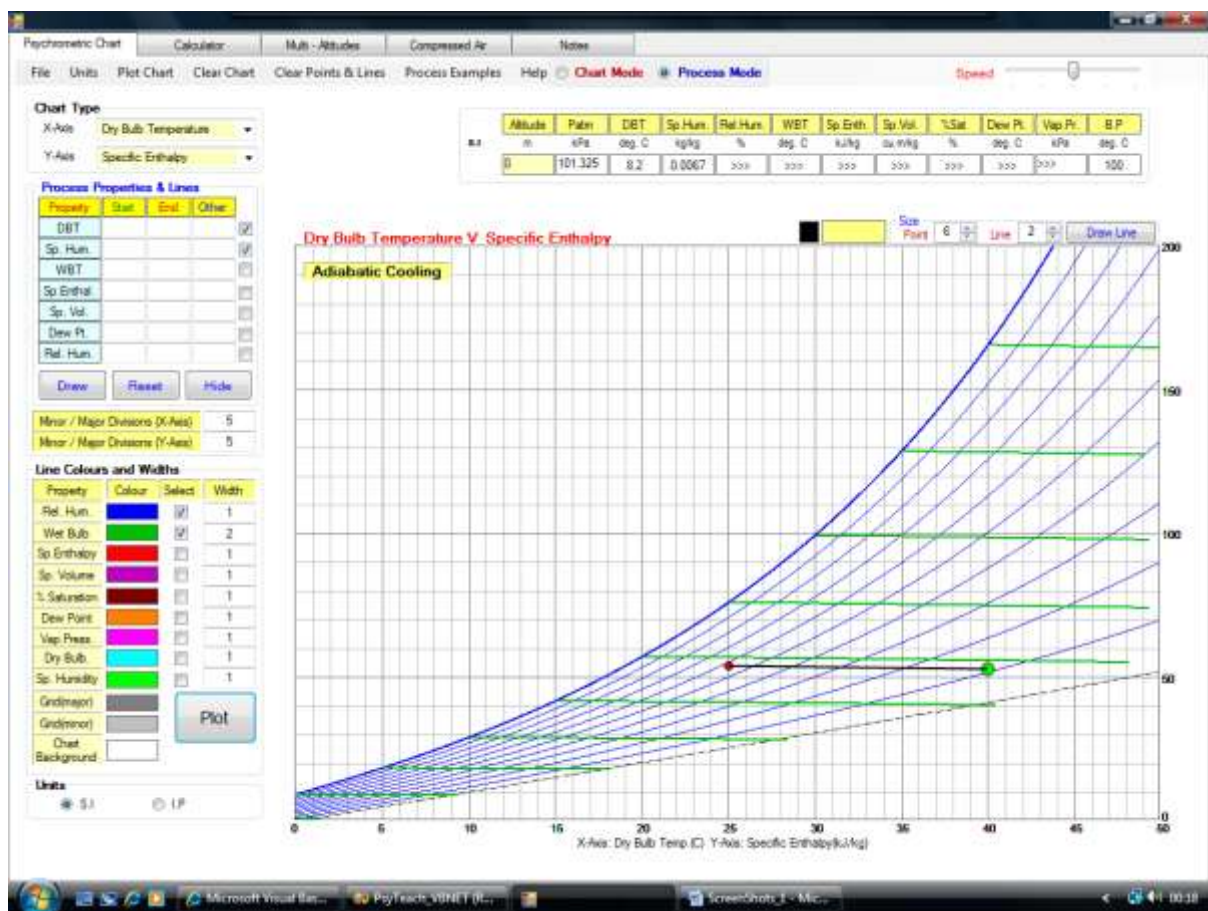
X-Axis: Dry Bulb Temperature; Y-Axis: Dew Point



X-Axis: Wet Bulb Temperature; Y-Axis: Dew Point



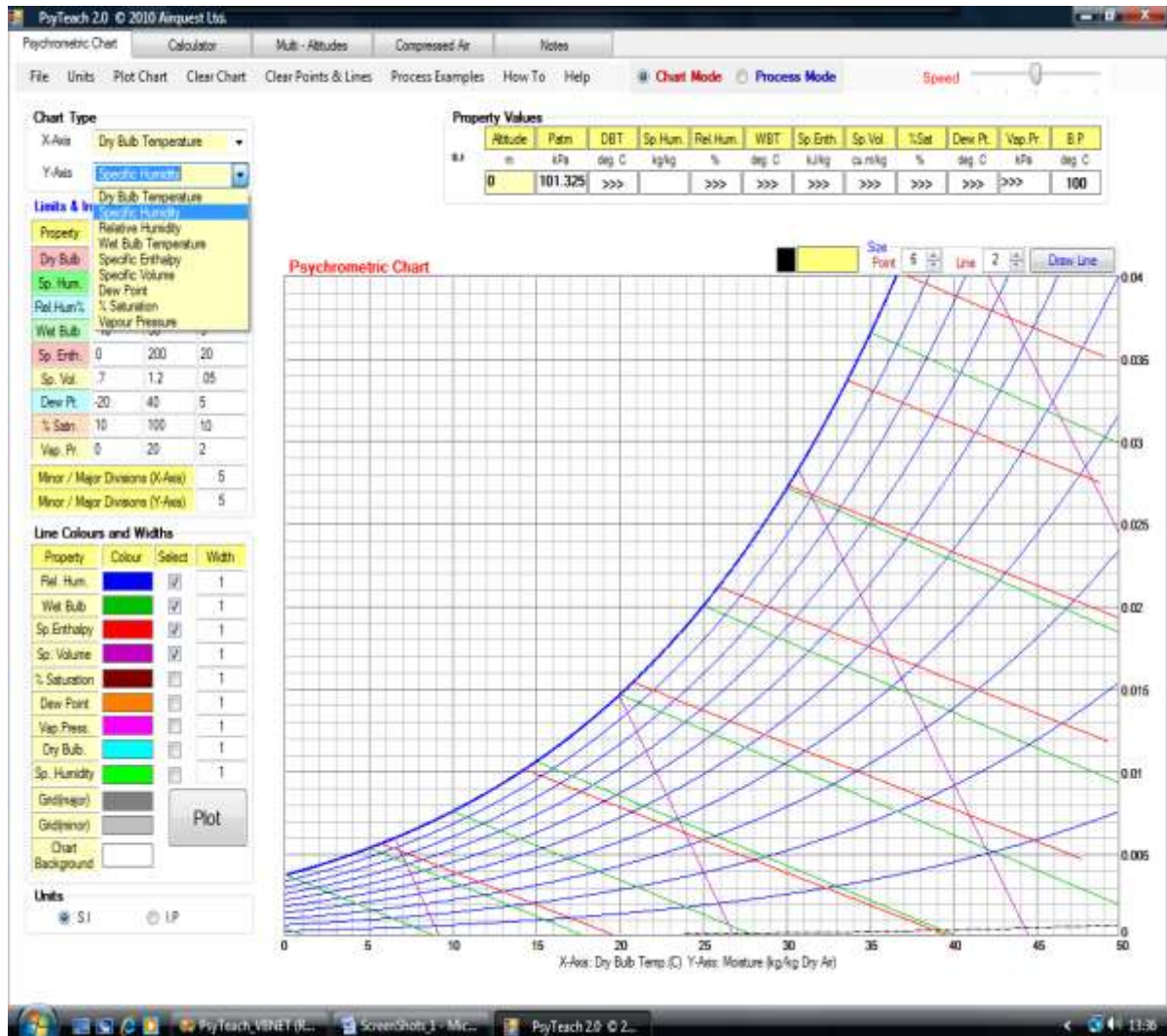
X-Axis: Dry Bulb Temperature; Y-Axis: Specific Enthalpy



5. Using the Chart in 'Chart Mode'

In addition to the functionality available from paper charts, PsychroGen 2.0 provides the following features:

1. Plot all psychrometric properties against any independent properties on the X & Y axes. As can be seen from the selections available in the X-Axis and Y-Axis drop-down lists, it is possible to plot the various psychrometric properties against almost any combination of X and Y Axes parameters.

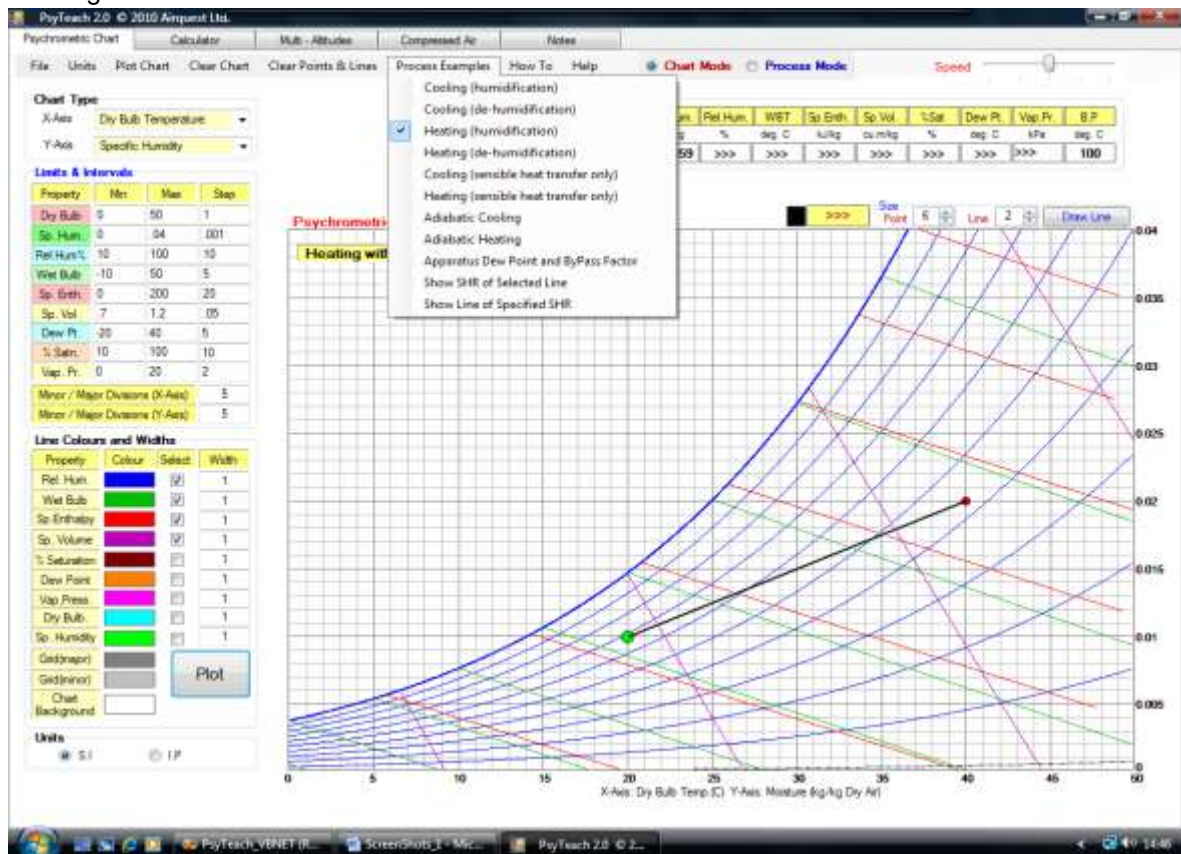


2. As the mousepointer is moved around on the Chart, the '**Property Values**' panel will display the property values at the mousepointer position.
3. Clicking the left mouse button anywhere on the chart will mark the point with a circle. The colour of the marker circle is selected by clicking on any coloured panel on the screen. It can also be selected by right-clicking in the small square just above the chart. Once two or more points have been marked, lines can be drawn between any 2 selected points. A line-end is selected by clicking on the point concerned. A small blue square will be displayed adjacent to the point over which the mouse pointer is currently positioned. Clicking the left mouse button at that stage will select that point. The <Draw Line> button will draw a line between the last two selected points. The colour of the line is selected in the same way as the colour of the points is selected. The width of the line is specified using the panel next to the <Draw Line> button.

