# TIN

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'Clouded' was the word used to describe the outlook for tin demand in last year's *Mining Annual Review.* Perhaps under the circumstances that was something of an understatement! Through 2001, and into the early part of 2002, the collapse in the tin price caused almost unprecedented problems for the tin-mining industry. The global slowdown, sparked by the downturn in the US economy, sent the price of tin on the London Metal Exchange to fresh contract lows.

On September 25, 2001, the LME cash price, having spiralled downwards through the second and third quarters of the year, hit US$3,605/t, breaching the post-1985 Tin Crash low of US$4,310/t seen in September 1993. The price has since recovered to trade around US$4,000/t. The slump in the market has been reflected notably in the troubled fortunes of the world's leading corporate tin producer, Indonesia's PT Timah, the failure of reputable trading houses, and rampant smuggling from Bangka Island in Indonesia, and China.

PT Timah has estimated that some 30,000 freelance miners were active in Bangka in 2001, producing around 42,000 t of tin-in-concentrates. The company says this activity stems from the devolution of power from Jakarta to the regions and widespread flouting of central authority. The Indonesian economy has yet to recover from its collapse four years ago and the civil disturbances that followed the end of the Suharto regime. Outright piracy also played its part in 2001! In March, the cargo ship KM Inabukwa, carrying 320 t of tin belonging to PT Koba Tin, was hijacked by pirates while en route from Bangka to Singapore.

Yet at the same time, exploration continued, new deposits were developed, especially in Russia and other CIS countries and, among tin consumers, the tinplate industry continued to expand in the Far East and in Eastern Europe. Patterns of consumption remain confused. Demand for tin in tinplate for packaging grew in certain areas while depressed markets for high technology items held back the demand for tin in solder.

The year 2001 also saw the demise of the Association of Tin Producing Countries (ATPC). Set up in September 1983 in the aftermath of the demise of the International Tin Council's market support operation, the ATPC was only intermittently successful in managing global tin production. It was formally wound up at a Council of Ministers meeting in Rio de Janeiro in September 2001.

When it was set up almost two decades ago, the founding members of the ATPC (Bolivia, Indonesia, Malaysia, Nigeria, Thailand and Zaire) controlled over three-quarters of the Western world's tin supply. That situation was not destined to last and the ATPC's 'supply rationalisation scheme' never had the effect its founders hoped for. However, the organisation's lasting legacy is surely its support through the late 1980s and early 1990s for the International Tin Research Institute. The ITRI has evolved into a wholly commercial entity, Tin Technology, supported by both corporate producers and consumers, which continues to develop and extend the commercial uses of tin.

On September 17, 2001, the Kuala Lumpur Tin Market (KLTM) switched from open outcry to electronic trading. The KLTM, a purely physical market, was established on June 28, 1984, and opened for trading on October 1, 1986, replacing the 75-year-old Penang physical tin market. The KLTM handles trades totalling just under 20,000 t/y.

In July 2001, Allied Deals became the seventh member of the KLTM; its tenure has been brief. The firm was the first new member since the mid-1990s. Current active members that trade through KLTM are Malaysia Smelting Corp. (MSC), H. H. Bhatt Trading, Mitsubishi, Mitsui and Toyota. Thaisarco and PT Timah also are KLTM members but neither is active at present.

**Production**

It was a torrid year for the world's largest corporate producer of tin. PT Timah staggered from opportunity to crisis to opportunity to crisis through 2001 and into 2002. The firm's troubles stemmed not just from the falling tin price but also from the 1999 Law on Regional Autonomy that granted mineral licensing rights to the 336 Kabupaten (local authorities) from January 2001.

The government for the province of Bangka and Belitung alighted on an opportunity to generate revenue by collecting royalties from locals who use hoses and shovels to separate Timah's tin concentrate from sand dunes and export it abroad, even though the central government had awarded rights to the same tin to Timah. The local authority believed it had the right to issue licences for mining and export of tin without any co-ordination with the central government.

The simple equation is this: the illegal miners worked on estimated average production costs of US$2,100/t compared with nearly US$4,000/t for Timah. The company's situation was not helped by a proposal tabled by the local government on Bangka Island for a 20% tax on tin sales.

Timah's troubles climaxed in November when its shares were suspended briefly and the firm announced plans to cease almost all dredging operations and retrench 3,750 staff. The firm also drew up contingency plans to relocate its smelting operation from Bangka to Kundur Island.

