

## LEAD

*By Allan Cooper*

**W**orld consumption of lead in 2003 was 6.72 Mt, up 1.2% from the level reached in 2002. Metal production was down by just 0.2%, at 6.65 Mt, and mine production down 1.4% at 2.79 Mt. In the Western world, 65.1% of metal production came from secondary sources, up from the previous year's level of 63.0%.

Net imports of lead to the West were estimated at 468,000 t, 7.3% up on the 2002 figure of 436,000 t. LME stocks fell to 109,000 t at the end of 2003 compared with a total of 184,000 t at the end of 2002. The lead price was relatively steady during the first half of 2003 but climbed in the second half – particularly in the later months, with the average LME settlement price rising to US\$516/t as compared with US\$452.5/t in 2002. The price finished on a very strong note to end the year at US\$725/t.

### **Supply and demand**

Western mine production, having decreased by almost 10% in 2002 to 2.02 Mt, increased by just 0.4% in 2003. Production in the Americas rose by 2.5% to 1.05 Mt, with production losses in Canada being more than compensated for by increases in Mexico, Peru and the US. Production in Australia was almost static at 654,000 t, and in Western Europe production was at a similar level to that of 2002, at 114,000 t. Problems at the TVX Hellas Kassandra mine in Greece, caused by a closure pending a decision on an environmental impact study, were largely offset by increased production in Ireland.

Total Western refined metal production fell further, by 194,000 t (4.5%) to 4.72 Mt in 2003, almost entirely as a result of smelter closures in Europe. Secondary production dropped slightly to 3.07 Mt (down 0.8%) representing 65.1% of total metal production. Primary production decreased again, to 1.65 Mt, down 9.4% from the 2002 level, with concentrate availability continuing to be the main factor. Scrap supplies in the US and Europe were adequate, if not plentiful, with a cold winter and a hot summer (at least in Europe) seemingly having little effect on the overall battery life which still seems to be increasing.

In Western Europe, metal production fell by 11.7%, from 1.48 Mt to 1.30 Mt, secondary production accounting for 0.93 Mt (71.6% of the total). The largest production loss was in France where output was down by 102,000 t from 203,000 t in 2002 as a result of the closure of the Metaleurop Noyelles Godault plant early in the year. In Belgium, production was down by 18,000 t because of a planned production cut at Hoboken. Production in Germany was 36,000 t lower than in 2002 because of the closure of two secondary plants late in that year. Further production was lost in the UK where one of the three refineries at the Britannia plant at Northfleet was closed following the disposal

by MIM of the Duisburg plant and the closure of Avonmouth. Late in the year, following the acquisition of MIM by Xstrata, it was announced that the recycling plant at Northfleet would also be closing. In Italy, production was at a similar level to 2002 because Porto Vesme closed in October for an extended period following the failure of talks with the government to obtain lower power prices.

In the US, metal production was down slightly at 1.34 Mt (1.9% lower than in 2002), with Doe Run announcing that the Glover plant was to be put on a care-and-maintenance basis from the end of November. Secondary production was down by 4,000 t to 1.10 Mt, representing 82% of the total. In Canada, production was 222,000 t, down 29,000 t on 2002. This was due to Noranda's Belledune smelter being closed for four months during the year following a decision not to purchase concentrates and treat only Noranda's own mine production. Production in Mexico was up by 3.0% to 241,000 t, and in Peru production fell by 9.1% to 109,000 t. This was because lower output of concentrates from Volcan resulted in a cut of some 11,000 t in production at Doe Run's La Oroya plant.

In Asia, production again increased strongly, rising by 230,000 t or 9.7%, to 2.60 Mt. Production increases were recorded in India (5.1%), Iran (38.5%) and Japan (3.5%). There were production falls in both Kazakhstan (10.8%) and Korean Republic (7.0%) because of a shortage of concentrates. China's ability to pay more for its concentrates saw production continue to increase from 1.32 Mt in 2002 to 1.53 Mt, an increase of 15.7%. Chinese smelters continue to increase capacity and there seems to be a progressive trend for more concentrates to be treated in China.