- Points and Lines may be deleted individually by right-clicking on them. They may all be deleted in one go by means of the <Clear Points & Lines> menu item.
- The program provides examples of the most common psychrometric processes as can be seen in the following screen-shot.

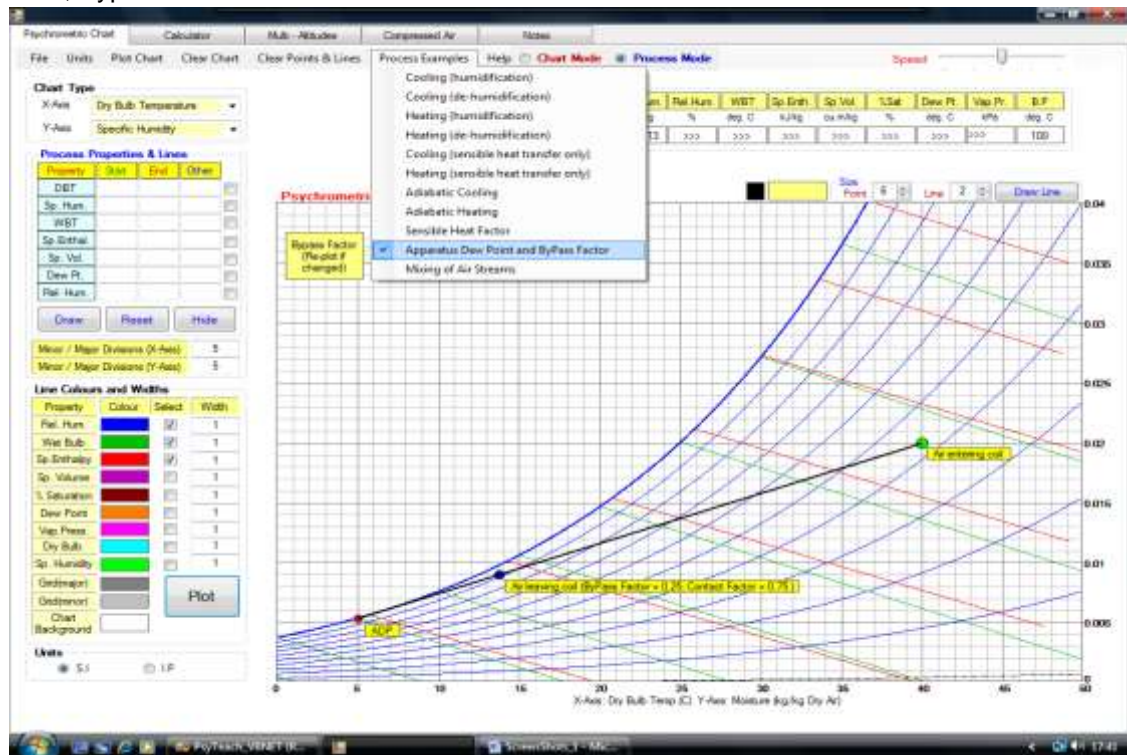
6. Some pre-loaded examples of common psychrometric processes

Heating with Humidification

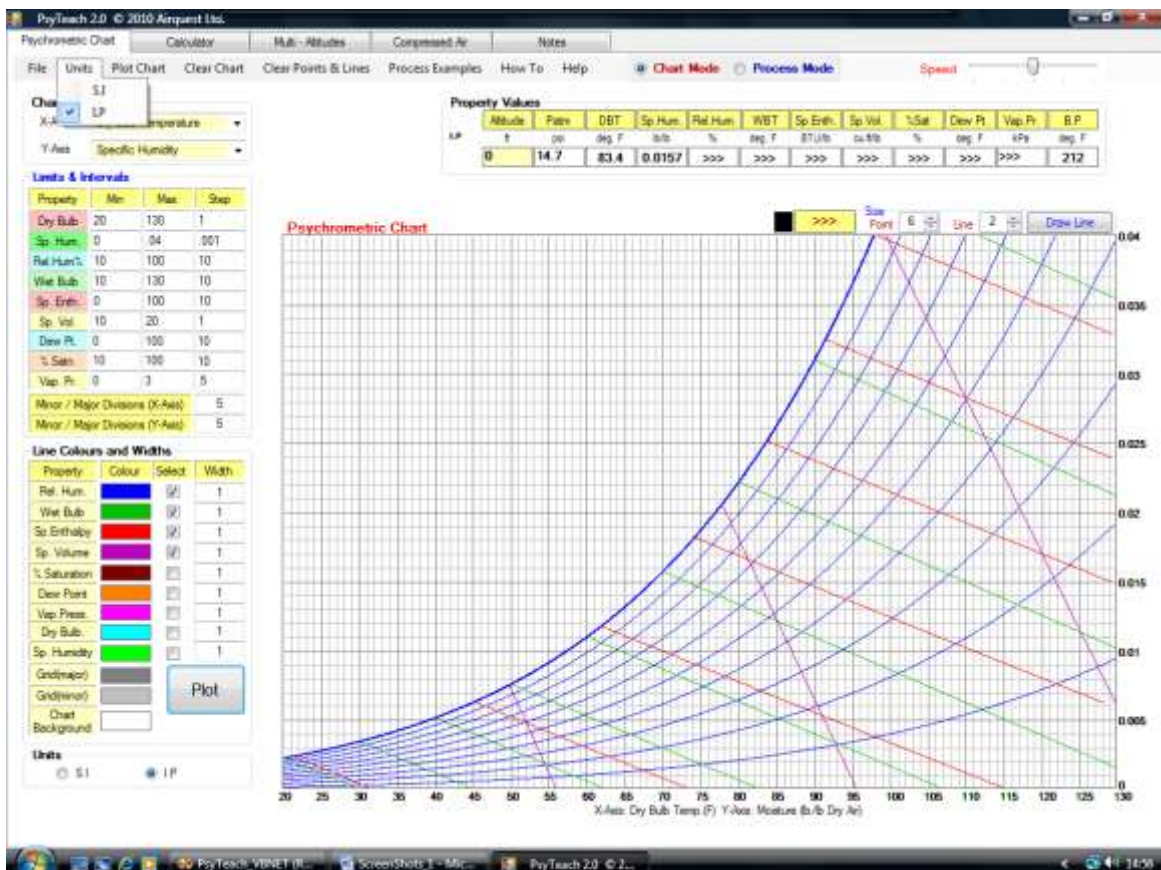


- Users may develop their own colour schemes for the chart and these can be 'saved' and 'loaded' as necessary. This allows customising the appearance for overhead projections, emphasising various property lines etc. Right-clicking a coloured panel will display the colour selection dialog box.

