



# Vista™ - Visual Turbomachinery Analysis

## Preliminary design of centrifugal compressors: powerful, accurate, but simple to use

- 17 years of development of the fundamental algorithms ensure essentially simple and rugged operation.
  - Data requirements kept to a minimum so that the designer can move very quickly to an initial design.
  - Extremely short run-times allow many candidate designs to be assessed rapidly.
  - Built-in loss correlations obtain accurate efficiencies for each design, with informative graphical output guiding the user towards the optimum efficiency.
  - Choice of gas property models, including a full real gas model
  - Smooth data transfer for subsequent off-design performance prediction and throughflow analysis.
  - One-button launch of 3D geometry in ANSYS® BladeModeler™ from standalone Vista CCD
- or
- full integration of Vista CCD in ANSYS® BladeModeler™ within Workbench 11 and 12.
  - Continuing addition of new facilities and PCA's established fast-response user support.

## Vista™ CCD - Centrifugal compressor preliminary design

### Overview

Preliminary design, sometimes called 'sizing', remains an essential first step in the design of a new turbomachine. Despite immense progress in the applicability and accuracy of CFD systems, it is widely acknowledged that an incorrect preliminary design cannot be remedied by any amount of subsequent analysis of a more advanced type. However, used together, a good preliminary design method and advanced CFD can complement each other very effectively in the design process.

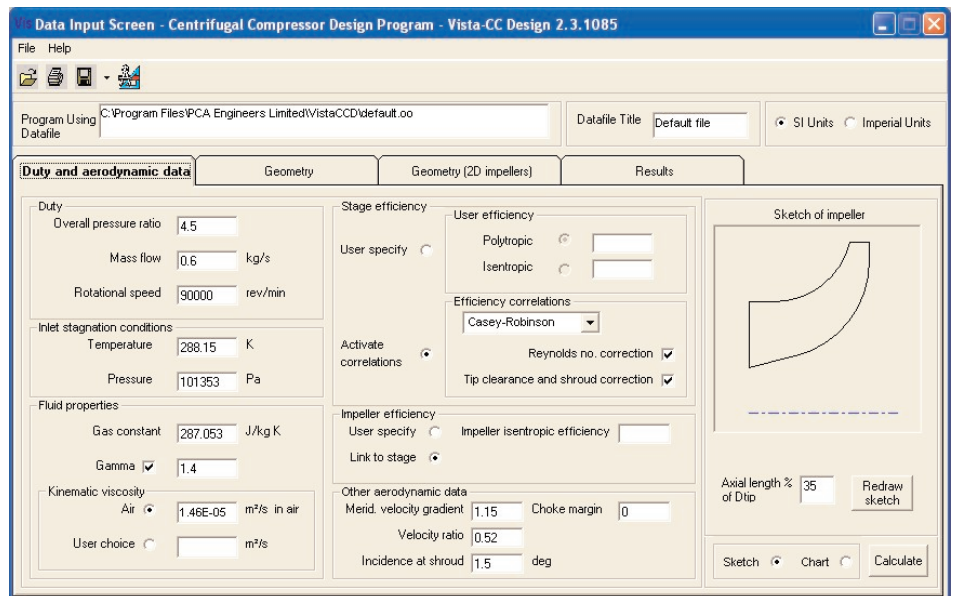


Fig. 1 Vista CCD user interface

For preliminary design of centrifugal compressors, PCA has developed over the past seventeen years Vista™ CCD, a simple yet powerful code which can allow the compressor designer to move from initial ideas about the compressor duty to a full 3D geometry launch in a few minutes.

### Keeping it simple for the user

One of the aims of Vista CCD development has been to avoid imposing on the user an unnecessary overhead of data preparation. The scope of the code has thus been kept within bounds consistent with this approach, avoiding over-sophistication and the potentially frustrating data demands that this incurs. This is especially beneficial at the very beginning of a new design when the designer may know little more than the required pressure ratio and mass flow, a speed constraint, and perhaps one or two geometric constraints. There is also appropriate use of default data settings, which may be reliably used in



the early phases of design, again avoiding time-consuming and unnecessary data preparation and entry.

