

## Preliminary Design of Multistage Axial Compressor and Turbines

### AXIAL™

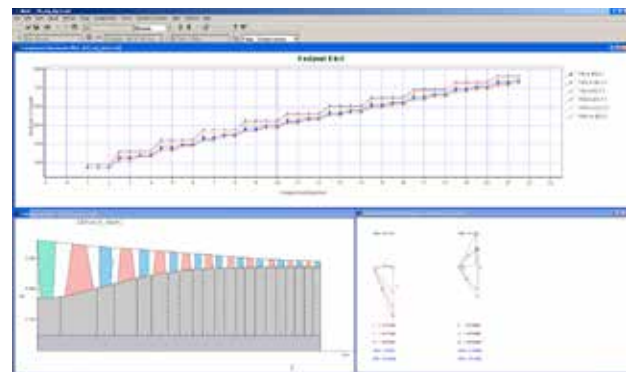
Perform meanline design optimization for single-stage and multistage axial fans, compressors, turbines and pumps with AXIAL™ Computer-Aided Engineering (CAE) software from Concepts NREC. AXIAL supports design-point and off-design analysis for subsonic and supersonic designs through advanced pressure-based formulation. Other AXIAL abilities include:

- Estimation of hub and tip flow parameters
- Evaluation of compressor stall and choking conditions for both compressors and turbines
- Design analysis of multiple choked and stalled components, along with mass flow, pressure ratio, and power
- Setup of an arbitrary sequence of stage elements (rotor, stator, duct, IGV, EGV, etc.)

### Loss Modeling

AXIAL's state-of-the-art loss modeling system allows for the independent selection of loss models by blade row and loss split by loss component (i.e., profile, secondary flow, partial admission, wetness losses, and more). Industry-standard loss models are included for turbines and compressors.

- Ainley-Mathieson (turbine)
- Dunham-Came (turbine)
- Kacker-Okapuu (turbine)
- Moustapha-Kacker (turbine)
- Koch & Smith (compressor)
- Wright & Miller (compressor)



Users may view and edit the selected design parameters, including parameter distributions, directly in the plots using the interactive graphical editing of input data.

## Real Fluid Thermodynamics

Real Fluid thermodynamics are integral to AXIAL, which includes built-in support for perfect and semiperfect fluid properties. Real Fluid Properties are provided through several different fluid databases, including D.B. Robinson Real Fluid Properties, NIST, and ASME Steam. AXIAL also supports condensed gases, user-modifiable fluid properties, and the barotropic fluid thermodynamic model.

## User-Friendly Features

AXIAL includes a flexible, user-friendly interface and built-in performance mapping. Context-sensitive help is included for each parameter in each table cell. HTML help is also available.

## Graphical and Tabular View of Results

AXIAL utilizes integrated performance map plotting. Users can view blade angles and velocity triangles at the rotor inlet and exit, as well as view results in a flexible spreadsheet-like table view. Tables are customizable through separate filters, with the user able to create any number of filters, select what to display, and customize the labels as well.



Axial blade row designed with AXIAL.

## OLE Automation Support

Users can control AXIAL from an external program by means of Object Linking and Embedding (OLE) automation, which supports the full control of data entry, program execution, and result retrieval. External programs can be written in Visual Basic®, Visual C++®, FORTRAN, Python® or other languages that support the Microsoft® OLE standard.

## Direct Integration with AxCent

AxCent files can be started from within AXIAL, with the initial geometry and flow parameters transferred automatically to AxCent for blade shaping/stacking, blade-to-blade analysis, throughflow analysis, and further transfer to CFD and FEA programs. The user can also update the AXIAL solution from AxCent, transferring the more complete geometry from AxCent back to the meanline model.

Agile Engineering  
Design System®  
Applications

		Radial Compressors	Fans & blowers	Turbines	Axial Compressors	Pumps	Fans & blowers	Turbines
Preliminary design	COMPAL®	✓						
	PUMPAL®		✓					✓
	RITAL™				✓			
	FANPAL™			✓				✓
	AXIAL™					✓	✓	✓
Detailed design	AxCent®	✓	✓	✓	✓	✓	✓	✓
CFD	Pushbutton CFD®	✓	✓	✓	✓	✓	✓	✓
FEA	Pushbutton FEA™	✓	✓	✓	✓	✓	✓	✓
Optimization	TurboOPT II™	✓	✓	✓	✓	✓	✓	✓
CAM	MAX-PAC™	✓	✓	✓	✓	✓	✓	✓

Concepts NREC design software is compatible with all commercial design packages.



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