

SWEDEN

By Sven Arvidsson

Sweden's economy grew by 1.6% during 2003, slightly less than the 2.1% growth achieved in 2002. The rate of inflation slowed a little, to 2.1%, from 2.3% in the preceding year. Industrial production increased by 1.7% (2002: 0.1%) and total investments rose by 1% after a fall of 3% in 2002. The average exchange rate was SK8.11:US\$1.00 (SK9.72:US\$1.00 in 2002). The unemployment rate rose to 4.9% (4.1%) and, for the second successive year, labour costs for the manufacturing and mining sectors increased by 4%.

Exploration activity in Sweden rose marginally last year, expenditures rising to SK183 million, from SK177 million in 2002. The increase followed the world trend in exploration. There was also an increase in the number of exploration permits granted by the Inspector of Mines, from 159 in 2002 to 183 in 2003 (mainly for ore minerals). The area covered by new permits was 3,970 (2,368) km². At year-end, the total area covered by exploration permits (mainly for ore minerals) amounted to 8,790 km² and included 1,187 km² for diamonds.

Several gold occurrences have been discovered in northwestern Sweden, notably in the vicinities of the cities of Sorsele, Storuman and Lycksele, and are being drilled. They all lie along a northwest-southeast trend, the so-called 'Gold Line'. Mine development is proceeding at one of the deposits and initial production is scheduled to start in late 2004. The deposit, Svartliden, is owned 80% by the Australian junior Dragon Mining NL. The exploitation licence was awarded in 2002 and environmental permits were obtained during 2003. Svartliden is situated some 60 km northwest of Lycksele. The resource estimate has been increased since last year to 1.63 Mt at 5.54 g/t Au, as drilling has continued. Plant construction is progressing and equipment has been airlifted to the nearby airstrip of Gunnarn.

Also, the Fäboliden gold deposit, some 35 km west of Lycksele, has been further drilled. Lapland Goldminers AB, which owns the deposit as well as other prospects in the area, reports an indicated resource of 18 Mt at 1.52 g/t Au in the central portion. The deposit is open along strike in both directions and at depth. A 1,300 m long open pit to a depth of 150 m is envisaged. MinMet plc and North American Gold Inc have intersected gold mineralisation at the joint venture Bersela property.

North Atlantic Natural Resources AB was granted an exploitation concession for its Vargbäcken gold deposit in October 2003. The deposit is situated 30 km west of Malå in southern Lapland. The resource is estimated at 590,000 t averaging 3.7 g/t Au.

Iron ore

Production of crude ore at LKAB's mines was increased in 2003 in response to a strong world market for iron ore. At Kiruna, production was 21.3 Mt compared with 20.7 Mt in 2002. The mine employs sub-level caving and material is hoisted from the 1,045 m main haulage level. Output of finished products at the plants in Kiruna and Svappavaara increased by 0.7 Mt to 13.7 Mt, and comprised 11.0 Mt of pellets (10.1 Mt) and 2.7 Mt (2.9 Mt) of fines. During 2003, the drilling volume increased to 673,000 m (564,000 m), and mine development included 12,495 m of drifting, slightly less than the 12,800 m achieved in 2002.

A new production control centre (PCRB) was established at LKAB's office building in Kiruna, thus moving control out of the mine. Staff at the centre now steer and direct trains, loaders and skips in the mine by remote control and co-ordinate the entire production chain.

At Malmberget, crude ore production was 12.7 Mt (12.2 Mt). Output of finished products reached a new all-time high of 7.8 Mt (7.2 Mt) comprising 4.3 Mt of pellets (4.0 Mt) and 3.5 Mt (3.2 Mt) of concentrate. The higher pellet production was a result of the second pellet plant being in operation for the entire year. Development work at the mine was maintained at almost the same level as 2002. Drifting totalled 14,651 m (14,600 m), and production drilling was increased to 500,000 m (443,000 m). During the year, three new loaders were purchased.