In Australia, metal production was at a similar level to that of 2002 at 304,000 t, despite the closure of Pasminco's Cockle Creek smelter in the second half of the year.

Western consumption of lead rose slightly in 2003, by just 0.4% to 5.35 Mt. Demand continued to be sluggish in the US, where consumption was down by 48,000 t (3.1%) to 1.48 Mt, with both automotive and industrial battery demand soft. In Western Europe, consumption was up by 23,000 t (1.4%) to 1.68 Mt. In Asia, China continued to show impressive growth, with consumption rising by 10.5% to 1.05 Mt, but the rate of growth seems to have slowed from previous years. In most of the region, demand showed some signs of growth although in Japan consumption fell, albeit only marginally, to 247,000 t, a drop of just 6,000 t on the 2002 level, indicating some stability in battery production.

Western European car sales fell again in 2003, by 1.7% to 14.1 million passenger cars. The fall was lower than had seemed likely in the earlier part of the year, given the poor economic growth and fear of a protracted war in Iraq. In the US, vehicle production was down by 1.7% over 2002 at 12.05 million units. According to BCI data, replacement battery shipments in 2003 were 88.25 million and 19.63 million for original equipment in the US, Canada and Mexico. By comparison, the previous year's figures for the same

countries were replacement batteries at 89.13 million and original equipment batteries at the level of 20.19 million units, representing falls of 1.0% and 2.8% respectively. Japanese vehicle production rose by just 0.3% on the 2002 levels, to just under 10.3 million units.

In 2003, it is estimated that the gap between Western production of lead metal and consumption was 635,000 t. Net imports from the former Eastern Bloc countries were estimated at 472,000 t, up 8.3% on 2002 levels of 436,000 t. US stockpile releases were 36,000 t in 2003 compared with 24,000 t the previous year. LME stocks decreased from 184,000 t at the end of 2002, to 134,000 t at the end of 2003. Of these stocks, 114,000 t were held in US warehouses, with low stocks elsewhere reflecting the continuing tightening of supplies.

### **Price trends**

The lead settlement price started the year at the low of US\$428/t and largely remained stuck at an average price between US\$450 - 470/t for the first half of the year. Renewed speculation about the future of the Porto Vesme plant started an upward trend in July and this, together with the wider investment move into commodities on the back of a declining US dollar, propelled the lead price to new heights, culminating in a high for the year of US\$739.50/t on December 31. The stock ratio (total stocks to consumption) slipped from the level of 5.2 at the end of 2002 to 5.0 in the first half of the year and then declined further to finish the year at just 4.0 weeks of supply.

In the US, the average scrap price in 2003 was US\$0.054/lb and was at a level of US\$0.055/lb at the year-end, US\$0.003/lb lower than in December 2002. In Europe, UK prices were static at an average of £50/t in the first half of the year before edging up in the second half of the year to finish at £63/t. In Germany and France, the price rose to €90/t at the year-end, thus eliminating the price differential that existed in 2002. However, the price increase was relatively when compared with the rise in the LME price and reflected the increasingly environmentally-driven, rather than price-driven nature of battery recycling.

The lead-acid battery remains the key market for lead, particularly the automotive battery, and thus growth is dependent on the health of the automotive markets around the world. These started 2004 somewhat mixed, with US sales up 2% in the first two months and Japanese sales up by 3.7% in the same period. In Europe, sales were strong in Spain and the UK but weak in France and Germany. Improvements in battery alloys seem to make batteries less susceptible to extremes of weather and battery life seems to be continuing to lengthen.