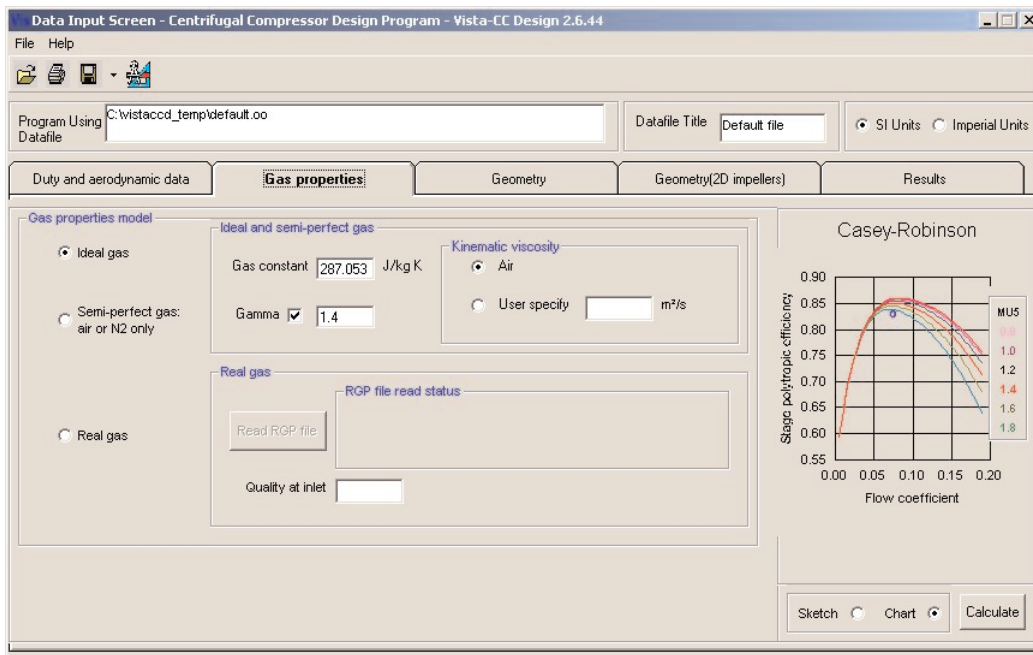
### Gas property model

A range of gas property models is available in Vista CCD. Many design duties can be run reliably using the ideal gas model. For higher pressure ratios the semi-perfect gas model – specific

All three are displayed as graphs and include the current design point as a single point symbol (Figure 2).

### Links to Vista™ CCP and Vista™ TF

There are direct data links to the off-design prediction method Vista CCP and to PCA's throughflow code Vista TF, now also integrated into ANSYS® Workbench.



### More facilities with every release

Figure 2 shows:

- the options for the gas property model – ideal gas, semi-perfect gas, or real gas. The latter is a recent introduction to Vista CCD's growing range of facilities.

- the simple but invaluable graphical representation of the current design's efficiency prediction in relation to the entire range of the underpinning correlation.

**Fig. 2 Vista CCD user interface**

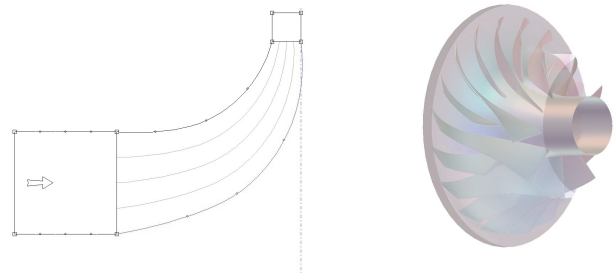
heat varying with temperature – offers greater accuracy. Finally a full real gas modelling system can be used for refrigerant and other real gases using an 'RGP' file which can later be used for CFD analysis in ANSYS® CFX™.

### Efficiency prediction

A choice of three efficiency correlations is offered. The default method is that due to Casey and Robinson, pictured above in Figure 2. This newer correlation unifies the correlations of two earlier systems, so that both high pressure ratio and high flow coefficient designs may be reliably predicted by a single method. However, for those preferring to stay with the traditional correlations, the two source methods are also offered, as published by Rodgers and by Casey & Marty.

### Vista™ CCD and ANSYS® BladeModeler™

Vista CCD is available as a standalone program but it is also integrated into ANSYS® BladeModeler™ within Workbench 11 and 12, so that it may be used to generate an optimised 1D compressor design before moving rapidly to a full 3D geometry model and subsequent CFD analysis. In its standalone form, Vista™ CCD has an option to launch ANSYS® BladeModeler™ (Fig 3).



**Fig. 3 Instantly-launched 3D geometry in BladeModeler™.**