At this point the Indonesian Government stepped in (PT Timah is still 65% state-owned) and put forward the suggestion of a merger with the state nickel business PT Antam, although neither firm viewed the prospect with much relish. By the end of the year, 3,000 of Timah's 5,221 workforce were working only alternate days, while 1,440 dredge operators had been sent home with just five of the company's 19 offshore dredges still operating.

In March 2002, Timah reversed its decision to lay off 72% of the workforce and restarted the 12 offshore dredges which had halted operations in December, saying a marginal recovery in the tin price had improved its business outlook. The introduction of an export licensing system for tin shipments in February may also have bolstered the management's confidence. President Director Erry Riyana Hardjapamekas, who had led the company since 1994, was replaced by Thobrani Alwi on March 14.

Timah reported an 89% drop in net profits for 2001 to Rp36.8 billion. Output of refined tin was 34,550 t, down 2.8% on 35,550 t in 2000. Full-year output reached 38,081 t, including tin-in-concentrates toll-smelted by MSC and Thaisarco. Timah smelted 2,120 t of tin-in-concentrates for PT Koba Tin. Timah sold 39,999 t of tin in 2001. Production is expected to be lower in 2002, forecast at 34,400 t, with sales of 33,500 t.

**Tin-in-Concentrate Output ('000 t)**

| | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|
| Indonesia | 54.5 | 53.9 | 47.8 | 51.6 | 50* |
| Peru | 27.9 | 25.7 | 29.7 | 37.4 | 38.2 |
| Brazil | 18.2 | 15 | 14 | 14 | 14 |
| Bolivia | 13 | 11 | 12 | 11.6 | 10 |
| Australia | 10.4 | 10.2 | 11 | 9.5 | 8.9 |
| Portugal | 3.5 | 2.9 | 2.2 | 2.3 | 2.1 |
| Malaysia | 5 | 5.7 | 7.3 | 6.3 | 5.1 |
| Others | 8.9 | 10 | 8.5 | 10 | 40 |
| **TOTAL** | **141.4** | **134.4** | **132.5** | **142.7** | **168.3** |

**PT Timah & PT Koba only, this figure does not take account of smuggled concentrates.*

 

Despite its domestic problems, Timah continued to develop international offshore exploration, signing a Memorandum of Understanding with the Marine Geology and Mineral Resources Centre of Vietnam in May 2001 and, a month later, receiving Malaysian Government approval to explore in Malaysian waters. It was also reported to be investigating prospects in Thailand.

**Western World Supply/Demand Balance in Refined Tin ('000 t)**

| | 1997 | 1998 | 1999 | 2000 | 2001[e] |
|---|---|---|---|---|---|
| Mine Output | 141.4 | 134.4 | 132.5 | 142.7 | 168.3 |
| DLA Sales | 12 | 12 | 12 | 12 | 6.5 |
| Net Eastern Bloc Exports | 30 | 30 | 47 | 45 | 35 |
| **Total Supply** | **183.4** | **176.4** | **191.5** | **198.2** | **209.8** |
| **Total Demand** | **180** | **182** | **185** | **188** | **182** |

[e] *Estimated*

China has some 15 tin-smelting operations with production capacity exceeding 5,000 t/y, the largest being Shenzhen-listed Yunnan Tin Corp. (YTC). China produced 110,000 t of tin metal in 2000 of which 62,000 t were exported. In 2001, production fell 17% to 91,600 t and exports to 46,000 t. Production for 2002 has been forecast as high as 80,000 t but may well be lower. Government export quotas for 2002 have been limited to 40,000 t, compared with 70,000 t for 2001. The 2001-2005 development plan for non-ferrous minerals promulgated by the State Development Planning Commission sees tin output at 60,000 t/y by 2005.

YTC was not immune from the impact of the falling tin price and on May 26 it idled its smelting operation for two months, taking advantage of the downtime to work on the installation of its new Ausmelt furnace, which was due in trial production by end-2001. YTC's output for 2001 reached 20,000 t. The firm says output for 2002 could be 20,000-25,000 t depending on market conditions. YTC expects to export around 6,000 t of tin in 2002, down from 8,000 t in 2001.

**Chinese Tin Exports 2001* (t)**

| | |
|---|---|
| January | 6,271 |
| February | 7,811 |
| March | 5,761 |
| April | 5,822 |
| May | 5043 |
| June | 4,243 |
| July | 3,376 |
| August | 4,415 |
| September | 2,775 |
| October | 1,664 |
| November | 2,445 |
| December | 7,625 |
| **Total** | **57,251** |

**Unwrought tin and tin alloys (based on reported customs figures).*

A disaster at the Longquan Nandan tin mine in Guangxi in July, which claimed more than 80 lives, acted as a spur to the authorities to clamp down on illegal operations throughout the Guangxi Zhuang Autonomous Region. By October, it was being claimed that more than 200 mining operations had been shut down.