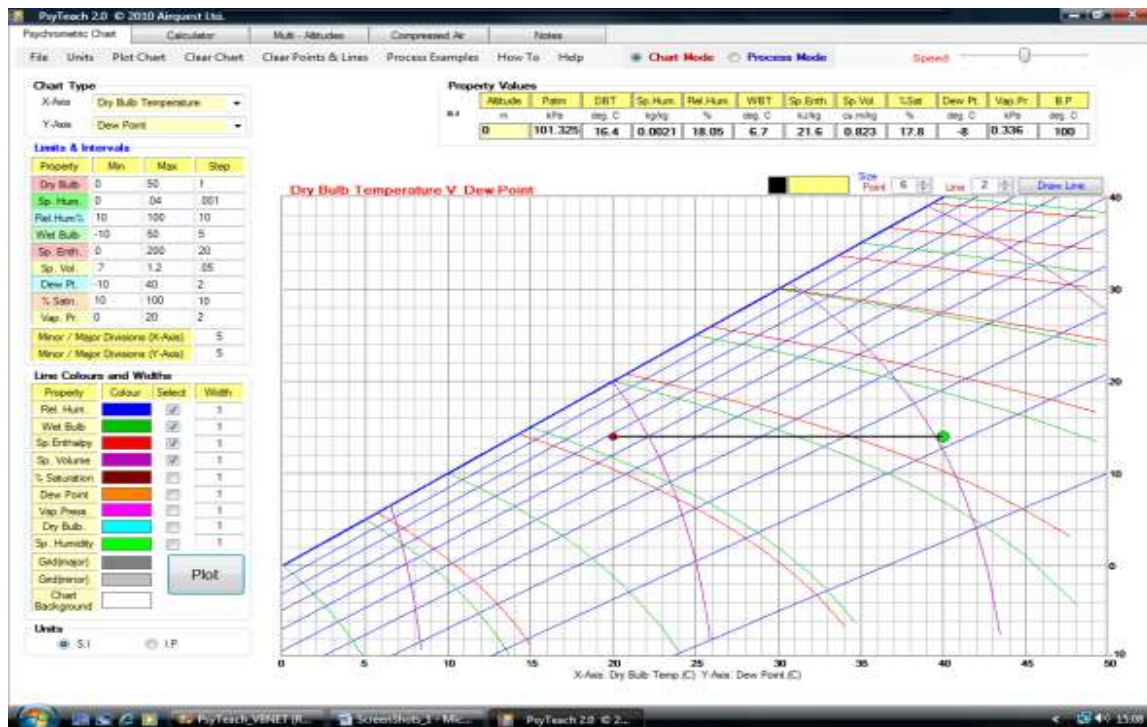
ADP, Bypass Factor and Contact Factor



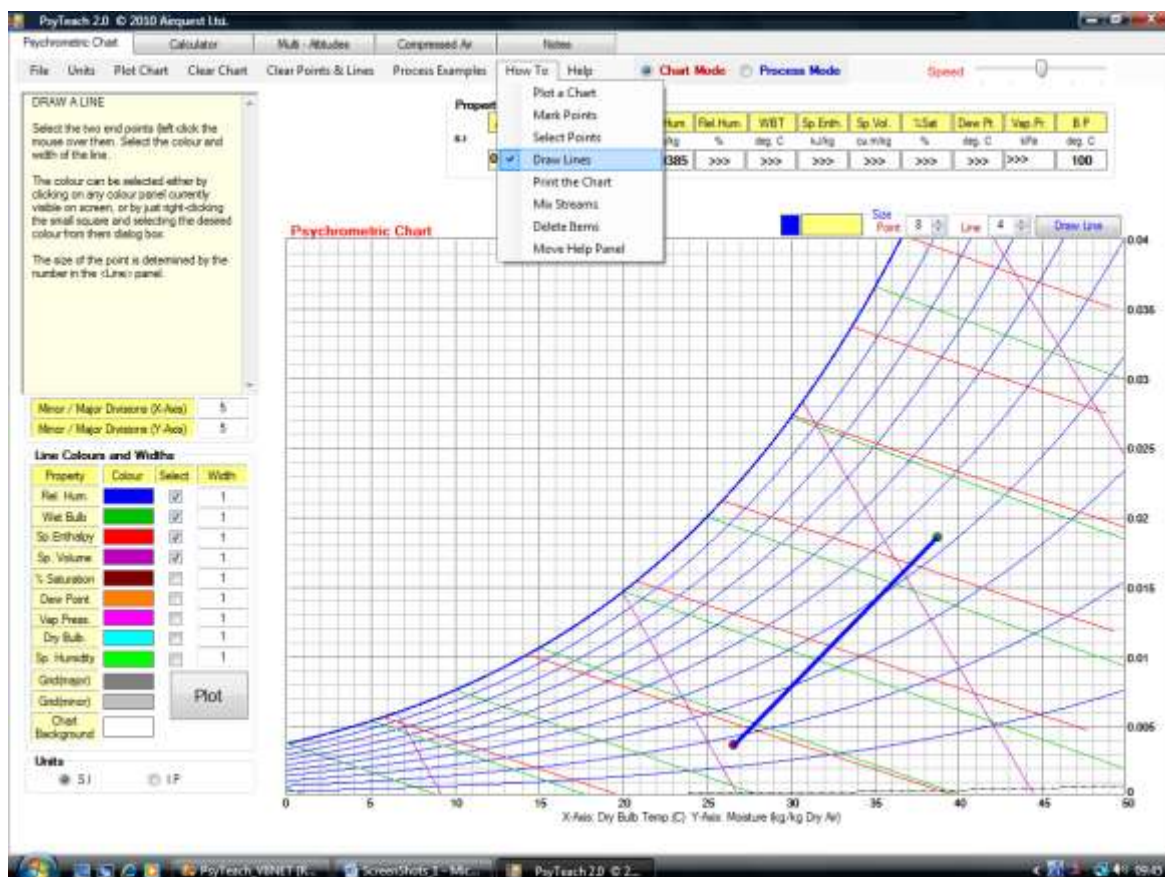
2. Plot Charts in S.I. or I.P (Imp / English / U.S) units, between user-selected ranges and graduation intervals



- Plot processes on charts drawn with various choices of axes. The following diagram displays a sensible cooling process against the backdrop of a chart drawn with Dry Bulb Temperature on the X-Axis and Dew Point on the Y-Axis.

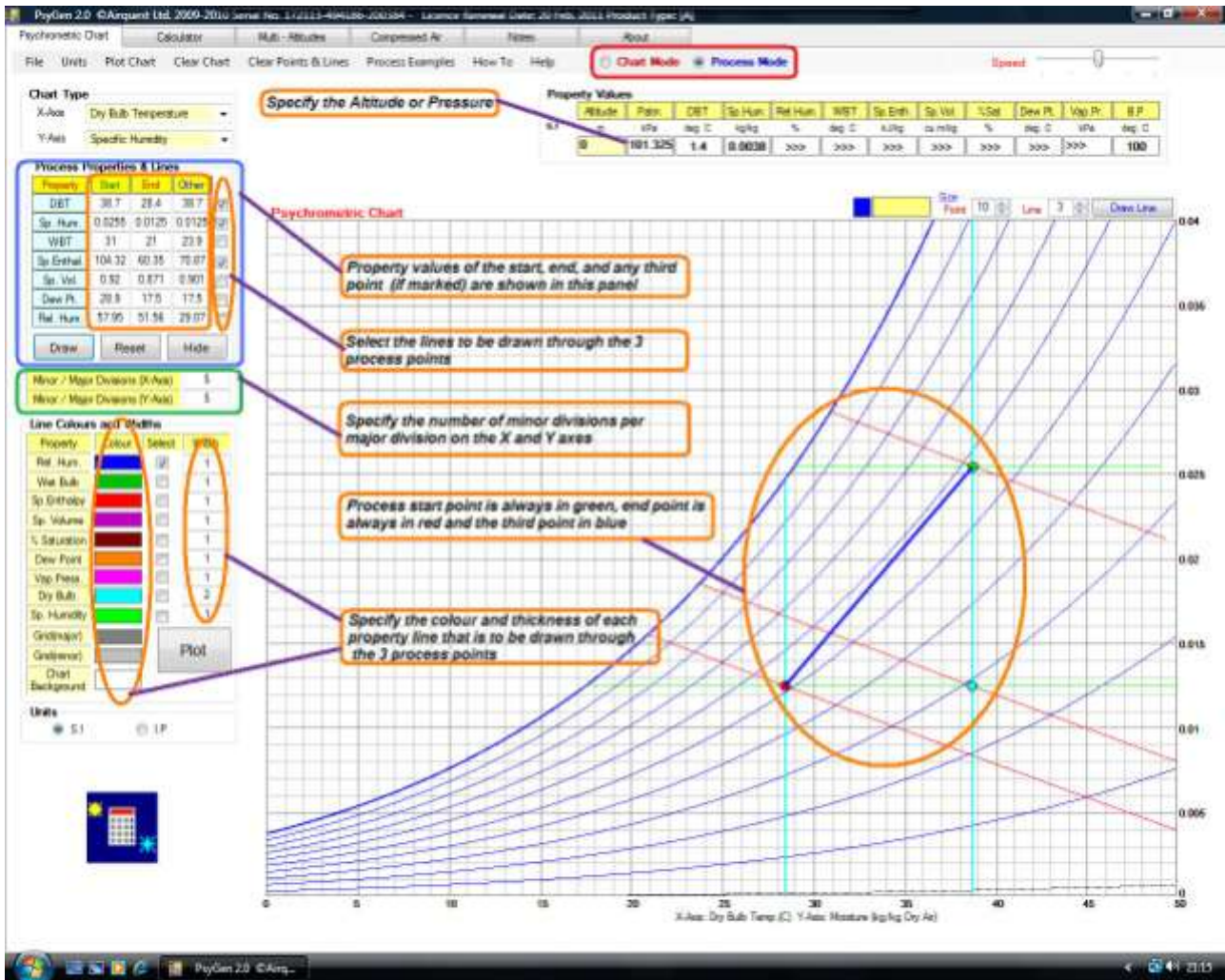


- A 'How To' facility displays topical help about some of the many features of the program.



7. Using the Chart in 'Process Mode'

The controls on the Psychrometric Chart Tab when in Process Mode



Process Properties & Lines

Property	Start	End	Other
DBT			<input type="checkbox"/>
Sp. Hum.			<input type="checkbox"/>
WBT			<input type="checkbox"/>
Sp. Enthal.			<input type="checkbox"/>
Sp. Vol.			<input type="checkbox"/>
Dew Pt.			<input type="checkbox"/>
Rel. Hum.			<input type="checkbox"/>

Draw

Reset

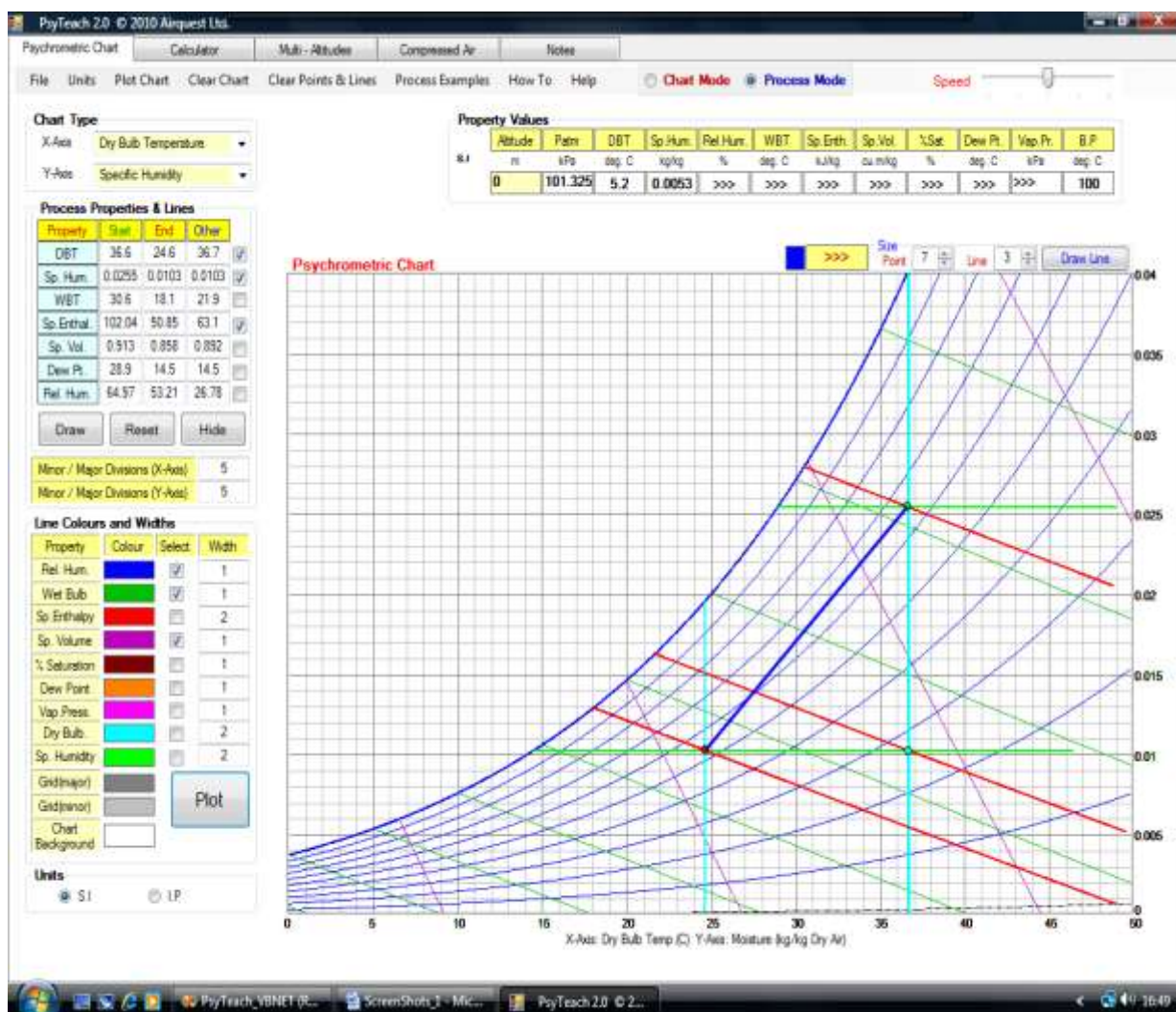
Hide

The Process Properties and Lines panel where the details of the Process Start, End, and a Third selected point will be displayed. Ticking the check boxes will draw (when the 'Draw' button is clicked) the specified property line through each of the three points. 'Reset' clears the columns. Note that the marked points on the chart are not cleared by this command. They can be cleared by right-clicking on them (or by the 'Clear Points & Lines' menu item 'Hide' conceals the panel. Clicking the 'Process Mode' option button will show the panel.

