![AFT Applied Flow Technology logo]

High Accuracy Modeling of Copper Mine Pipeline System Using AFT Fathom™

Company: Southern Peru Copper
Address: Retamas S-226
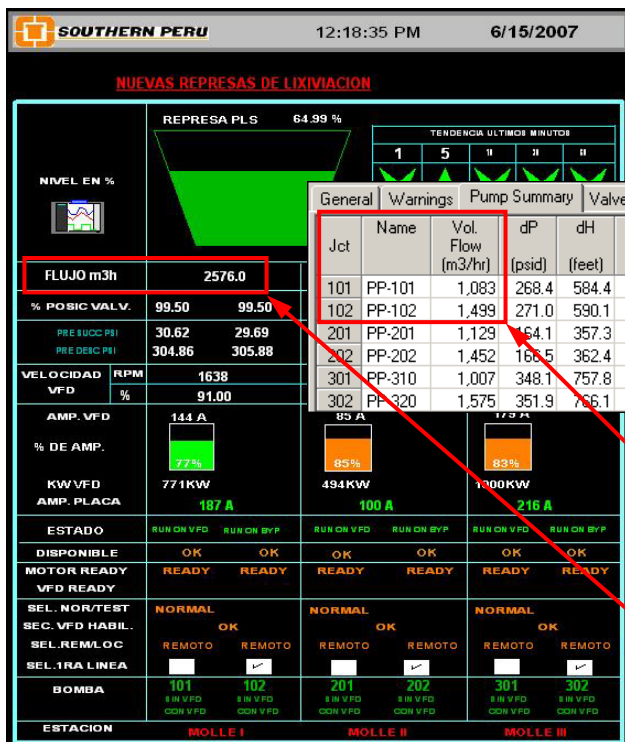Tacna, Toquepala 303
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Southern Peru Copper's Toquepala copper mine is one of four mining operations in Peru and Mexico within the SCC group, and with associated metallurgical complexes is an integrated copper producer and was named the 'Best Managed Metals and Mining Company' in Latin America by Euromoney.

The Toquepala copper mine operation includes an acid leaching system for copper extraction where ore is sprayed with a sulfuric acid solution. This acid and copper rich solution, called PLS (Pond Liquid Solution) is collected in ponds and then pumped back to the leaching plant. Beginning in 2007 Southern Peru Copper undertook a project to improve extraction of the PLS fluid, evaluate alternate system configurations and improve pumping efficiency.

Referred to as the *Área 823 Sistema de Bombeo de PLS*, the pumping system utilizes three pumping stations in series over the approximately 7 km long pipeline. Each pumping station is equipped with three pumps, two normally operating, rated at 1,100 m3/hr. Design head is varied according to the pumping station location along the pipeline to achieve high pumping efficiency, and ranges from 360 meters to 760 meters. Pumps are equipped with variable speed drives for efficient capacity control.

System testing was conducted under a variety of operating scenarios to verify the design. Arturo Saenz, Mechanical Design Engineer at Southern Peru Copper's Central Project Office, compared the measured flow over fourteen tests to that predicted by their AFT Fathom model and found they agreed within 1%.

Asked about the advantages obtained modeling the system with AFT Fathom, Arturo commented that it reduced the time required for design analysis, provided clear results and confirmed a good design approach that saved money.

Jct	Name	Vol. Flow (m3/hr)	dP (psid)	dH (feet)	Overall Efficiency (Percent)	Overall Power (kW)	BEP (gal/min)	% of BEP (Percent)
101	PP-101	1,083	268.4	584.4	84.20	660.7	5,915	80.60
102	PP-102	1,499	271.0	590.1	87.40	889.6	6,500	101.52
201	PP-201	1,129	154.1	357.3	85.86	413.1	5,460	91.07
202	PP-202	1,452	166.5	362.4	86.61	534.2	6,000	106.57
301	PP-310	1,007	348.1	757.8	78.73	852.2	6,825	64.97
302	PP-320	1,575	351.9	766.1	87.43	1,212.8	7,500	92.43

