Concepts NREC

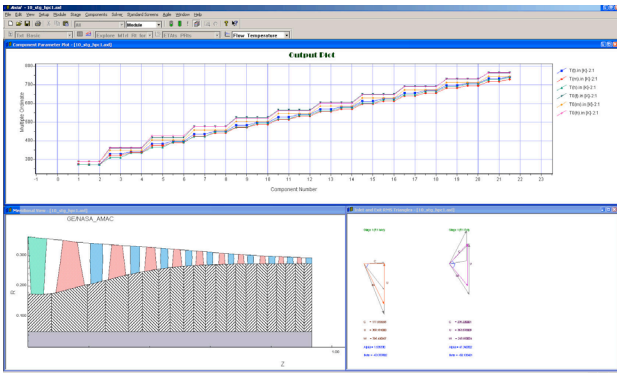
The Experts in Turbomachinery

Preliminary Design of Multistage Axial Compressors and Turbines

AXIAL™

Perform meanline design and analysis of single-stage and multistage axial compressors and turbines 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:

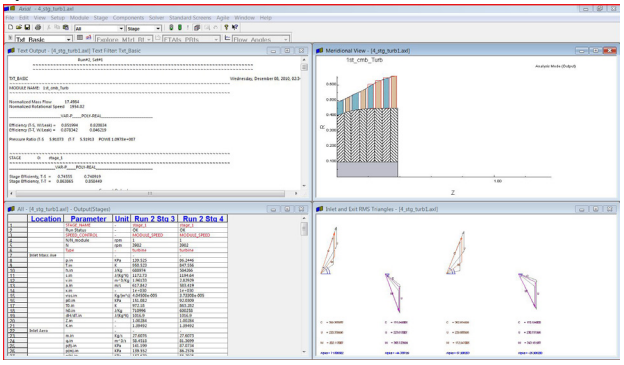
- Estimation of hub and tip flow parameters
- Evaluation of stall and choking conditions
- Analysis of multiple choked and stalled components, along with mass flow, pressure ratio, and power
- Setup of an arbitrary sequence of stage elements (rotor, stator, duct, IGV, EGV, etc.)



Loss Modeling

AXIAL's state-of-the-art loss modeling system allows for the independent selection of loss and deviation 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.

Concepts NREC's Agile Engineering Design System®		Radial: Compressors	Radial: Fans	Radial: Pumps	Radial: Turbines	Axial: Compressors	Axial: Fans	Axial: Pumps	Axial: Turbines
CAE Preliminary Design									
Meanline Approach	AXIAL™					√			√
Meanline Approach	COMPAL®	√							
Meanline Approach	FANPAL™		√				√		
Meanline Approach	PUMPAL®			√				√	
Meanline Approach	RITAL™				√				
CAE Detailed Design									
3D Geometric Design	AxCent®	√	√	√	√	√	√	√	√
Basic CFD Option for AxCent	FINE™/pbCFD*	√	√	√	√	√	√	√	√
CFD Option for AxCent	FINE™/Turbo™*	√	√	√	√	√	√	√	√
FEA Option for AxCent	Pushbutton FEA™	√	√	√	√	√	√	√	√
CAE Specialized Design Software									
Gas Turbine Blade Cooling	CTAADS™								√
Optimization	TurboOPT II™	√	√	√	√	√	√	√	√
Rotordynamics	Dyrobes®	√	√	√	√	√	√	√	√
Gas Turbine Cycle Analysis	Gas Turb®	√				√			√
CAM Toolpaths									
Base Platform	MAX-PAC™	√	√	√	√	√	√	√	√
Flank Milling Option	MAX-5™	√	√	√	√	√	√	√	√
Point Milling Option	MAX-AB™	√	√	√	√	√	√	√	√
Closed Impeller Option	MAX-SI™	√	√	√	√	√	√	√	√
Single Blade Option	MAX-SB™	√	√	√	√	√	√	√	√

*Offered in partnership with NUMECA International as part of the FINE/Agile™ integrated suite.

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