The main difference between the 'Chart Mode' and the Process Mode is that, in the process mode, any property line may be drawn through up to 3 marked points. The Chart Mode does not have this facility. The 'Process Mode' is used as follows:

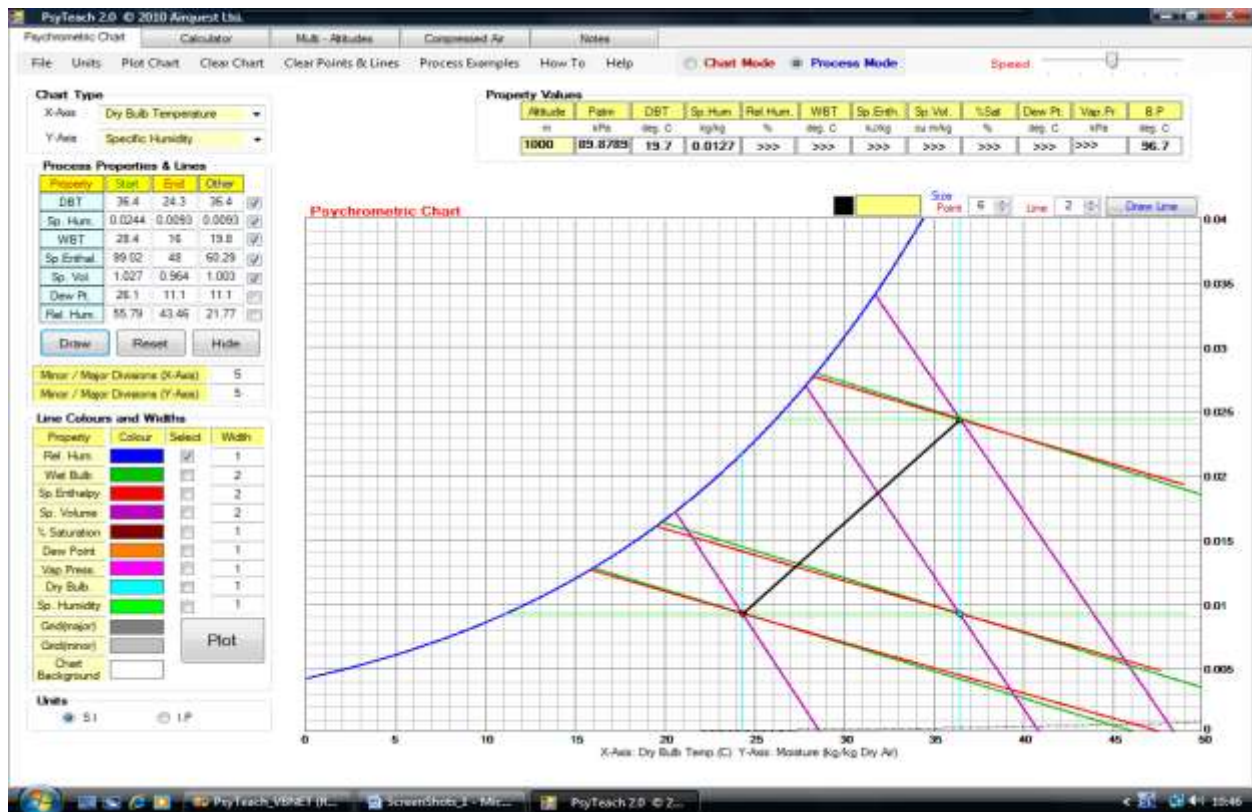
Example : Heating and dehumidification:

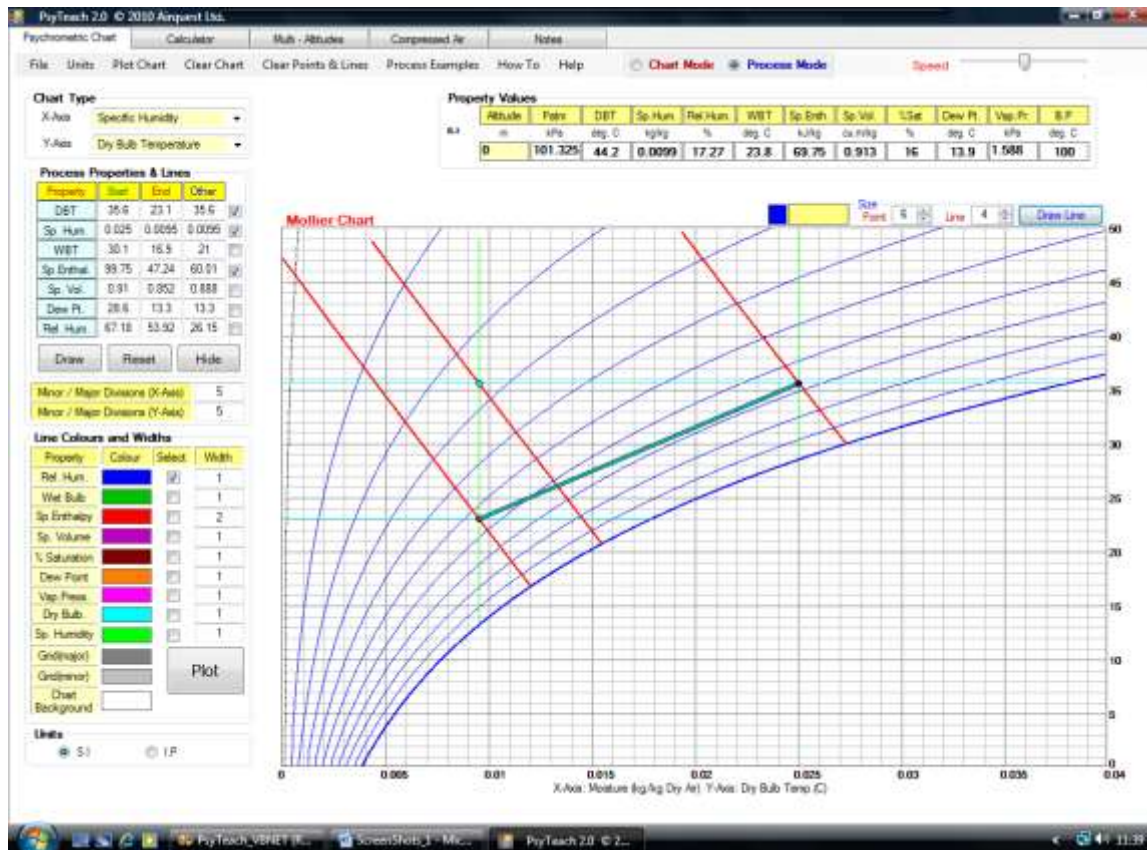
- Click the 'Process Mode' option. A new panel (Process Properties and Lines) will be shown to the left of the screen.
- Mark the starting point of the process (in this example, the higher of the two points), and then the end point (the lower of the two points). Draw a line between them.
- The process consists of both sensible and latent heat changes.
- To determine the two components, tick the <DBT> and <Hum.R> check boxes in the 'Process Properties and Lines' panel
- Then Click the <Draw> button in the same panel. The Constant DBT and Constant Humidity Ratio lines will be drawn through the starting and end points.
- Mark their intersection point.
- The check the <Sp.Enthal> check box in the 'Process Properties and Lines' panel and click the <Draw> button again.
- Note that in Process Mode, the start, end, and third point are always marked in green, red and bright blue respectively**
- The above routine can be carried out regardless of the choice of X and Y parameters



- The above diagram clearly illustrates the sensible and latent heat changes involved in this particular process.

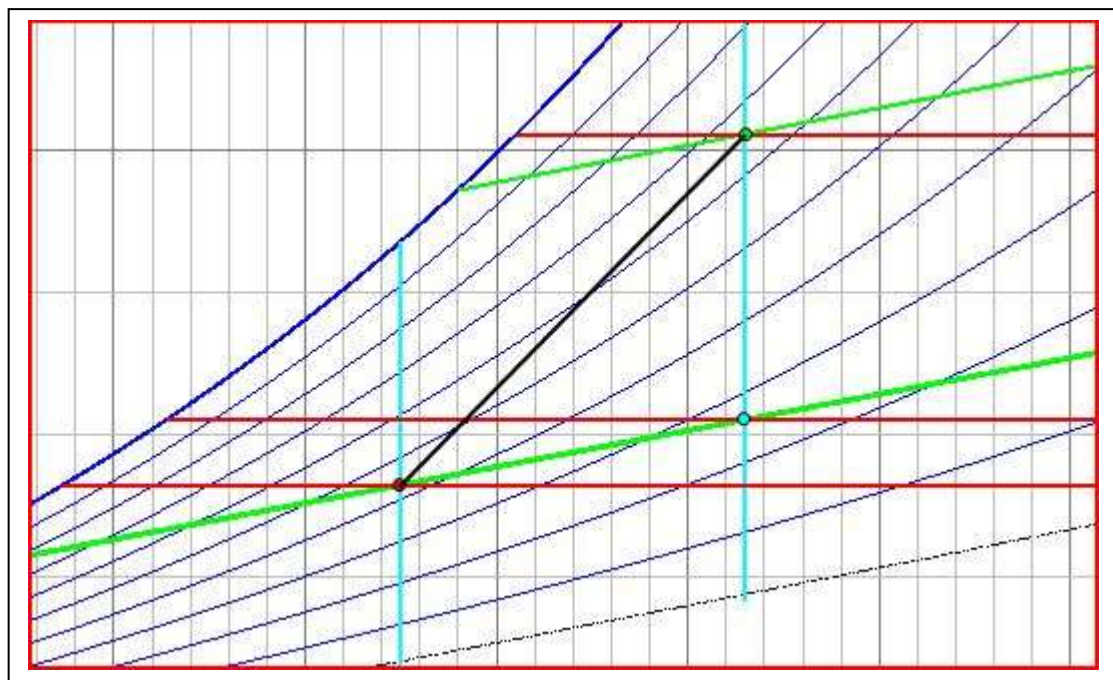
Since the user can specify the property lines that are to be shown in the chart, it is possible to create a diagram which contains only the relevant curves. The diagram below presents the same information as the chart above, but much more clearly since it only contains only the Wet bulb temperature, specific volume, and specific enthalpy lines of immediate interest. Note that the relevant values are also listed in the 'Process Properties & Line' panel at the left of the screen.





