Collahuasi on high

HVC=57th
C~175kt
Cu cone/yr.

The fourth-largest copper mine in the world is getting bigger. Two major developments have been announced at the Collahuasi copper-molybdenum mine in Chile

MILL RECORD

In 2004, ABB established a world record of 21 MW for a gearless mill drive (GMD). This was part of a new 12 m-diameter semi-autogenous (SAG) mill at Collahuasi.

This was part of a contract awarded in 2001 to Bechtel Chile Ltda (acting as Collahuasi's lead engineer) to design, manufacture, erect, test and commission three GMD mills: the 21 MW SAG mill and two 15.5 MW ball mills. ABB also installed a harmonic filter and power factor compensation plant.

Because of its elevation, the crushing plant at Collahuasi required a special design for the hydraulic, lubricating and compressed-air systems. The plant structure was also designed to resist seismic activity.

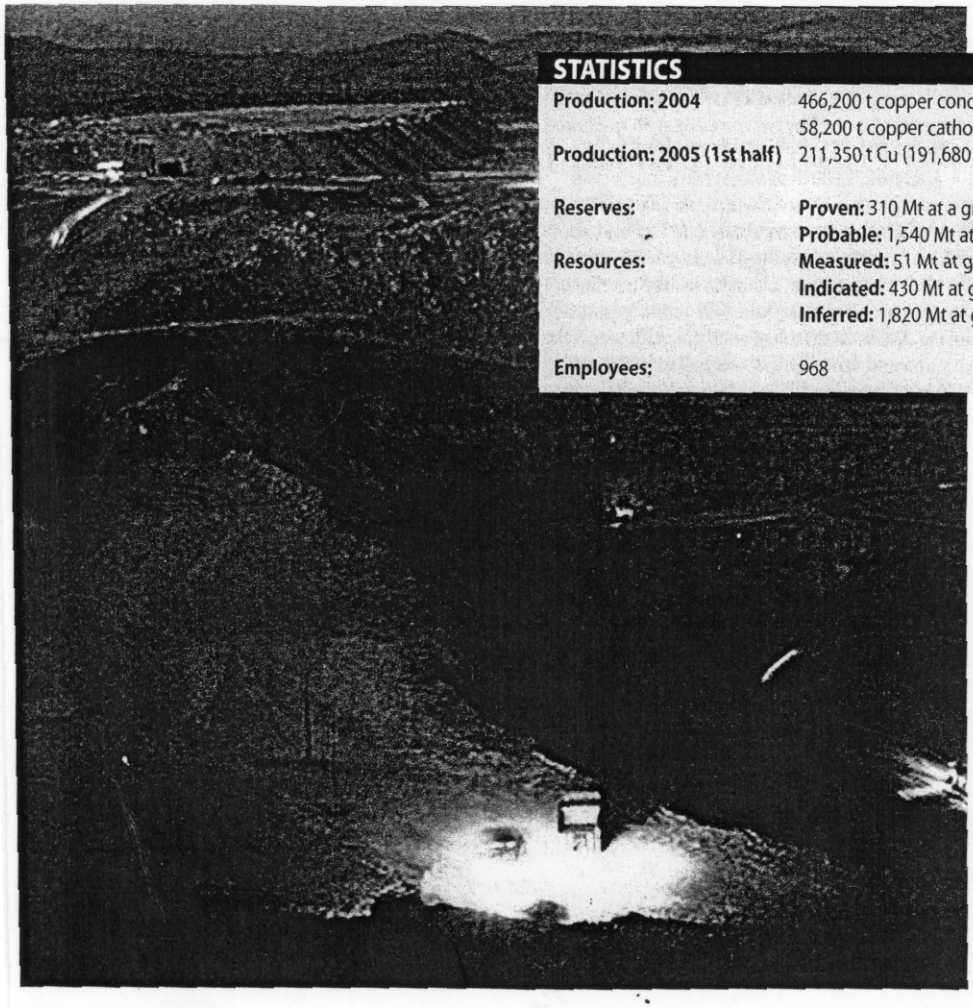
COLLAHUASI is in the barren Atacama Desert at an altitude of over 4,500 m on the Andean plateau of Region I, Tarapaca, in Chile's northernmost territory. Operating conditions are severe, with breathing a struggle in the thin air, and temperatures that rarely exceed 11°C during the day, and normally plunge below freezing at night. Blizzards and lightning storms batter the region. There are no trees, signs of animal life are rare and the nearest settlement is almost 100 km away.