However, China's potential to remain the world's largest tin producer remains intact. In May, there were reports of a 90 km by 80 km tin belt discovered in Chenzhou, in Hunan Province. Local officials were quoted as saying that verified reserves were estimated at 500,000 t, with potential reserves estimated at up to 1.0 Mt.

Peru's sole tin producer, Minsur, suspended smelting operations at its Funsur refinery in Pisco for four weeks in September and October. However, operations continued at the San Rafael mine. Tin-in-concentrate production of 38,180 t for 2001 as a whole was up 2.1% on 37,409 t in 2000. Minsur says it intends to invest US$8 million in exploration work in 2002 in an attempt to boost its reserves. The San Rafael mine has reserves of 14 Mt at an average grade of 5% Sn, and an estimated mine life of 15 years. Minsur has been largely shielded from the worst impact of the slumping tin price by its low production costs, said to be around US$1,200/t.

In Brazil, Paranapanema's Mamore Mineracao unit hopes to boost output to 14,300 t/y of tin by 2004 through developing the Rocha Sa project which is adjacent to its near-exhausted Pitinga mine. The firm was seeking foreign investment to allow it to continue development and lined up a US$80 million credit from the International Finance Corporation. Mamore produced 11,750 t of tin in 2001, up from 11,200 t in 2000.

Australia's tin industry experienced a blast from the past in 2001 with the reopening in July of the Ardlethan mine by Marlborough Resources. The mine, which had originally been shut down in 1986, shipped its first concentrate in August. Ardlethan is protected by a floor -price scheme ensuring a base price of at least A$8,000/t compared with estimated site cash operating costs of A$3,000/t. Marlborough has estimated a ten-year mine life for Ardlethan, producing some 800 t/y of tin-in-concentrates.

Murchison United's Renison Bell mine in Tasmania produced 8,961 t of tin-in-concentrate in 2001. Production costs were reduced through the year to A$3,118/t in the fourth quarter. A new ore reserve and resource statement showed an increase in mineable tin to 4.96 Mt averaging 1.76% Sn for about 60,000 t of recoverable tin metal. In February 2002, Murchison finalised its agreement to purchase Rio Tinto's 49% stake in Somincor of Portugal, operator of the polymetallic Neves Corvo mine in southern Portugal for US$78 million. Just two months later, Murchison agreed to sell its Renison Bell tin operations to Brisbane-based Sirocco Resources.

Australian tin output is likely to be slightly higher in 2002, taking into account output from Ardlethan. Both Murchison and Marlborough ship their concentrate abroad for smelting, to Thaisarco and MSC respectively. However, the low tin price has dissuaded at least one Australian company from entering the tin sector; Gippsland Ltd of Perth was considering the reactivation of its Queen Hill tin mine in Tasmania. The plan has now been shelved.

In Bolivia, the Vinto smelter operated by Allied Deals, produced 10,000 t of tin in 2001, despite bouts of industrial unrest among the mines supplying it with concentrate. Disputes halted output at Huanuni in July and November.

The tin-zinc Colquiri mine, now being operated as a joint venture between Comsur and the UK's Commonwealth Development Corp. (CDC) should produce around 2,400 t of tin in 2002. Colquiri has a resource of 12 Mt of proven and probable reserves averaging 0.83% Sn, with a further 12.6 Mt averaging 0.52% Sn in the form of tailings. Some 3,000 t of tin-in-concentrates will also be produced by around 15,000 miners working in small co-operatives.

In Malaysia, tin-in-concentrate output fell back sharply in 2001 and is likely to fall again in 2002. From 6,307 t in 2000, tin-in-concentrates output dropped to 5,100 t in 2001, and 3,500 t is forecast for 2002. However, tin metal output is likely to rise.

MSC's capacity will increase to 37,000-38,000 t/y from 25,000-26,000 t/y previously, boosted by the firm's takeover of Iluka Resources' 75% stake in Indonesian miner PT Koba Tin. MSC paid an initial US$14 million with up to a further US$6 million depending on the tin price. PT Timah intends to retain its 25% stake in Koba, which produced 15,446 t of tin in 2001, up 41.7% from the 10,900 t produced in 2000. Koba's production in 2002 is expected to be around 12,000 t.