The same process shown on a Mollier chart, displaying only the constant Specific Enthalpy lines

Processes may be depicted on any combination of X and Y axis parameters. For instance, the process plotted on X-Axis of Dry Bulb Temperature and Y-Axis of Specific Enthalpy would be as shown below:



8. Using the Calculator

The controls on the Calculator Tab and their functions

The screenshot shows the PyGen 2.0 Calculator Tab interface. At the top, there are tabs for Psychrometric Chart, Calculator, Altitude, Compressed Air, Notes, and About. The Calculator tab is active, displaying a table of psychrometric properties. Annotations with arrows point to various controls and data fields:

- Select the Unit System:** Points to the radio buttons for S.I. Units and I.P. Units.
- A 4 function calculator:** Points to a small floating calculator window with +, -, *, /, and = buttons.
- Specify the altitude or atmospheric pressure:** Points to the input fields for Atmospheric pressure (kPa) and Altitude of Location (m).
- Select the properties to be specified and enter their values:** Points to the checkboxes and input fields for properties like Dry Bulb Temperature, Wet Bulb Temperature, Relative Humidity, etc.
- Results of the calculation are displayed in this column:** Points to the rightmost column of the results table.
- Click to reset the calculator before each calculation:** Points to the Reset button.
- Click to carry out the calculation:** Points to the Calculate Property Values button.
- The results of each calculation is shown in a separate column. A scroll facility is provided if there are more columns than can be seen on the screen at a time. This button deletes all the results columns:** Points to the Clear All button.

Property	Value 1	Value 2
Atmospheric pressure (kPa)	101.325	101.325
Altitude of Location (m)	0	0
Dry Bulb Temperature (deg C)	30	30
Wet Bulb Temperature (deg C)	18.7413	18.7413
Relative Humidity (%)	50	50
Percentage Saturation (%)	46.7564	46.7564
Specific Volume (m³/kg)	0.974875	0.974875
Specific Enthalpy (kJ/kg)	754.6225	754.6225
Wet Bulb (deg C)	16.8239	16.8239
Vapour Pressure (kPa)	6.1726	6.1726
Saturation Pressure (kPa)	12.3456	12.3456

The calculator can carry out psychrometric calculations if the Atmospheric Pressure or Altitude and ANY 2 other independent property values are provided. The general procedure is as follows:

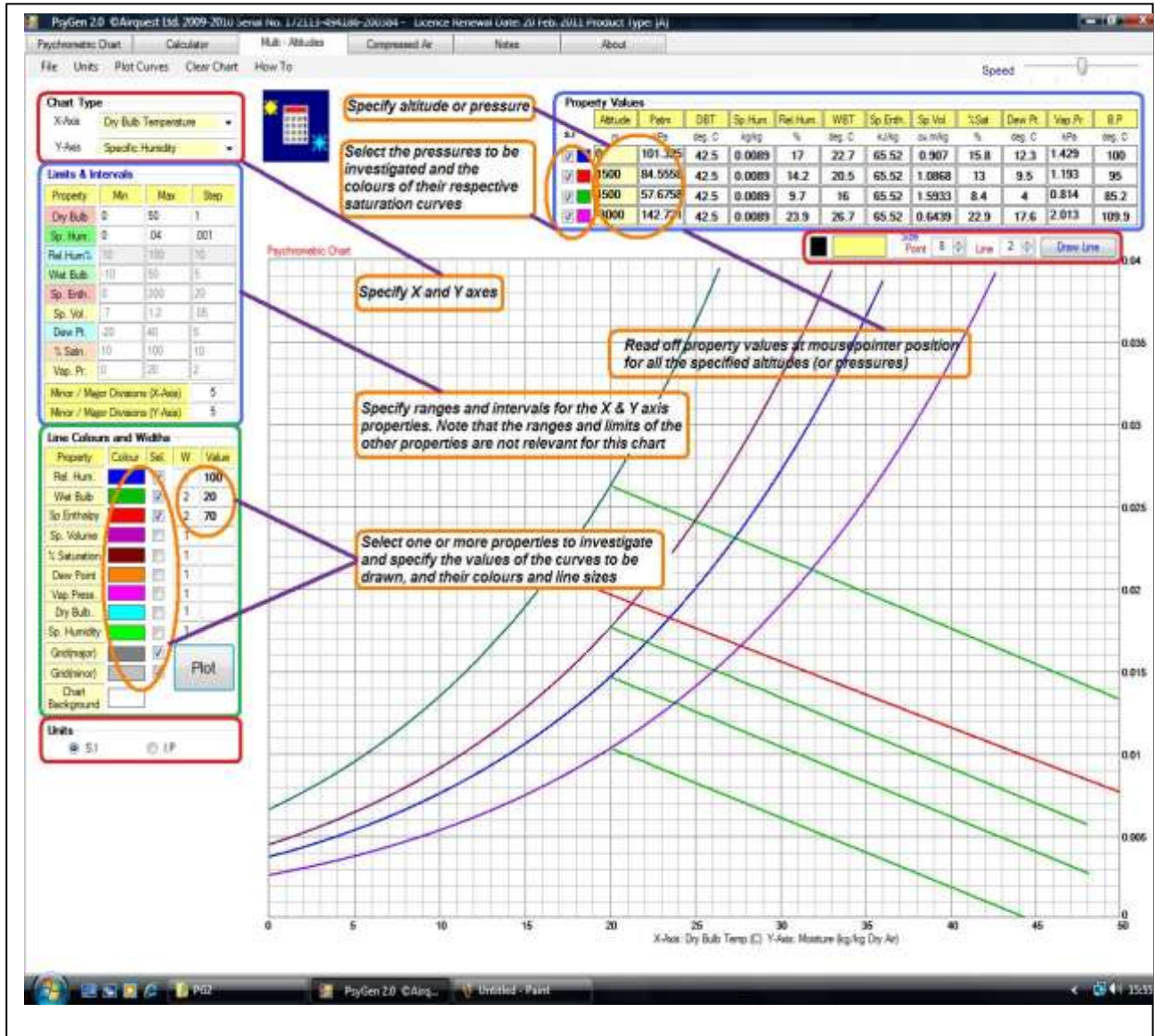
- Select the Unit System
- Enter the pressure (kPa or psia) OR the Altitude (m or ft) as appropriate
- Check any 2 properties and enter their values. In the appropriate units
- Click the <Calculate Property Values> button
- This will display the results in a numbered column to the right of the input panel.
- Calculations which fall outside the saturated region will not be added to the result set.
- Each correct calculation will move the existing columns one space to the right (as can be seen by the numbers at the bottom of each column)
- Click the <Reset> button to carry out another calculation.
- Once the screen is full, it would become possible to scroll horizontally to view the earlier result columns.



- As can be seen above, calculations for different altitudes and pressures can be carried out and the results are all visible at the same time. This makes it easier to carry out calculations which involve the mixing of streams at different pressures and the mixture is to be used at a third pressure. (Note: Dealing with mixtures of streams at the same pressure can be carried out easily using the 'Process Mode' of the normal Chart)
- Click the <Clear All> button to delete all the result columns.

9. Using the Multi-Alt Chart Facility

The controls on the Multi-Alt Tab and their functions



This is a unique facility and is especially suited for dealing with up to 4 different atmospheric pressures (or altitudes). It can be used to graphically illustrate the variations in psychrometric properties due to changes in atmospheric pressures. The diagram below indicates the results of mixing two streams at different pressures and compressing the mixture to a third pressure.

10. Mixing of Streams

- Enter the three relevant pressures in the pressure (Patm) column in the Property Values panel. The colours could be left as their default settings. Alternatively you could change each by right-clicking in the square and selecting the desired colour. Make sure the checkboxes in those 3 rows are ticked.
- Select the unit system, and the X and Y axis parameter. Change their range if necessary. Then click the <Plot> button.
- The Saturation lines at those three pressures will be drawn
- Moving the mouse in the chart will display the various property values in each row.
- Mark the point representing the stream at pressure of 101.325 psia. Use the same colour as the corresponding Saturation (100% R.H) line. (Just click the mouse in the colour panel in the corresponding row in the 'Property Values' panel to obtain the colour) This is the higher end of the line.
- Mark the point representing the other stream (at 89.879 psia). Obtain the colour by clicking in the coloured box in the corresponding row.
- Click the <Draw Line> button to draw the line. Moving the cursor along the line will display the mixing ratio in a small panel adjacent to the line. Select the point corresponding to the required mixing ratio and left-click the mouse to mark the point
- The diagram shows the mixture condition at a mixing ratio of 64.2% of the 'red' component (and 35.8% of the 'blue' component).
- Moving the cursor to the mixture condition (the green point on the line) will display the condition of the mixture at each of the pressures. For instance, if the mixture is finally taken to the 'green' pressure it will have a relative humidity of 90.9%, a specific volume of .4436 cu. m /kg, etc.

(See the following diagram)

