The Design & Construction of a 96,000 tpd Copper Tailings Paste Thickener Plant

L. MacNamara
Vice President, EMEA
FLSmidth Non-Ferrous
Overview

- The Sarcheshmeh concentrator
- Water management plan
- Tailings disposal project
- Testwork
- Equipment selection
- Design
- Construction
The Sarcheshmeh Concentrator
The Sarcheshmeh Concentrator
Existing 122m Eimco Tailings Thickeners
Located in Kerman Province – Iran
- Arid Climate
- Mountainous region
- Difficult terrain for tailings disposal

Water is a scarce resource
- Mining sits alongside local community
  - Agriculture
  - Domestic consumption
Water Management

- Original 40,000 tpd concentrator built between 1975-1980
- Phase 1 expansion of 28,000 tpd commissioned in 2003
- Phase 2 expansion of 28,000 tpd currently in progress and projected to start production in 2013
- Planned expansion to 96,000 tpd would put unacceptable strain on the available water resource
- Plan to improve water use on site in all areas – including tailings disposal
Thickened Tailings Options

- Increased water recovery
- Maximise dam capacity
Iranian Experience in TTD

- **Miduk**
  - 4 x 16m Eimco DCT’s
  - Installed 2002
  - 7 Mtpa

- **MFR**
  - 1 x 14m Eimco DCT
  - Installed 2007
  - 2 Mtpa
Miduk Copper Tailings
Down-Valley Gravity Discharge
MFR
Testing

- Laboratory Testwork
- On site Pilot testwork
Feed PSD

Cumulative Volume Under (%)

- ▲ Day 1
- ■ Day 2
- ♦ Day 3

Particle Size (μm)
Lab Test Results

![Graph showing the relationship between underflow yield stress (Pa) and underflow solids concentration (% w/w). The graph displays a positive correlation between the two variables.]
Pilot DCT at Sar Cheshmeh
Pilot Trials

![Graph showing U/F Solids Concentration (%) and Density (g/cc) over time.]

Legend:
- Underflow Concentration (oven drying)
- Underflow Density (Marcy scale)
Pilot Testwork Conclusions

- 12 hour residence time was confirmed
- Floc dose of 25 g/t confirmed
- Average U/F density 59.9% over 73 hours running
- Highest U/F density 62% over 12 hours
96,000 tpd
40% solids w/w
Target U/F 60% w/w

Sizing:
- 6 x 34m ø Deep Cone Thickeners
- 12 x 24m ø Deep Cone Thickeners
Eimco DCT development

![Graph showing Eimco DCT development with diameter (m) on the y-axis and year on the x-axis from 1996 to 2005. The graph indicates a significant increase in diameter from 1996 to 2005.]
Large Diameter Paste Thickener

25 mayo 2012
Equipment Selection
Deep Cone® Paste Thickener

Patented E-Duc® Feed Dilution System

- Drivehead
- Rakes
- Paste Discharge Cylinder
Eimco Deep Cone Thickener

Patented E-Duc® Feed Dilution System

Driveheads

Feed Pipe

Paste Discharge Chute

Paste Rake
Discharge Cylinder/Shear Thinning Loop

- Benefits of Rio Tinto Alcan patented Shear Thinning Design

- Reduces torque in the discharge cylinder
- Can recycle shear thinned mud to the tank knuckle and reduce the rake torque during shutdowns and upsets
- Thinned material in the discharge cylinder helps in getting the thick mud out of the thickener
- Thinned material in the discharge cylinder keeps things fluid and mixed during times when the discharge pumps are off
Flocculant Control

- Plant feed density measurement
- Individual thickener feed rate measurement
- Individual thickener flocculant control as g/t of actual feed
Plant location

Concentrator

Dam
- Tailings flow by gravity to existing dam
- Channel design will not allow higher solids concentration to flow
- Remote thickener installation
- Locate thickeners at the dam and no requirement for pumping paste
Plant Layout

- Plant Services
- Feed Distributor
- Outlet #1
- Outlet #2
- Incoming feed line
- Return Water Pump Station
Feed distribution

- Single central distribution tower
  - Common feed density measurement
  - Individual feed rate measurement

- Even flow to all thickeners
  - No matter how many are operating

- High flexible operation
Feed Distribution
Feed distribution
Feed Distribution
Feed Distribution
Construction
Construction