Only 30 out of 145 tin mines remain active in Thailand. Most have closed as a result of high production costs although these costs were exacerbated by a complex and expensive eight-level tax structure. The main mining regions are Kanchanaburi, Phuket and Phang Nga. The country's only tin smelter, Thaisarco, produced 17,076 t of tin metal and 2,363 t of concentrate in 2000, exporting 12,833 t. Output in 2001 reached 18,000 t and is expected to rise to 20,000 t for 2002.

Russia and other CIS states continued to expand their tin operations. The Novosibirsk Tin Combine produced 5,236 t of tin in 2000 and 2,547 t in first half 2001. Two other smelters are under construction, by Urals Mining and Metallurgical Co. and as part of the development of the Syrymbet deposit in Kazakhstan, with annual capacities of 5,000 t and 5,500 t respectively.

Although Khrustalnaya Mining Co. and Polimetall Tin both halted output during the year, others raised their production. For example, Deputatskolovo in Yakutia increased output by 18% in 2001 to 3,000 t and the Tyan-Shanolovo joint venture between Russia and Kyrgyzstan produced its first concentrate in December.

Among other projects around the world, talks in the UK continued concerning a possible restart of operations at the South Crofty mine in Cornwall, while a review board continued its discussions of personal injury claims related to Rio Tinto's former Capper Pass tin smelter on Humberside; the Pirquitas polymetallic prospect in Argentina was put on reduced care and maintenance; War Eagle Mining reported significant tin-tantalum mineralisation at its property in the Mackenzie Mountains in Canada's Northwest Territories; Reefton Mining was given the green light to explore for tin-tantalum in Namibia; and in a sign of the return of a semblance of normality to Rwanda, the state-owned tin smelter at Karuruma was offered for privatisation.

**Consumption**

Despite the collapse in demand from high-technology industries during 2001, the outlook for tin demand in solder over the medium and long term looks bright. The transition to lead-free soldering remains one of the hottest topics in the global electronics manufacturing industry. A ban on lead and other harmful substances is expected to be enforced in 2008 by the European Commission's proposed Waste in Electronics and Electrical Equipment Directive.

The problem for electronics manufacturers is that the transition to lead-free soldering is proving problematic. Many of the current practical alternative soldering alloys have higher melting points than tin/lead mixtures, dictating key changes to the manufacturing process. However, the solder production industry is at work on this. For example, Matsushita Electric Industrial's new lead-free solder can be used with conventional lead-solder equipment for reflow soldering of electronic components.

Tinplate may have now been overtaken as the key end-use for tin but it remains important and, despite its 'old-tech' image continues to grow. However, it was in the news through 2001 and into 2002 for a more problematic reason. The US steel industry complained vociferously about dumping and in March 2002 tinplate was one of the key products covered by tariffs imposed by President Bush. Despite the closures of tinplate production lines in the US and the UK, expansion continued elsewhere.

Among the expansion projects announced in 2001, a US-Slovakian joint venture, US Steel Kosice, signed a deal with Serbia's Sartid which will see the latter produce 150,000 t/y of tinplate by 2003. In the Ukraine, Zaporizhstal commissioned a second tinning line and has plans for a third. South Korea's Pohang Iron & Steel announced plans to boost capacity by 50,000 t to 247,000 t/y, while Nippon Mining & Metals entered a joint venture with South Korean firm, Poongsan Corp., to set up a new tinplate plant in Ulsan, South Korea.

In other developments, motor vehicle manufacturers are showing increasing interest in tin-zinc coatings for fuel tanks to replace lead-based fuel tank coatings, and Tin Technology is continuing to work on developing tin-based non-toxic ammunition pellets. In chemicals usage, tin consumption was boosted in April 2001, by the European Parliament's endorsement of proposals to ban lead and cadmium PVC stabilisers.

**Outlook**

The leading players used the opportunity presented by LME week in October 2001, to issue a joint statement. PT Timah, PT Koba, Murchison United, Minsur and YTC called for illegal activities to be discouraged. Their statement said: "Tin mining companies and independent smelters should refuse to buy any tin ore clearly or strongly allegedly supplied by illegal mining activities. It is hoped that the whole tin industry supports these aims and buys only from legitimate sources."

Mining safety was also a key issue. "All tin mining companies should observe the highest environmental and safety standards, both during mining operations and after they have ceased to properly rehabilitate the areas mined and return them to their natural state. A globalised tin industry necessitates that all producers operate from a level playing field and as such observe the same standards of practice following the laws of the countries in which they operate and thus discourage illegal mining operations wherever they occur."