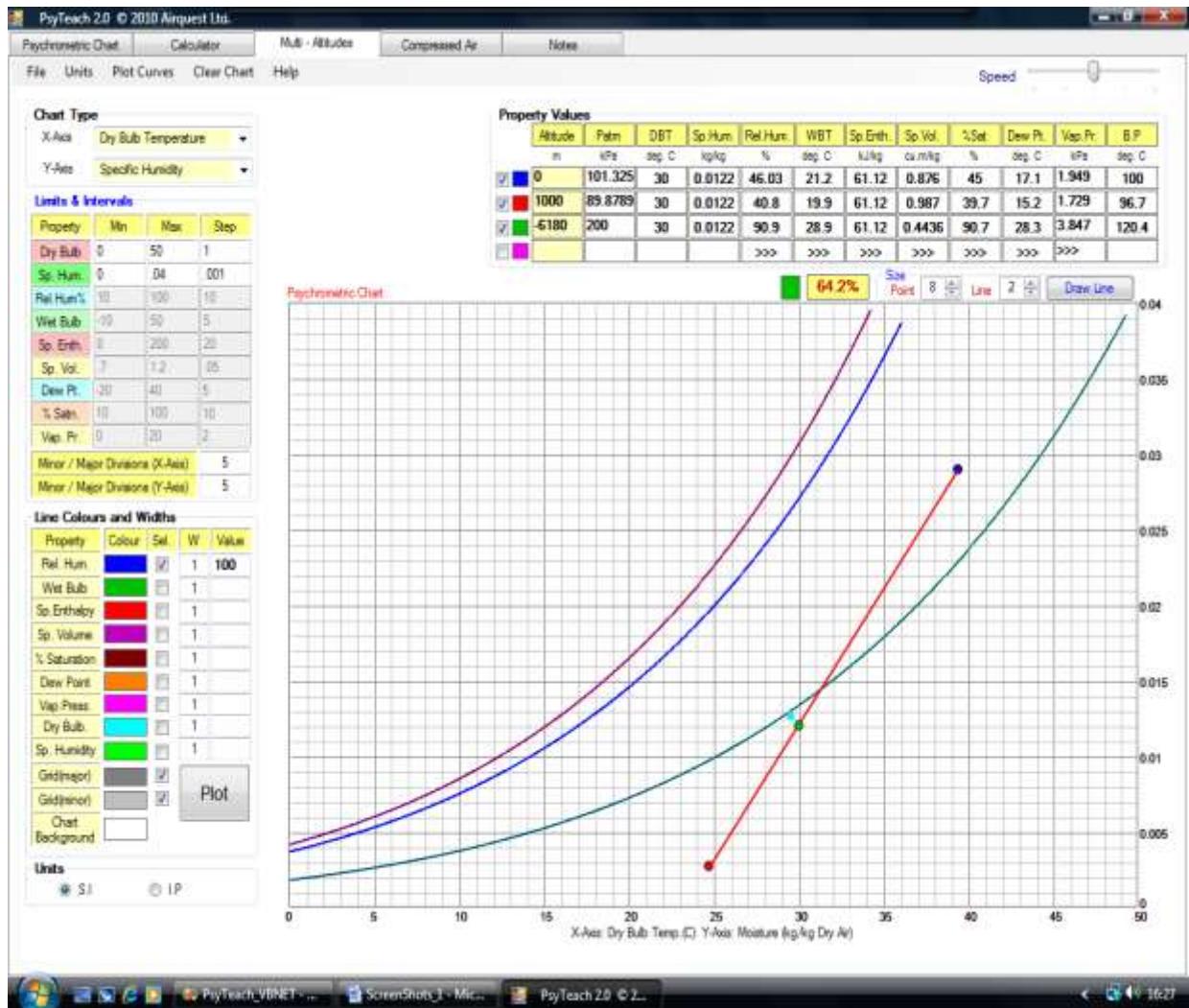


Illustration of the mixing of 2 streams:

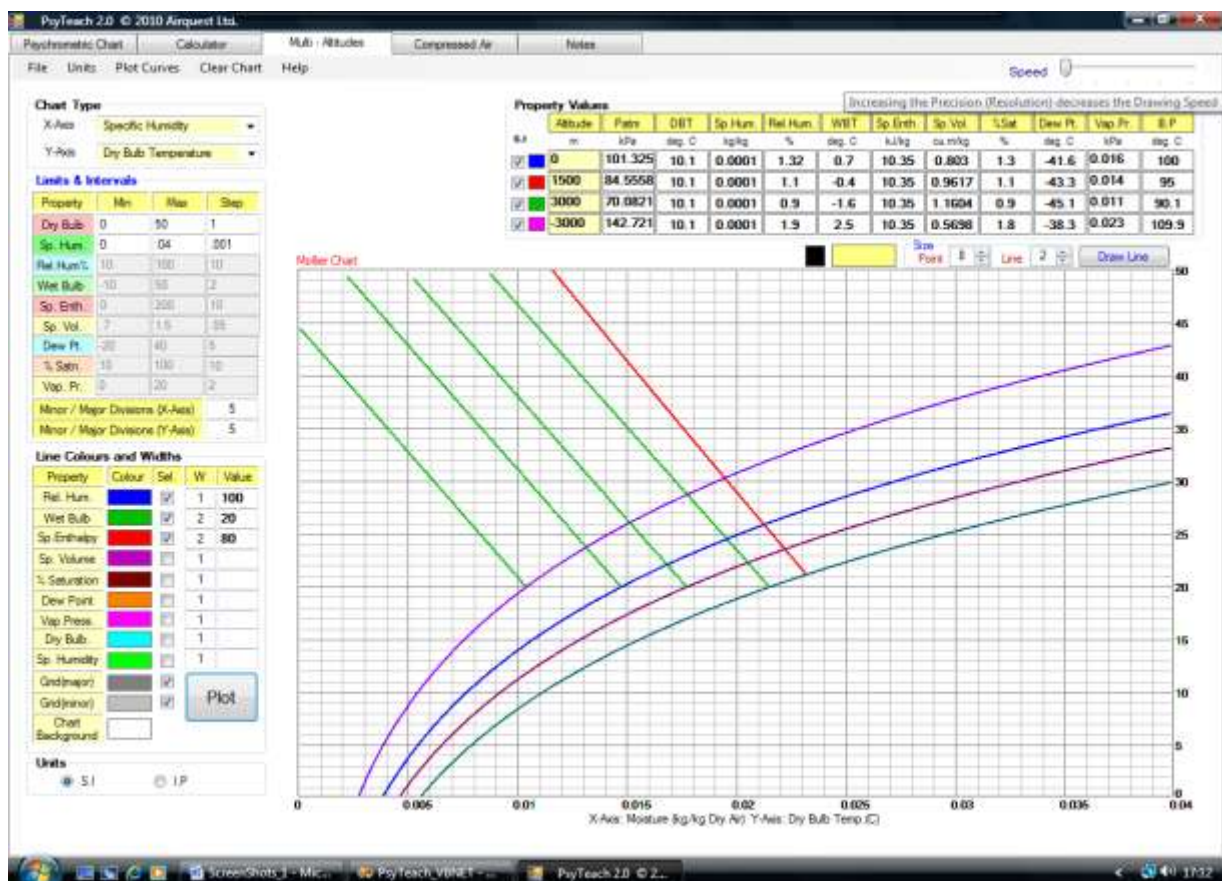
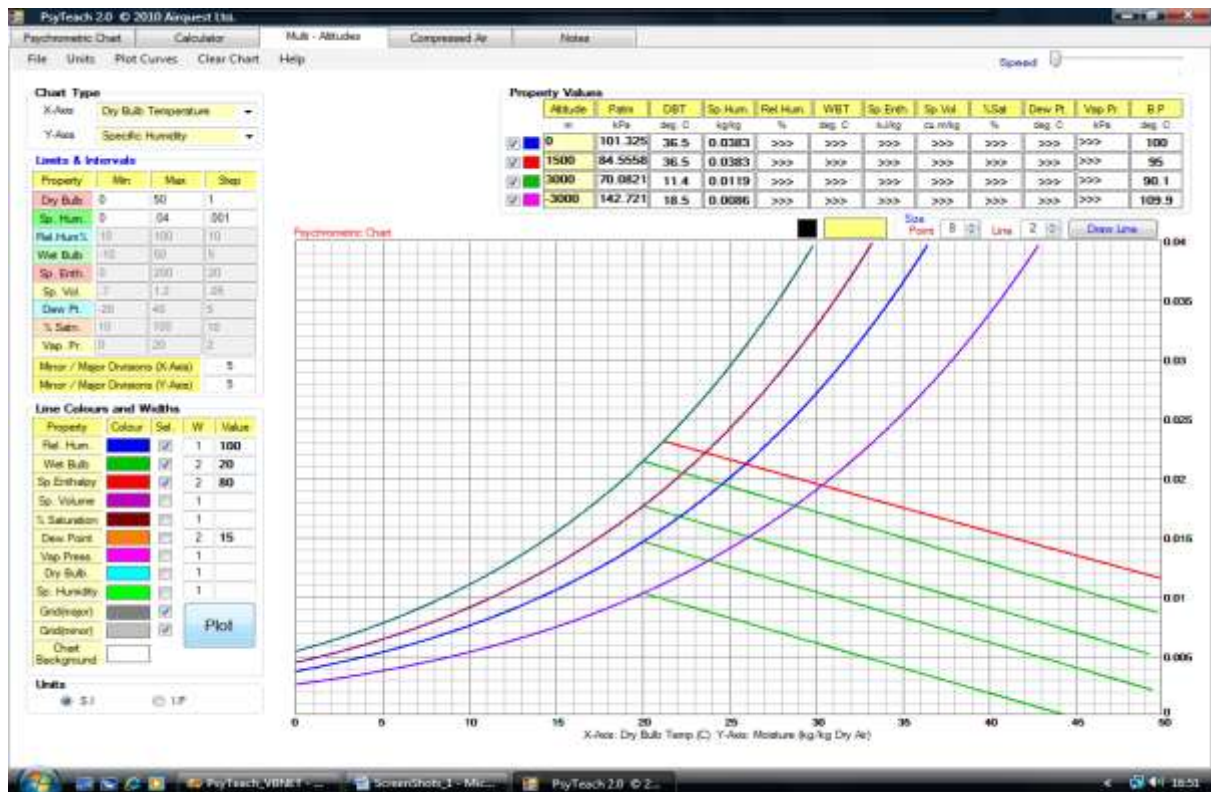
Blue and red streams are mixed in the ratio of red = 64.2%, blue = 35.8 (note the entry in the small yellow panel just above the chart)

The resulting mixture is then taken to the pressure represented by the green line.

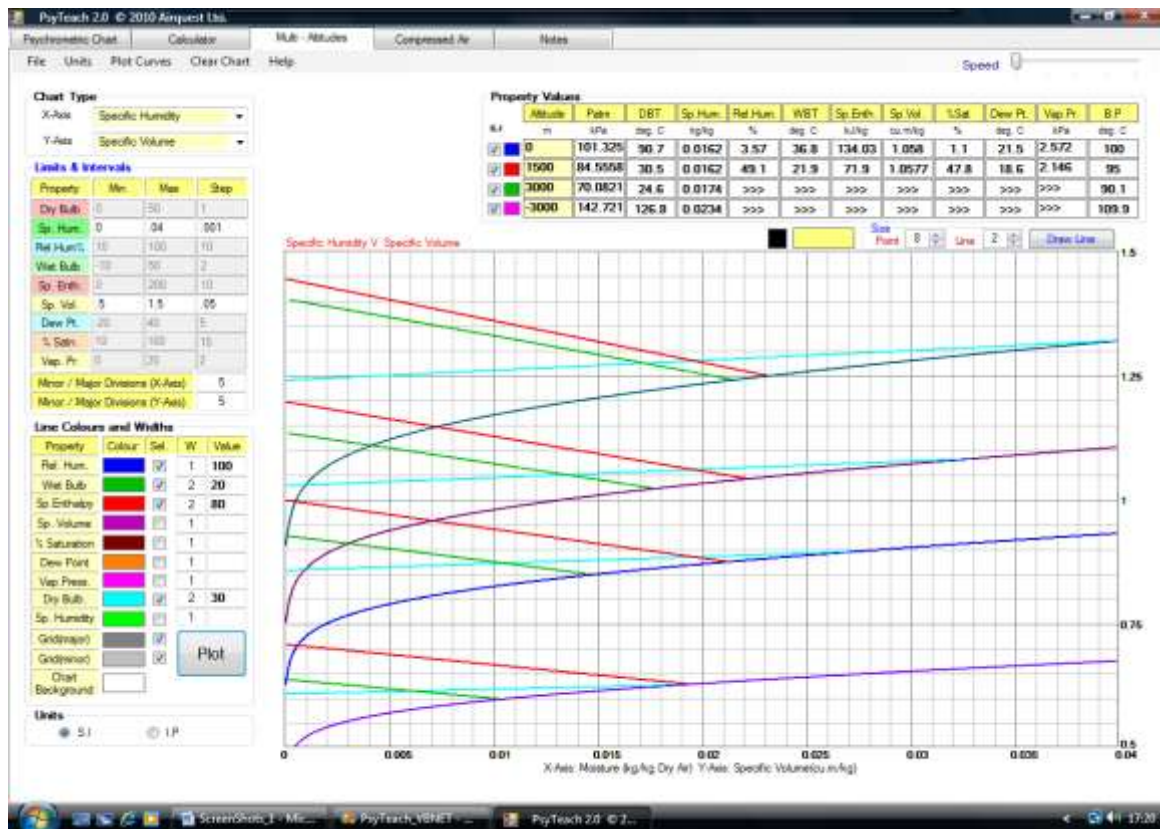
The condition of the resulting mixture is read off from the corresponding row in the readout panel when the mouse pointer is over the green point.

