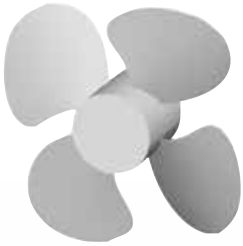
Concepts NREC

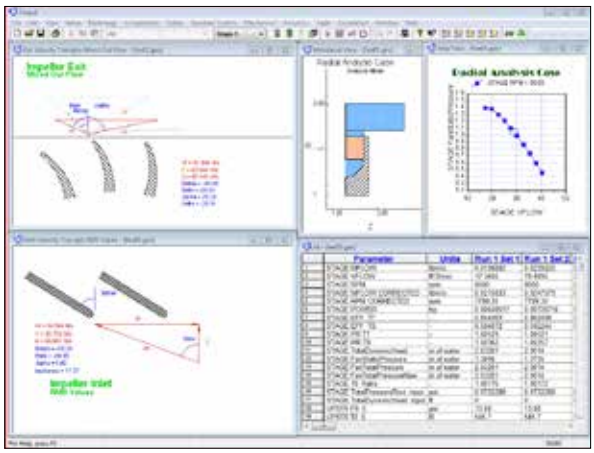
The Experts in Turbomachinery



Preliminary Design Module for Axial, Radial, or Mixed-Flow Fans

FANPAL™

Perform meanline design optimization for AXIAL, centrifugal, and mixed-flow fans with Concepts NREC's FANPAL™ CAE software program. The meanline approach can be used to rapidly design and analyze axial, radial, and mixed-flow fans for single or multiple stages. FANPAL is used to design the fan stage, analyze the performance, refine parameters with data reduction, and model the machine according to several performance models. FANPAL's unique Design Wizard guides the user through all the steps necessary for design, analysis and data reduction. The meanline fan design from FANPAL can easily migrate into the AxCent® program for further blade design and fluid dynamic analysis.



Radial fan design example.

Components Supported by FANPAL

- Radial or axial inlet guide vanes
- Open or closed impellers
- 2D or 3D impellers
- Front and rear seals
- Diffusers, including: Vaned; Vaneless; Wedge/Channel; Cascade; Conical; 90/180-degree Bends; Foil
- Exit elements, including: Collector; Volute; Return Channel
- Various leakage paths
- Multistage fans

Previous generation Holmes High-Velocity Floor Fan (left) compared to quieter and more efficient new design (right).

Integrated Performance Map Plotting

Review design performance, analysis, and test data with performance maps that are flexibly plotted and updated automatically with each geometric change.

Modeling

Radial fans and blowers in FANPAL are supported by the Two-Elements-in-Series (TEIS) rotor diffusion modeling through a two-zone approach. Axial designs are modeled using the famous Koch-Smith method to calculate loss and deviation. Other models are implemented to calculate disk friction, exit mixing, radial and axial stator diffusion/losses, volutes, stall, thrust, and other fluid dynamic aspects of fan performance.

Easy Editing

View the fan or blower stage in an active, true-scale meridional view. Edit the parameters by double-clicking on the component in the meridional view. Also, edit parameters using a single text input/output file, a feature especially useful for optimization.

Preliminary Mechanical Analysis

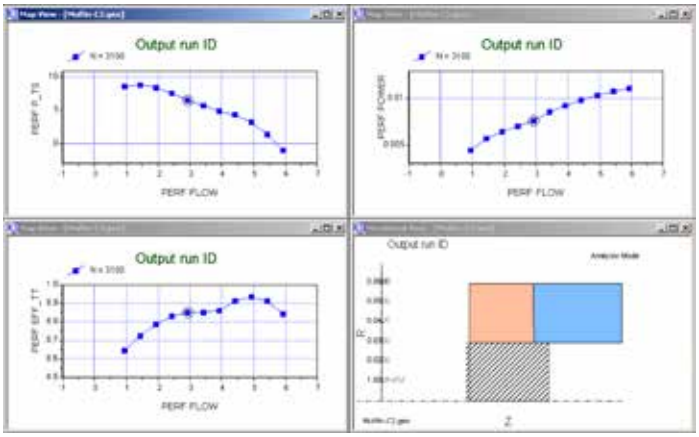
FANPAL provides the user with an initial calculation of the design's mechanical properties. It also estimates stress, vibration, and fatigue limit, and accesses a large database of customizable material properties.

Axial View with Velocity Triangles

View blades and velocity triangles at the impeller inlet and exit in a window view.

A Real Fluid program

FANPAL calculates real fluid properties using optional D.B. Robinson Real Fluid Properties, NIST, or ASME steam routines. Users can also incorporate their own proprietary fluid property routines.



Axial fan design example.

OLE Automation Support

Control FANPAL from an external program through industry-standard Object Linking and Embedding (OLE) automation, which supports 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 can start automatically from within FANPAL, with the initial geometry transferred automatically to AxCent. Changes in AxCent that affect the meanline analysis will cause the meanline analysis to be rerun and all performance maps to be regenerated.

Concepts NREC's Agile Engineering Design System®		Radial				Axial			
		Compressors	Fans	Pumps	Turbines	Compressors	Fans	Pumps	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®	√	√	√	√	√	√	√	√
CFD Option for AxCent	FINE™/Turbo™*	√	√	√	√	√	√	√	√
Pre- & Post-Processor for AxCent	pbPost™	√	√	√	√	√	√	√	√
FEA Option for AxCent	Pushbutton FEA™	√	√	√	√	√	√	√	√
CAE Specialized Design Software									
Gas Turbine Blade Cooling	CTAADS™								√
Optimization	TurboOPT II™	√	√	√	√	√	√	√	√
Rotor Dynamics	Dyrobes®	√	√	√	√	√	√	√	√
Gas Turbine Cycle Analysis	GasTurb®	√				√			√
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™	√	√	√	√	√	√	√	√
3+2 Roughing Option	3+2 Roughing	√	√	√	√	√	√	√	√

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

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