A perhaps unlooked-for outcome of the pressure the price slump put the tin industry under was the trend towards vertically-integrated producers. It would appear that a 'big four' (in no order other than alphabetical) of Minsur, MSC, Timah and YTC are likely to be the key corporate players for the medium term. For 2002 as a whole, by some estimates there will be a stock overhang in the market of more than 30,000 t. Among the more pessimistic forecasts is that of PT Timah. The Indonesian group estimates an oversupply of around 34,000 t. Having fallen to 28-year lows, the tin price is likely to continue to trade in a relatively tight range, capped at around US$4,500/t for the year. However, that would indicate a rally in the spot price to around US$5,000/t by end-2002.

**Average Tin Prices (US$/lb)**

| | |
|---|---|
| 1993 | 2.34 |
| 1994 | 2.48 |
| 1995 | 2.82 |
| 1996 | 2.08 |
| 1997 | 2.56 |
| 1998 | 2.51 |
| 1999 | 2.45 |
| 2000 | 2.46 |
| 2001 | 2.00 |
| 2002[f] | 2.01 |

*f: Forecast*

Optimists talk of Chinese buy-backs of tin sitting in LME warehouses. Certainly, Chinese tin output is expected to fall further as a result of firmer action to curb unregulated mining and ore smuggling. The question remains whether such moves will actually succeed. The ailing PT Timah, which at one stage described its condition as 'critical', also plans a cut in output for 2002.

Western world tin consumption is likely to recover a little after dipping by around 5% in 2001 but even best estimates suggest a rise of no more than 3% for 2002. Solder usage accounts for roughly 31% of annual tin consumption and, by some measures, is now accounted the largest end-use of tin, just ahead of tinplate at 30%, with the third major area of consumption, tin chemicals, responsible for 15%. Domestic demand in China for 2002 is expected to rise to 60,000 t from 40,000 t in 2001. By 2004, it is being suggested that China could be a net tin importer, partly on the back of soaring demand for tinplate packaging, which has already passed 1.0 Mt/y.

Tin has finally caught up with the wired world. In February 2001, PT Timah launched its own sales website (www.e-timah.com) and, in February 2002, the US Defense Logistics Agency (DLA) unveiled plans to transfer its stockpile auctions to the web. The DLA had sold 6,500 t of tin in April but cancelled further sales until the first quarter of 2002 in response to the poor market conditions.

RMT Metals, one of the world¹s largest tin traders handling around 3,000 t/mth, went into administration on August 31, 2001. The trading firm’s finances had been wrecked by the sliding tin price. RMT had been purchasing tin through the use of bank loans with the tin as collateral. As the value of its collateral fell, RMT was unable to meet margin calls. The firm’s largest unsecured creditor was actually the DLA. However, the collapse of global commodity trader Enron had only limited direct impact on the tin trade - its LME ring-dealing subsidiary’s business had been ring-fenced from the parent.

Controversy continues to dog the tin industry with the demise of Allied Deals/RBG Resources in what could turn out to be one of the most complex international banking scandals of recent years. It has been alleged that Allied Deals had been playing a complex ‘shell game’, using fake invoices, purchase orders and bills as proof of genuine deals to secure borrowings of more than US$600 million from a consortium of banks.

London-based RBG Resources, which had changed its name from Allied Deals in September 2001, had a turnover of more than £1,000 million in the year ending May 21, 2001. The firm filed for bankruptcy. Among the casualties was a proposed 10,000 t/y tin smelter in western India and a planned joint venture with the state-owned Nigerian Mining Corp. (NMC). Tin concentrate from Nigeria was to have been shipped to Bolivia for smelting at Vinto. RBG had bought into NMC’s 84%-owned Ririwari Mines, which NMC says controls inferred reserves of 6.53 Mt of tin, indicated reserves of 2.08 Mt and proven reserves of 496,000 t spread over a number of mine sites. RBG was to contribute mining expertise, equipment and financing in exchange for 100% of the ore produced while NMC would receive 10% of the profits from the joint venture.

RBG dominated the tin-mining business in Bolivia following its successful bid in the controversial privatisation of state mining assets in 2000. More than 1,200 direct jobs and many more dependent jobs at the Vinto tin smelter and Huanuni have been jeopardised. Bolivia’s Minister of Economic Development, Carlos Kempff, took legal control of the Huanuni mine in May 2002 and held talks with RBG liquidator Grant Thornton to ensure continuity of business at the Vinto tin smelter.