11. Variation of Property Values with Pressure

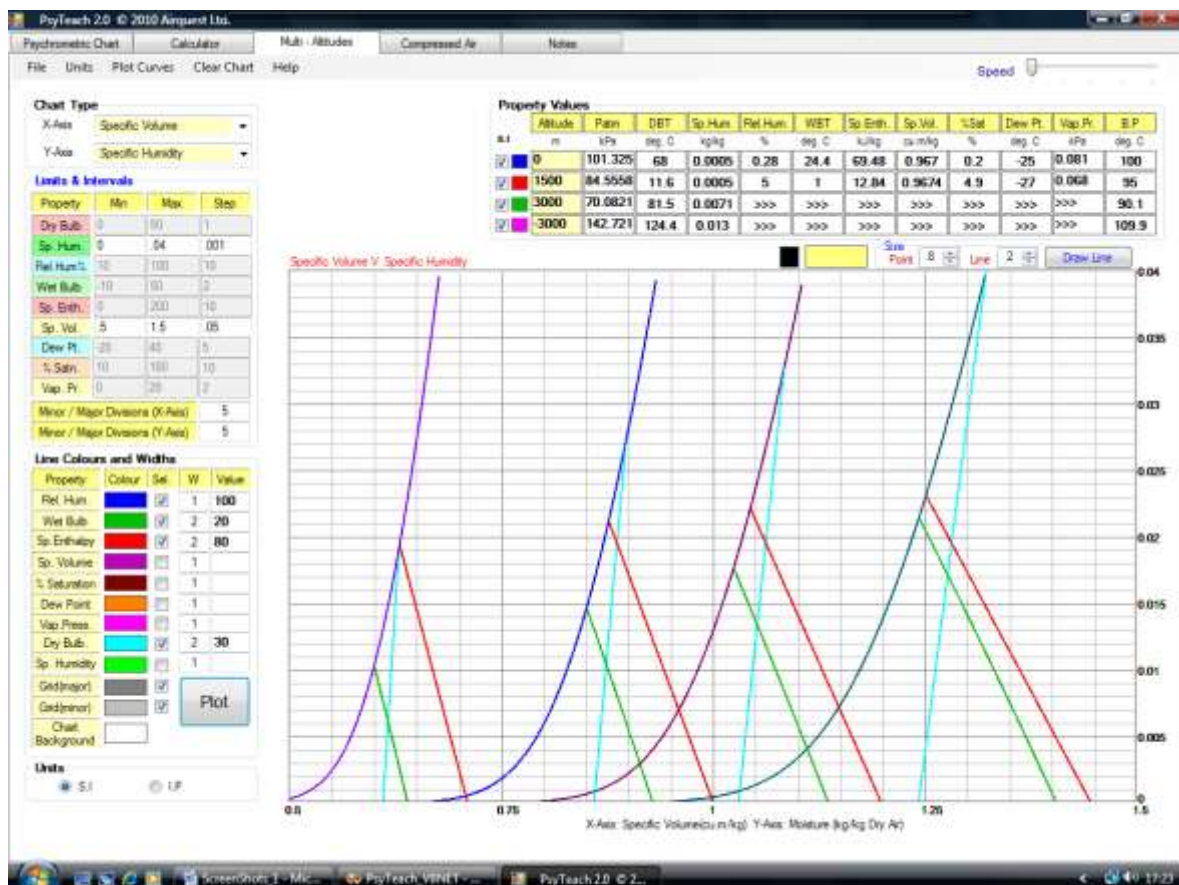
The charts below shows the 20°C Wet Bulb Temperature Lines (in green) and the 80 kJ/kg Specific Enthalpy line(s) (in red) corresponding to 4 different pressures.



The same information as above, but plotted on a chart with X-Axis: Humidity Ratio and Y-Axis: Specific Volume

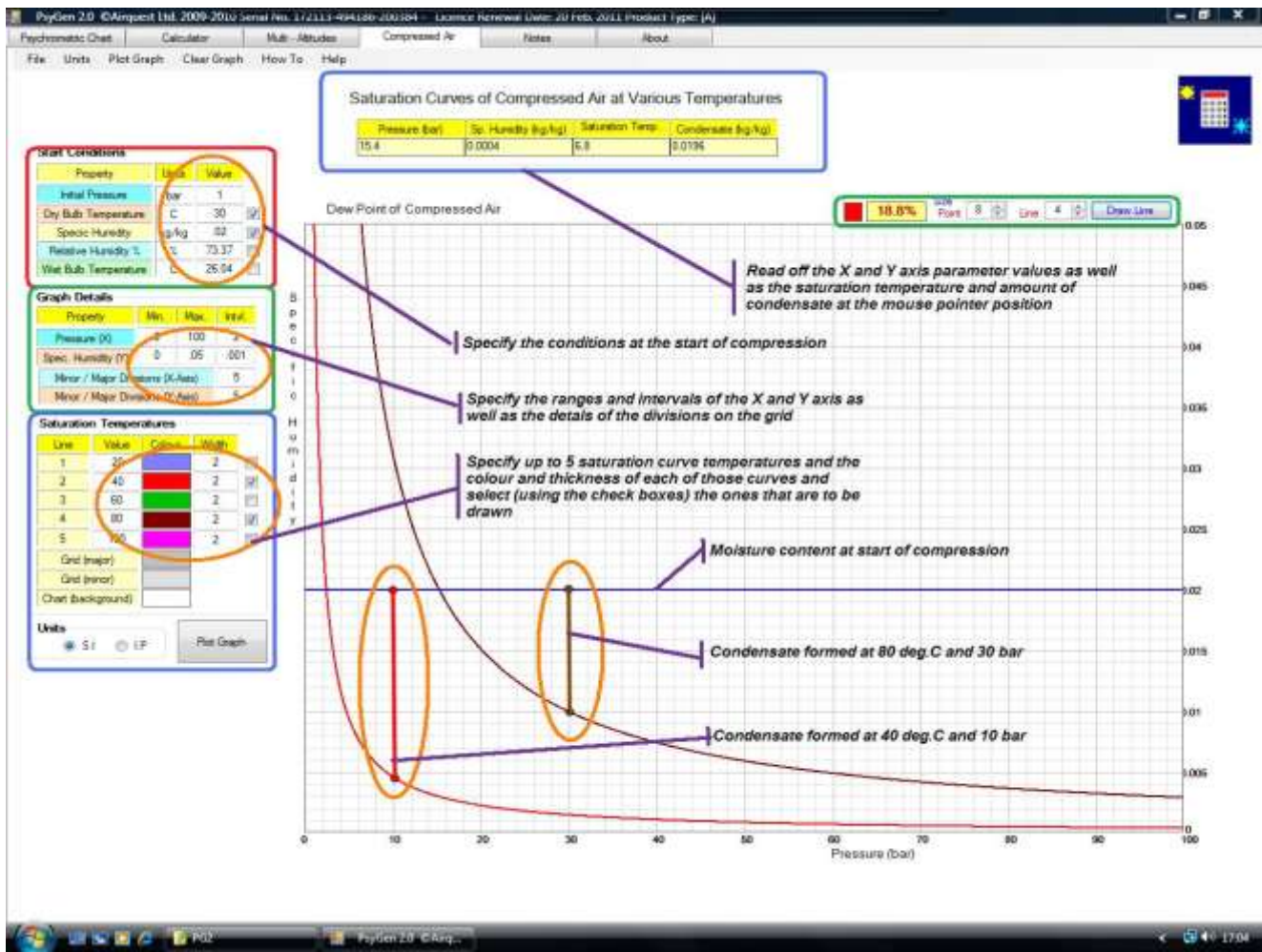


The same information as above, but plotted on a chart with X-Axis: Specific Volume and Y-Axis: Humidity Ratio



12. Using the Compressed Air Facility

The controls, their functions and the interpretation of results are illustrated below.



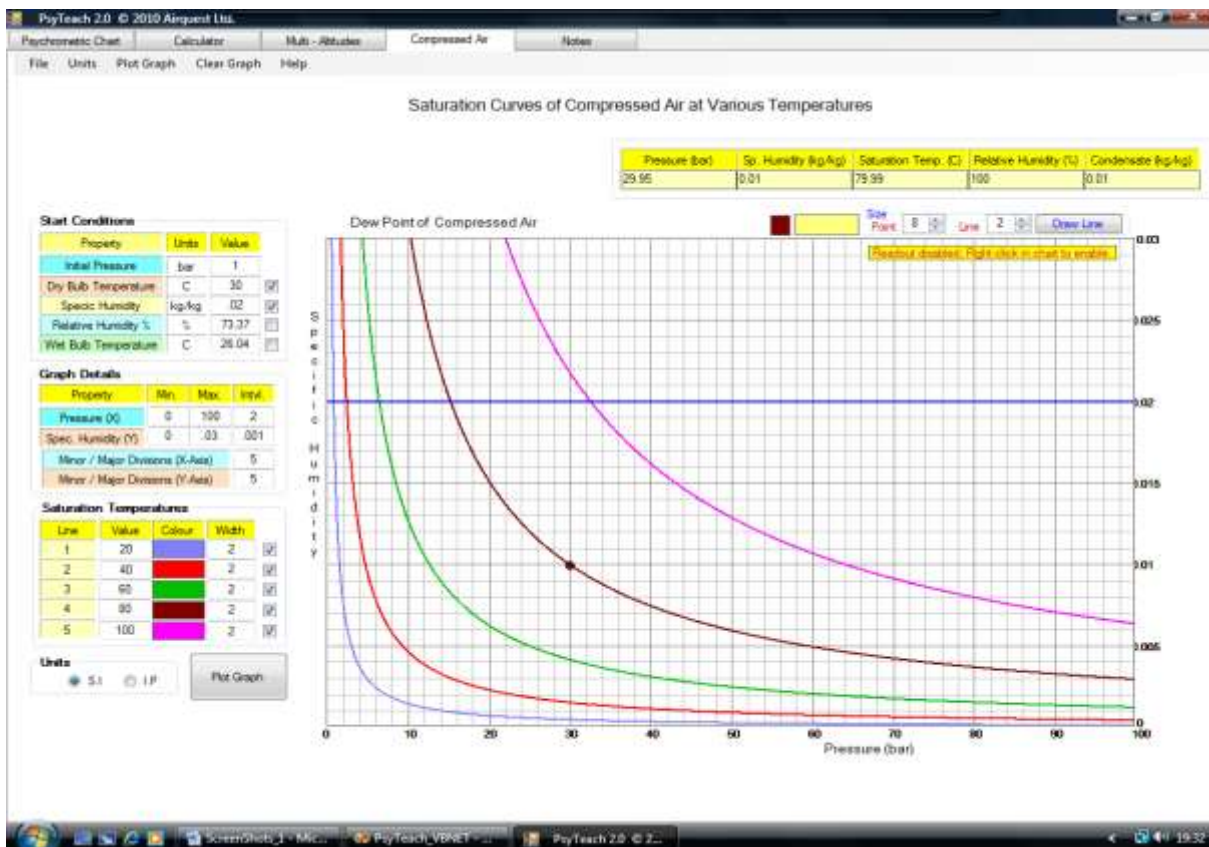
The next chart displays the saturation curves at various user-selectable temperatures over a wide range of pressures. The chart below shows the saturation curves at 20, 40, 60, 80 and 100°C over a pressure range of 0 to 100 bar.