AFT Fathom flow –
PP-101 = 1,083 m³/hr
PP-102 = 1,499 m³/hr
Total   = 2,582 m³/hr

Measured flow = 2,576 m³/hr

Control & Monitoring System Display
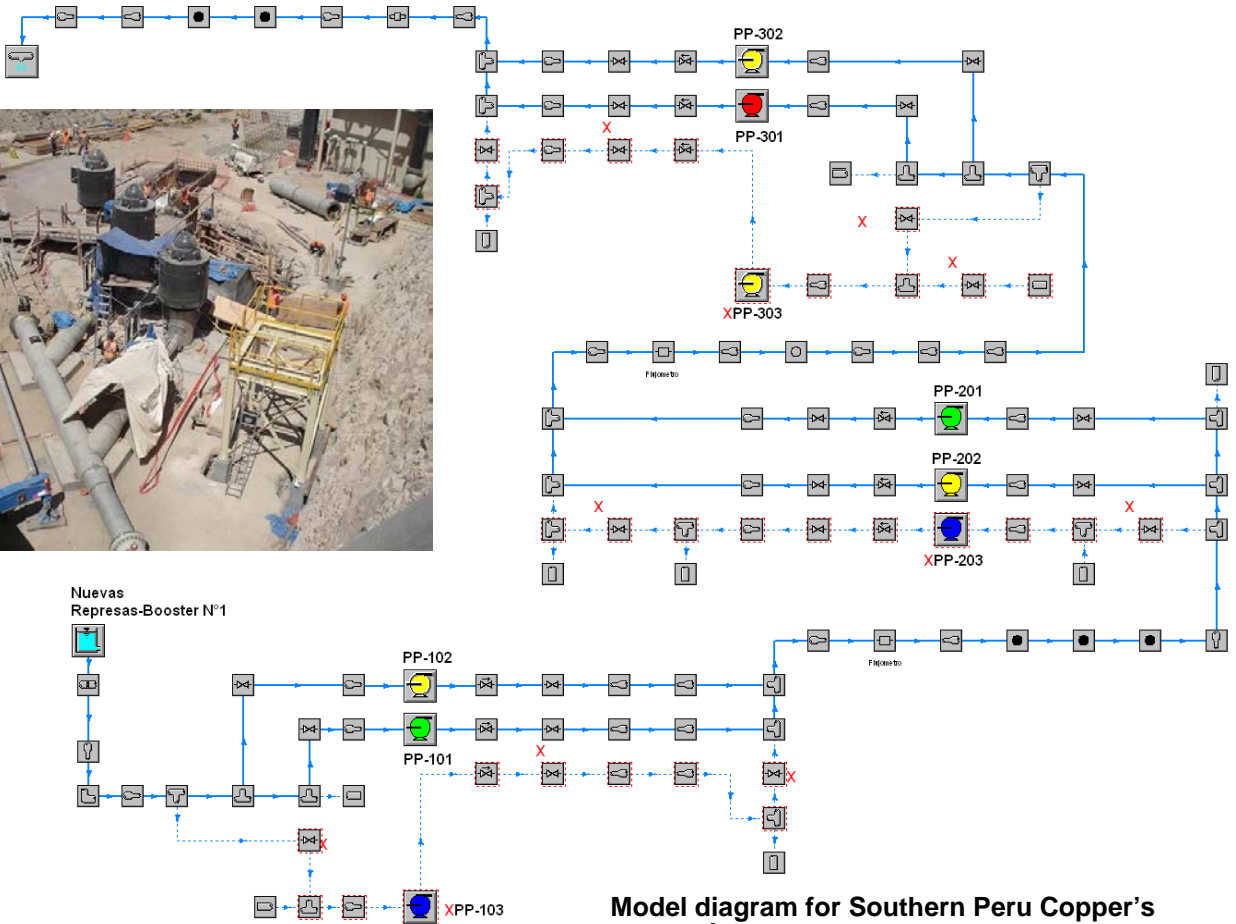
Model diagram for Southern Peru Copper's
Área 823 Sistema de Bombeo

Pressure profile along pipline