The Collahuasi property centres on two major porphyry copper deposits: Ujina and Rosario. Operated by Compañía Minera Dona Inés de Collahuasi SCM, the operation is owned 44% each by Falconbridge Ltd and Anglo American plc, and 12% by a Japanese consortium led by Mitsui & Co.

Collahuasi's new molybdenum plant was commissioned at the end of September, two months ahead of schedule and under budget. The plant can process 4,300 t/d of copper concentrate, and is designed to produce 4,000 t/y of molybdenum-in-concentrate, rising to 8,000 t/y in later years.

In the second major recent development, it was announced in October that the first stage of an inferred resource estimate for the Rosario Oeste copper deposit has been completed. The estimate for the zone is 248 Mt at an average grade of 1.54% Cu, using a 0.4% Cu cut-off grade.

Mineralisation at Rosario Oeste occurs mainly within a structurally-controlled supergene chalcocite blanket that formed over a swarm of high-sulphidation veins. According to Anglo American, the area relating to the resource estimate represents about half of the total prospective area, which is 300 m from the present limit of the Rosario open pit. Current resources at Collahuasi are already enough to sustain production for at least 50 years.



STATISTICS

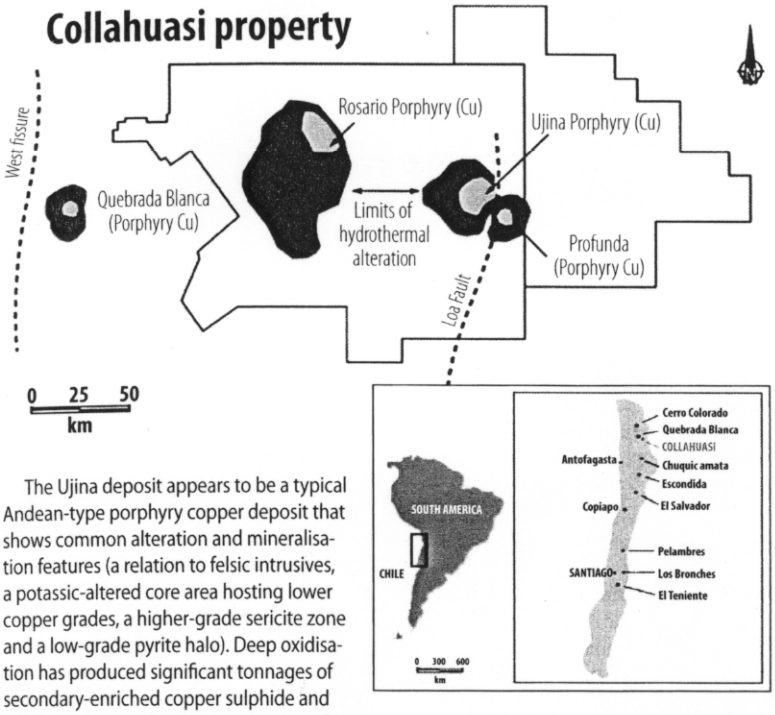
Production: 2004	466,200 t copper concentrate 58,200 t copper cathode
Production: 2005 (1st half)	211,350 t Cu (191,680 t in 2004)
Reserves:	**Proven:** 310 Mt at a grade of 1.09% Cu **Probable:** 1,540 Mt at a grade of 0.87% Cu
Resources:	**Measured:** 51 Mt at grade of 0.55% Cu **Indicated:** 430 Mt at grade of 0.65% Cu **Inferred:** 1,820 Mt at grade of 0.80% Cu
Employees:	968

GEOLOGY

The Collahuasi district lies within a major north-south structural feature known as the West Fissure system. This system controls most of the large tertiary porphyry deposits in Chile, including Chuquicamata and La Escondida. The operation is based on a low-grade copper porphyry, comprising three ore zones: the Ujina and Rosario deposits (consisting of secondary-enriched sulphides and oxides) and the smaller Huinquintipa oxide deposit.

Falconbridge notes that the geology at Collahuasi comprises stratified and intrusive units whose spatial distribution is strongly influenced by the West and Rio Loa faults, which are part of the West Fissure system. Collahuasi lies within a block of up-thrown volcano-sedimentary rocks between the faults. A thick section of folded Jurassic sediments lies west of the fault system and Tertiary volcanics and Quaternary sediments underlie the area east of the fault system.

Movement on these major bounding faults resulted in development of a conjugate set of northwest and northeast faults associated with Tertiary intrusive activity and the formation of the Rosario and Ujina deposits. These large porphyry deposits developed on two separate intrusive and hydrothermal systems of similar age, and exhibit a typical profile (a leached cap, copper-oxide horizon, secondary-enrichment blanket and a primary sulphide protore).