Base and precious metals

A corporate deal was carried out during the year between Outokumpu Oyj of Finland and Boliden Mineral AB, whereby Boliden acquired the Finnish company's mining and smelting operations, and Outokumpu acquired Boliden's fabrication and technology sales operations. As part of the deal, Outokumpu became a 49% owner of New Boliden. On the mining side, the deal transfers ownership of the Tara mine in Ireland to Boliden. On the smelting side, Boliden acquired Outokumpu's copper smelters at Harjavalta and Pori in Finland, and its zinc smelters at Kokkola in Finland and at Odda in Norway. Boliden has retained its Rönnskär copper and lead smelter in Sweden. The deal has increased Boliden's total annual smelting capacity to 410,000 t of zinc, 400,000 t of copper and 80,000 t of lead

During 2003, Boliden Mineral AB's seven existing mines in Sweden produced a total of 20.3 Mt (21.1 Mt). Three ore-dressing plants serve the mines. They are situated in Boliden, Aitik and Garpenberg. The Aitik open-pit copper mine produced 18.0 Mt. The two underground mines, Garpenberg and Garpenberg North, produced 1.1 Mt of zinc, copper, lead and silver ore. The mines are 800 m to 1,000 m deep. In the Boliden area, the Kristineberg, Petiknäs, Renström and Maurliden mines, together, produced 1.2 Mt of complex sulphide ore. Ore from these mines is treated at the Boliden mill, which employs flotation for complex ore and leaching for gold ore. The concentrates produced contained a total of 93,700 t of copper, 178,600 t of zinc, 18,700 t of lead, 272 t of silver and 5.1 t of gold. There was an all-round improvement in production, particularly for copper (+19%) and zinc (+18%).

Drilling has continued at the newly-discovered Lappberget deposit. It is located between Garpenberg and Garpenberg North, and drifts made from both mines were linked at a depth of 900 m. They will be used to access the Lappberget orebody, which exhibits high grades for zinc, lead and silver.

In the Kristineberg mine, drilling continued at the J-zone (situated beneath the K-zinc and Einarsson West deposits at a depth of 1,000 m to 1,300 m. The J-zone is characterised by pyrite, chalcopyrite and sphalerite, and contains gold, as well as copper and zinc.

In the Renström mine, efforts have been concentrated on the Simon orebody, which will be further investigated through drilling and drifting. For the future, work remains to be done on the Fingal mineralisation and the Deep orebody.

Boliden's Rönnskär smelter is located close to the city of Skellefteå. It treats Boliden concentrates and also purchases concentrates and secondary copper from elsewhere. During 2003, it produced 214,181 t (224,402 t) of copper, 24,200 t (17 800 t) of lead, 12.3 t (15.6 t) of gold and a record 456.6 t (408.4 t) of silver.

Rio Tinto plc has sold Zinkgruvan Mining AB to South Atlantic Ventures Ltd, now renamed Lundin Mining Corp Ltd. The cost was reportedly US\$100 million, plus SK39.7 million and an additional sum yet to be agreed.

At Zinkgruvan, underground mining took place at two operations, Nygruvan and Knallagruvan. The total ore hoisted in 2003 was 757,000 t averaging 9.2% Zn, 4.8% Pb and 103 g/t Ag. The grades were higher than the previous year as a result of less dilution of the ore. Approximately 87% of production was from from drifts, 11.5% from development work and the remaining 1.5% from backfill mining. Development, mainly in the Burkland area, contributed 153,000 t of barren rock, of which two thirds were used for underground backfill. Investments in new equipment included one Elphinstone 1700 and one Volvo L 120 C.

The use of paste filling to form stable backfill in the mine has been improved. The paste slurry comprises tailings mixed with cement, which is pumped back into the mine. Paste backfilling, particularly during the second half, was steady, with good utilisation of the facility, and the total amount of paste slurry produced was 260,000 m³.