For instance, at a pressure of 30 bar, the air becomes saturated at 80°C if the Humidity Ratio is .01. In other words, at 80°C and a pressure of 30 bar, the dew point corresponding to a Humidity Ratio of 0.01 is 80°C

The chart is drawn as follows:

- In the 'Start Conditions' panel, specify the condition of the air before it is compressed. The initial pressure and 2 other parameters are required.
- In the 'Graph Details' panel, specify the desired range of pressure and Humidity Ratio.
- In the 'Saturation Temperatures' panel, specify up to 5 saturation temperatures and tick the checkboxes of those that need to be displayed. The width of the curves may also be specified. Finally, click the 'Plot Graph' button.
- The readout panel at top left will display the relevant values at the current mouse pointer location.
- The 'Condensate' column will show the amount of condensate that will be formed if air at the 'start' condition is compressed to the condition at the mousepointer position.

- For the example shown, air at the start condition had a Humidity Ratio of 0.02 (as indicated by the horizontal blue line). At the position indicated by the brown circle, the Humidity Ratio at saturation at 80°C is 0.01. Hence the condensate would be 0.01 as shown in the relevant column in the readout panel.



13. Customisation facilities

Almost all aspects of the appearance of the charts can be customised. These include:

- Colours and sizes of the points marked
- Colours and widths of the lines marked
- Colours used to represent the various properties
- Appearance of the grid including the colours of the minor and minor divisions as well as the number of minor divisions per major division.
- Background colour of the chart
- Whether or not a 'title'; should be displayed for the diagrams on the various Tabs
- What the title should be
- Size, position and colours of the titles (captions)
- Whether or not a logo should be displayed, what the logo should be and its position.
- The size, colour and position of the various 'help' panels
- Create any number of customised 'templates'
- All the customised aspects can be saved and loaded back

14. Save and Load Feature

All the customisations as well as any created charts and process diagrams may be saved and re-loaded using the File-Save and File-Load menu items. These files have the default extension of .psy.txt. When a saved chart is loaded, any diagrams or settings of the current chart will be deleted. There will be an opportunity to save them if desired. The loaded diagram will be automatically displayed on the currently visible tab. If there are charts on the other tabs as well, simply click the <Plot> button on the relevant tab to display the loaded diagrams.

15. Sources of Help

Several sources of information have been provided to assist the user in making full use of the numerous facilities provided by this Application.

- As illustrated in section 3 (page 5), each tab, in general has 3 main areas, The left hand side contains most of the controls which determine how then chart will look like. The central part contains the actual chart, and the top part contains the readout of the various property values of the point at the mouse-pointer (cursor) position.
- Tooltips are provided for almost all the control elements and these can be seen by hovering the mouse over the various menu items, labels, textboxes, command buttons etc.

- On each of the tabs, a 'How To' menu item provides specific information on how to perform various tasks.
- The general procedure in drawing a chart is almost always as follows:
 - Specify the X and Y Parameters, and the Unit System. The Unit system may be specified using either the relevant menu item or the option buttons at the bottom of the left hand panel.
 - Specify the atmospheric pressure or altitude. These are always specified in the first/second columns of the readout panel. Only one of these need to be specified
 - Specify the desired ranges of the X and Y parameters. Then click the <Plot> button.

16. Hints and Tips



- The small panel at the top of the chart contains the controls for specifying the size of the next point to be marked and the width of the next line to be drawn. The colour of the next item to be drawn is indicated by the coloured square. This coloured square will automatically take the colour of any other panel in which the mouse was clicked. Alternatively, right-clicking the coloured square will display the colour selection dialog.
- Lines can be drawn only between 2 selected points. **A point is selected by clicking the mouse in the point.** As a point could be rather small, a small blue highlight will indicate whether the cursor is inside a point or not. This is particularly helpful when trying to click within a point which also has a line in it. Generally, when the cursor is on a 'line', a yellow box (with a % value) will be visible next to the cursor and when the cursor is on a 'point' a small blue square will be visible.
- On the Psychrometric Chart Tab, whenever a point is marked, all its property values are automatically listed in a 'scratch pad'. The scratch pad may be seen using the 'File – Scratch Pad' menu item.
- On the Multi-Alt Tab, when a point is marked, the property values of that point corresponding to each of the drawn pressures will be displayed in the scratch pad.
- Point and lines may be deleted by simply right-clicking on them.
- Note that the corresponding scratch pad entries are not automatically deleted when the point is deleted. If necessary, the corresponding entry has to be deleted manually.
- When the cursor is moved along a line, a small yellow panel beside it will indicate the positional ratio of the mousepointer position with respect to the two ends of the line. This feature is intended to be of help when dealing with mixing of streams or the bypass factor.
- The readout panels will display ">>>" when the value is out of range and also if the relative humidity is above 100%.
- The calculator and the charts have been designed to work only up to the boiling point temperature. As the boiling point is dependent on the pressure, the maximum temperature for which the chart can be drawn varies according to the altitude.

- In the process Mode, the following 'Process Properties & Lines' panel is displayed within the control panel to the left of the chart.

Process Properties & Lines

Property	Start	End	Other
DBT			<input type="checkbox"/>
Sp. Hum.			<input type="checkbox"/>
WBT			<input type="checkbox"/>
Sp. Enthal.			<input type="checkbox"/>
Sp. Vol.			<input type="checkbox"/>
Dew Pt.			<input type="checkbox"/>
Rel. Hum.			<input type="checkbox"/>

Draw
Reset
Hide

Line Colours and Widths

Property	Colour	Select	Width
Rel. Hum.		<input checked="" type="checkbox"/>	1
Wet Bulb		<input type="checkbox"/>	1
Sp. Enthalpy		<input type="checkbox"/>	1
Sp. Volume		<input type="checkbox"/>	1
% Saturation		<input type="checkbox"/>	1
Dew Point		<input type="checkbox"/>	1
Vap. Press.		<input type="checkbox"/>	1
Dry Bulb.		<input type="checkbox"/>	1
Sp. Humidity		<input type="checkbox"/>	1
Grid(major)			
Grid(minor)			
Chart Background			

Plot

- The check boxes in that panel are used to select the property lines to be drawn through the Start, End and the Third point. However, the colour and width of those lines are specified in the 'Line Colours and Widths' panel. The check boxes in the 'Line Colours and Widths' panel are for specifying the lines to be drawn in the Chart.

•

Speed

The above control is used to adjust the resolution of the chart. The slower the speed, the higher the resolution of the chart will be. This facility has been provided because some combination of X and Y axes will require the use of complex implicit equations and iterative calculations and plotting these at the higher resolutions may take an inconveniently long time. The speed slider always loads up in the 'medium' position and that is suitable for most types of charts.

Limits & Intervals			
Property	Min	Max	Step
Dry Bulb	0	50	1
Sp. Hum.	0	.04	.001
Rel. Hum%	10	100	10
Wet Bulb	-10	50	5
Sp. Enth.	0	200	20
Sp. Vol.	.7	1.2	.05
Dew Pt.	-20	40	5
% Satn.	10	100	10
Vap. Pr.	0	20	2
Minor / Major Divisions (X-Axis)			5
Minor / Major Divisions (Y-Axis)			5

The grid of the chart can be customised using the features in the above panel. 'Step' determines the interval between the minor divisions and the Minor/Major feature determines the interval between the major divisions. The graduations on the X and Y axes are always printed at the major divisions.

17. Updates

- We are constantly improving PsychoGen and information about updates and their installation will be available on our website.

18. List of Features

- SI and I-P Units
- Psychrometric Chart and Mollier Diagram
- Dynamic chart that, as the mouse is moved over it, displays the property values of the of the point at the mouse-pointer position
- User customisable colours and widths for property lines, grid lines and chart background
- Save / Load settings
- Build up charts step by step or in one go
- User specifiable ranges and intervals for the axes and property lines
- Single Altitude Display mode
- User-customisable grid for the charts
- Mark and delete points and lines
- Create process diagrams
- Save /Load Process Diagrams
- The property values at all marked points are displayed in a Scratch Pad.
- In the case of multi-altitude displays the property values of the marked point corresponding to each altitude concerned are saved in the Scratch Pad.
- Quick way to find the SHR of a selected line
- Quick way to find the line which has a given SHR
- Save / Load notes and screen shots
- Assign Captions
- Print out Charts and diagrams

Special Features:

- *Number of additional types of charts: 64 (PsychroGen®20 only)*
- *User-selectable X and Y axis parameters*
- *Multiple Altitude Display mode*
- *Simultaneous display of property lines at up to a maximum of four altitudes*
- *Full-featured property values calculator with (input required: altitude or pressure and ANY 2 independent property values) over 30 different input pairs.*
- *Results of an unlimited number of calculations can be retained on-screen.*
- *Saturation curves and dew points of compressed air*
- *Saturation details of up to 5 temperatures (over a wide range of pressures) can be simultaneously displayed.*
- *Knowing initial conditions, find amount of condensate at different pressures and temperatures*
- *Practically any combination of properties on the X and Y axes (up to 66 different combinations) (PsychroGen®20 only)*
- *Pre-loaded examples of some processes*
- *Dynamic display of mixing ratios, ADP and SHR*
- *Process Mode for finding SHR and other process parameters*
- *Help feature with detailed 'How To' notes on using the various features*