The Ujina deposit appears to be a typical Andean-type porphyry copper deposit that shows common alteration and mineralisation features (a relation to felsic intrusives, a potassic-altered core area hosting lower copper grades, a higher-grade sericite zone and a low-grade pyrite halo). Deep oxidisation has produced significant tonnages of secondary-enriched copper sulphide and oxide ore that overlies larger tonnages of primary chalcopyrite ore.

According to Falconbridge, the Rosario deposit is characterised by a dome-shaped zone of copper mineralisation that centres on a section of the Rosario and Collahuasi porphyries. The centre of this zone contains bornite, chalcopyrite and primary chalcocite (and generally lacks pyrite). Copper mineralisation occurs as both disseminations and fracture-controlled veinlets. The deposit contains a thin, erratically-developed secondary enrichment blanket underlain by a relatively high-grade primary chalcopyrite zone. The lack of a well-developed secondary enrichment blanket is due to both the structure and level of oxidisation.

Huinquintipa, the third deposit at Collahuasi, is a small gravel-hosted exotic copper deposit where the contained copper is present as copper oxides, probably derived during the erosion of the Rosario porphyry.

The economically-important ore types are secondary sulphide (chalcocite, chalcopyrite, bornite and covellite), oxide (chrysocolla and minor brochantite), a mixed combination of oxide and sulphide, and primary ore (chalcopyrite and bornite).

OPERATION

The Collahuasi operation lies in an area of historical copper mining. The deposit was outlined in 1991 after exploration by Shell, Chevron and Falconbridge in the late 1980s.

Production began in 1998 at the Ujina pit, which has a 4.4:1 waste:ore stripping ratio and 15 m bench heights. The mine was commissioned in April 1999 at a cost of US$1.76 billion. Stripping at the Rosario deposit began in 2002 (being completed in 2004).

Since the orebodies are complex (eg five types of oxide ore and seven types of sulphide ore are at Ujina) careful production control is needed. In April 2001, Caterpillar's computer-aided earthmoving system (CAES) was commissioned for two Bucyrus 495B shovels (using 43 m^3 buckets).

CAES was also used to improve the bench configuration (bench-floor elevation variance from design halved to under 20 cm after the installation of CAES). Information collected by CAES at the shovel was also used to reconcile the block model and geological information.

By 2001, Collahuasi was using a fleet of 45 haul trucks, included the first two Caterpillar 797 mining trucks to operate at such an altitude (up to 4,800 m). The trucks were equipped with lighter bodies to boost the payload capacity to 345 t from the standard 326 t, and were further modified to maintain performance in the thin air. Four extra turbochargers were added to the four used on the standard version of the 24-cylinder Caterpillar 3524B engine, rated at 2,537 kW.

To maintain the vehicles' low weights, the modification used the same number of inlet air filters and engine exhaust mufflers as in the standard version. The engine modifications enable the mechanical-drive 797s to maintain their capabilities to climb 8-10% haul roads at speeds of up to 64 km/h.

The Collahuasi operation incorporates an accommodation complex, concentrator plant, solvent extraction-electrowinning (SX-EW) plant and a 200 km pipeline to transport concentrate from the mine to

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EQUIPMENT SCHEDULE

ABB	SAG and Ball mills, and materials handling
Bucyrus-Erie	Five 49R III electric drills Five 495BI electric rope shovels
Caterpillar	797 trucks
Cognis	Synthetic lubricants and hydraulic fluids
Drilltech	T60KL diesel drill
Electric Power Door	Storage facility doors
Eriez	Magnetic separation, metal detection and vibration
FFE Minerals	Mineral processing equipment
Flygt	Submersible pumps and mixers
Geho Pumps	Slurry and sludge pumps
Geosystems International	Analysis software
Goulds Pumps	Slurry and process pumps
Grindex	Submersible drainage, sludge and slurry pumps
Komatsu	40 x 830E haul trucks
Krupp Canada	Ship loader
Krupp Fördertechnik	Two 6,000 t/h semi-mobile crushing plants
MAN Takraf	Mining and bulk-handling equipment
Metso Minerals	Grinding mills
Outokumpu Technology	Flotation cells
Rema TIP TOP	Conveyor belt maintenance and wear/corrosion protection
Pipeline Systems	Slurry pipeline
Vista Training	Training and consulting services
Weir Minerals	Processing equipment