Gas Train Simulation of a Evaporative Cooling Chamber

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PRESENTATION TOPICS

• Company Overview
• Problem Description
• Methodology
• Results
• Conclusion
• COPRIM Ingeniería S.A. is a chilean company certified by ISO 9001 since 2004 and member of Asociación de Empresas Consultorras de Ingeniería de Chile (AIC). It was founded in 1978 and it is oriented to satisfy the copper mining industry needs.

• COPRIM has developed in-house technology in their equipment. It has been installed and it is working successfully in different refinery and smelters facilities in the world.

• COPRIM has developed projects in countries such as Serbia, Peru, China, Canada and Chile.
COMPANY OVERVIEW
PROBLEM DESCRIPTION

- Evaporative Cooling Chamber
- Off-Gas Hood
- High Speed Duct
- Butterfly Valve
• Evaporative cooling chamber
Objectives:
- Determine the Suction Pressure to be supplied by the client in the project battery limit.
- Corroborate that water supplied by Vendor is enough to cool the gas.
METHODOLOGY: Mesh
METHODOLOGY:

• Turbulent model
  – k-epsilon
    • Realizable
  – Near-Wall Treatment
    • Standard Wall Functions

• Injections
  – Four (4) Solid-cone
  – Nine (9) Particle Streams

• Materials
  – Mixture
    • SO₂, N₂, O₂, H₂O.
  – Near-Wall Treatment
    • Standard Wall Functions
METHODOLOGY: Boundary Conditions

Hood, Chamber and Hopper:
- Imposed Temperature measured in field

Duct:
- Adiabatic

Duct Outlet:
- Pressure Outlet
- Imposed suction pressure

Infiltration:
- Pressure Inlet
- Temperature

Off-Gas:
- Mass-Flow Inlet
- Gas composition
METHODOLOGY:

- **Solution Methods**
  - Pressure-Velocity Coupling
    - SIMPLE
  - Spatial Discretization
    - Second Order Upwind

- **Solution Controls**
  - Under-Relaxation Factors (URF)
    - At the beginning: smalls URFs
    - Then: larger URF.

- **Solution Initialization**
  - Standard Initialization
RESULTS: Temperature Contours & Flow
RESULTS: Pressure Contours & Flow
RESULTS: Temperature Flow
CONCLUSIONS

• The minimum suction pressure that warranties the system operation is: 500 Pa(g)

• The water range proposed by the Vendor is enough to cool the gas