

Wind Blade Analysis for Wind Power - Pre-Analysis & Start-Up

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Problem Specification

1. Pre-Analysis & Start-Up

2. Geometry

3. Mesh

4. Physics Setup

5. Numerical Solution

6. Numerical Results

7. Verification & Validation

Exercises

Comments

Pre-Analysis & Start-Up

Pre-Analysis

The governing equations to be solved using Ansys Fluent are shown below.

Governing Equations

- Use rotating frame of reference
 - Don't need to move mesh in this reference frame
 - $\vec{v} = \vec{v}_r + \vec{\omega} \times \vec{r}$
- Reynolds-averaged continuity
 - $\nabla \cdot \vec{v}_r = 0$
- 3D Reynolds-averaged Navier-Stokes equation
 - with Coriolis and centripetal accelerations
 - $\rho(\vec{v}_r \cdot \nabla)\vec{v}_r + \rho(2\vec{\omega} \times \vec{v}_r + \vec{\omega} \times \vec{\omega} \times \vec{r}) = -\nabla p + \mu \nabla^2 \vec{v}_r + \nabla \cdot \vec{\tau}_{turbulent}$
 - The last term represents the turbulent or Reynolds stresses
- Equations for k and ω
 - k and ω are used to calculate the turbulent stresses from the averaged velocity field
 - k : Turbulent kinetic energy
 - ω : Specific dissipation rate



[Go to Step 2: Geometry](#)

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