The ore-dressing plant at Zinkgruvan treated 773,700 t of crude ore for the production of 117,000 t of zinc concentrate (86,800 t in 2002) and a record 45,800 t (36,000 t) of lead concentrate. Lundin Mining is planning to invest some SK100 million in the processing plant in order to increase the capacity.

In the western part of the Skellefte mining district, close to the city of Malå, the Storliden zinc-copper mine completed its first full year in operation. The mine is owned by North Atlantic Natural Resources (NAN) but Boliden Mineral AB is acting as a contractor and operates the mine. Ore is trucked some 90

km to the Boliden mill where it is processed. Boliden and South Atlantic Ventures are the principal shareholders of NAN.

A total of 339,700 t was mined at Storliden, and 33,363 t averaging 4.1% Cu and 11.0% Zn were processed at the Boliden mill compared with 131,508 t in 2002. Output amounted to 44,011 t (14,410 t) of copper concentrate at 28.1% Cu and 61,292 t (26,174 t) of zinc concentrate at 54.1% Zn. The recovery rate was maintained at 91% for both concentrates.

Exploration drilling was carried out at the mine during 2003 to further delineate the orebodies. Drilling was undertaken in 78 holes totalling 3,734 m. Surface geophysical investigations have been used in order to identify further drilling targets in the vicinity of the mine.

The ownership of the Björkdal gold mine changed during 2003, the Irish junior company MinMet plc acquiring the mine from Dormant Properties and International Gold Exploration AB in two separate transactions. The mine is situated 35 km northeast of the city of Skellefteå in northern Sweden. Ore production from the open pit was 644,849 t and, with additional stockpiled low-grade ore, the concentrator processed 1.2 Mt of to yield 43,287 oz (1,346 kg) of gold at a recovery rate of 86.4%.

MinMet is undertaking an exploration programme at the mine in order to bring some of the resources into reserves. There are also two targets within 1 km of the mill facility that will be further investigated.

Industrial minerals

Production of limestone in Sweden reached 8.6 Mt during 2003, up 0.1 Mt from the previous year. Nordkalk (former Partek Nordkalk) produced 3.5 Mt (3.2 Mt) at its Swedish plants (Storugns, Uddagården, Ljung, Ignaberga, Forsby and Orsa), with Storugns contributing 3.2 Mt. The other major limestone producer, Svenska Mineral, operates quarries at Gåsgruvan, Rättvik and Stucks. At Rättvik, the company invested in a third kiln during 2003 and at Stucks, on the island of Gotland, the company invested in new port facilities. Omya is running the Sala, Glanshammar and Larsbo dolomite quarries.

Cement production at the three plants of Slite, Degerhamn and Skövde, operated by Cementsa, part of the Heidelberg Cement Group was down to 2.5 Mt (2.6 Mt). Of the total sales, 44% were exported.

Dolerite is produced at a few sites in southern Sweden, and is used mainly for the production of insulating material (such as stone wool) for the building industry.

At Kringelgruvan, there was no graphite production during the year. The owner, Woxna Graphite, was granted environmental permits for two additional graphite deposits in the area, Gropabo and Mattsmyra.

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Clay is produced by a number of companies at several locations in southern Sweden. The clay is used mainly for the production of light clinker, brick and ceramics.

Production ('000 t)	2001	2002	2003
Iron ore products ¹	19,484	20,281	21,498
Processed sulphide ores	22,695	22,119	22,043
Copper concentrate	268	263	305
Lead concentrate	123	68	78
Zinc concentrate	285	271	341
Gold in concentrate (t)	5.0	5.8	5.9
Lime and limestone	8,658	8,520	8,600
Cement	2,600	2,600	2,492
Dolerite	179	188	180
Talc/soapstone	1.4	20	7
Graphite ore	1.0	0	0
Clay	238	267	253

¹. Marketable products.