

## Detailed 3D Design and Rapid 2D Flow Analysis Module for Turbomachinery

### AxCent®

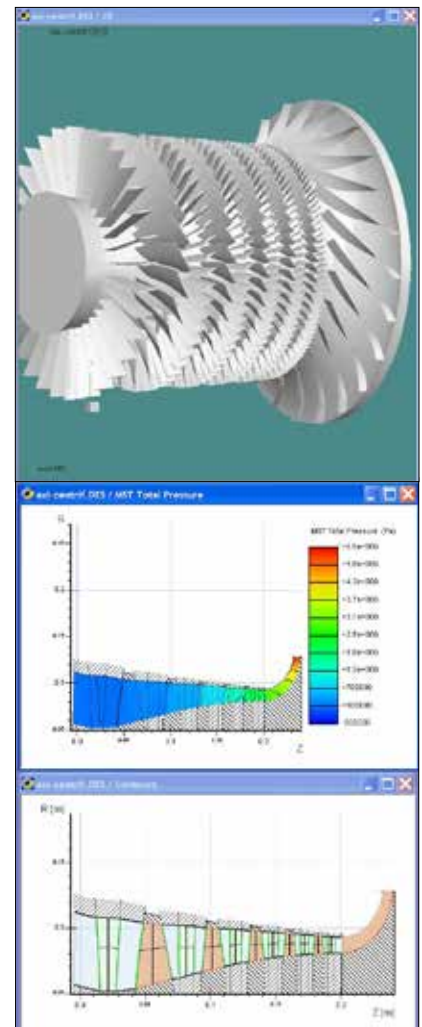
Design and analyze 3D geometries for axial, radial, mixed-flow compressors, pumps, fans, and turbines. AxCent® combines the capabilities of the most widely-used turbomachinery codes to design single-stage or multistage turbomachines. Powerful features are employed for axial, mixed-flow, and radial geometries that can be combined to design almost any type of turbomachinery.

#### Blade Geometry

AxCent easily handles the most complex blade geometry. A partial list of blade design features includes:

- Blade stacking of 2D cross sections
- Blade restaggering around an arbitrary axis
- Bowed blading defined by hub-to-shroud bow profiles
- Bowed or sculpted element with arbitrary number of mid-span sections
- Variable tip clearance on either end of the blade
- Flow cuts and radial trims
- Swept leading/trailing edges
- Multiple, offset, and independent splitter blades
- Irregular blade/splitter configurations for noise reduction

Other design features include: parameterized volute geometry generation, split-duct geometry, and fillets with constant or variable radius and aspect ratio. Also, cutaway views allow real-time cross sections to be viewed as the design is edited. AxCent's 3D overlays permit viewing of current, real-time changes on a transparent overlay.



*A multistage axial and centrifugal compressor laid out in AxCent.*

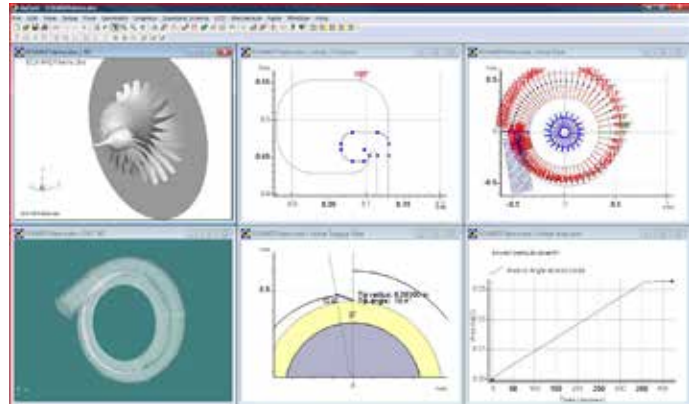
## Flow Analysis

In addition to geometry design, AxCent includes several options for real-time interactive flow analysis utilizing a number of CFD solvers. Concepts NREC's inviscid streamline curvature solver is the industry standard for centrifugal pump and compressor flow analysis. Blade-to-blade is a powerful and rapid 2D CFD-based solver for quickly evaluating cross sections. Through-flow is an axisymmetric solver for rapid analysis of axial flow in compressors and turbines using industry standard loss and deviation models. Comprehensive analysis can be accomplished through full 3D CFD with an advanced full Navier-Stokes solver.

## Direct Integration to Other Programs

AxCent works through direct links with all Concepts NREC meanline programs, including:

- COMPAL® (radial compressors)
- PUMPAL® (radial pumps)
- RITAL™ (radial turbines)
- FANPAL™ (axial & radial fans)
- AXIAL™ (axial & radial compressors and turbines)
- Pushbutton CFD® (flow analysis)
- TurboOPT II™ (optimization)



**AxCent has advanced volute generation capability.**

AxCent can be started from any Concepts NREC meanline program (once the geometry has been set up), and can link the AxCent geometry back to the meanline design to rerun the analysis and regenerate the performance maps. Additionally, using TurboOPT II, the AxCent geometry can be linked to an internal optimizer or to a third-party optimizer such as Isight™, VisualDOC, and IOSO. Other programs with which AxCent is compatible include: FLUENT®, OpenFOAM®, CAD systems, and import-export formats with Python® scripting.

## Structural Analysis Integration

AxCent is fully integrated with Concepts NREC's FEA stress analysis program, Pushbutton FEA™. FEA stress, thermal, and modal analysis can be conducted directly through the AxCent interface.

**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™	✓	✓	✓	✓	✓	✓	✓



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