FLOTHERM™ Advanced Training Course

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Computational Fluid Dynamics

- Computational Fluid Dynamics (CFD)
- Describe flow of fluid and heat transfer within system of interest
- Get results in terms of temperature, velocity etc.

CFD

- Develop equations
- Transform them
- Solve them

Governing Equations

- Describe mathematically the physics of flow and heat transfer
- Using fundamental empirical laws of matter
- Set of governing equations for a point in space

Governing Equations

- Conservation of Mass

⇒ Continuity equation

- Newton's Second Law

⇒ Navier-Stokes equations

- First Law of Thermodynamics

⇒ Energy equation

Governing Equations

- General form of conservation equations:

$$\partial\phi/\partial t + \phi_{out} - \phi_{in} = S_{\phi}$$

- Differential equation, must be transformed before it can be solved

Transformation

- Differential equations must be transformed into a form that can be solved
- Process is called discretization
- Discretized equations can be solved numerically by computer

Solution

- The algebraic equations formed by discretization must be solved
- Solution scheme must be chosen
- Within the scheme, a technique for solving equations is used
- Scheme is iterative as error in the algebraic equations is minimised

Solution

- Must supply boundary conditions
- Initial conditions
- Termination criteria

Solution

- Solution schemes have controls to improve stability and convergence time
- False time step
- Linear relaxation

CFD

- After solution, we have full description of flow field and temperature within our domain of interest