However, lead demand was predicted to grow by some 1.6% (111,000 t) during 2004 by the International Lead Zinc Study Group (ILZSG). The main driver for this is a predicted 6.2% rise in lead demand from China. This has been driven by rapid rises in the vehicle fleet there (albeit still small in world terms at 1.7% of the total vehicle population), which is boosting SLI battery

demand. There is also continuing investment in telecommunications and the IT sectors, which is boosting industrial battery demand. Additionally, Chinese battery exports of both industrial and SLI batteries continue to grow. With the prospects of a slight fall in lead production in the year, because Western smelter closures more than offset expansions in China, Kazakhstan and Saudi Arabia, a Western lead deficit of 129,000 t is predicted for 2004. This could put significant pressure on the lead price.

Hybrid vehicles have continued to make in-roads into the automotive markets, with the Toyota Prius and Honda Civic vehicles selling well in Japan and the US. The threat of higher fuel prices could have a significant impact on these sales. These cars have a high-voltage nickel/metal hydride battery operating as a source of power to boost the engine as required and to accept power during regenerative braking – thus improving fuel efficiency and reducing emissions. Although the high-voltage hybrids continue to make progress, the lower-voltage (36V) mild hybrid development seems to have stalled somewhat. Only one vehicle, the Toyota Crown had been launched and now this seems to have been withdrawn. There is some activity in Europe but vehicle manufacturers seem happy to let diesel technology meet the lower emission standards called for by 2008.

In the review last year, the problems of operating a lead-acid battery in a partial-state-of-charge condition were discussed. The battery must be able to deliver charge and receive it at high rates and to do this must operate in a range so that it will not become overcharged or too deeply discharged. A much more systems-orientated battery solution is required. Research has been under way to try and solve some of these problems in programmes sponsored by the Advanced Lead Acid Battery Consortium. One project has already produced some encouraging results in that a specially developed lead-acid battery has been retro-fitted into a Honda Insight and has shown that it can undertake the demanding duty cycle. The battery will be undergoing extended life testing in the vehicle during 2004. It is important that the lead-acid battery can demonstrate its ability to perform in the low- to medium-voltage range of any future hybrid vehicle demand if it is not to start to lose market share to other chemistries in its most important market.

It seems that there was some recovery in the global economic climate during 2003 although this was somewhat variable. GDP growth was 4.4% in the US, 9.1% in China, 2.3% in the UK but only 0.2% in Japan and France, with Germany actually falling 0.1%. There are, however, signs that the telecommunications and other industrial markets are now improving and a 6% growth has been forecast in 2004.

Thus the overall picture seems to be of a slowly increasing demand for lead against a background of falling LME stocks and tight supplies. This is likely to have the effect of increasing the LME price and a cash price of US\$975/t was seen at the beginning of March this year by which time the LME stocks had fallen to 74,000 t. The price had decreased to a low of US\$696/t on 21 April but the relentless reduction in LME stocks has caused a reversal of the

downward price trend with the effect that the cash price reached US\$1,039/t at the end of July when the stock level was just 37,450 t

### **Health and environmental issues**

To ensure the safety of both human health and the environment, the use of lead is tightly regulated to reduce any risks associated with its use. However, despite the many measures already taken, which have resulted in significant reductions in the emissions of lead to air, water and soil over the past 20-30 years, the use of lead often continues to be targeted by regulators on the basis of hazard. However, the industry is taking steps to ensure it is represented at the appropriate levels when new regulations are being formulated.

The Lead Development Association International (LDAI) has continued to co-ordinate work on the voluntary risk assessment on lead on behalf of the European lead industry. The three-year project was officially launched on January 1, 2002 and has been following the official EU process for risk assessment. The Netherlands Government had agreed to participate in the process as the official sponsoring country to ensure that the assessment was carried out in a fair and credible way, and independent experts in relevant health and environmental disciplines have been retained by industry to form scientific review panels. Both the health and environmental progress reports have been well received by the review panels with a range of constructive comments being put forward for further improvement.

The reports represent by far the most extensive health and environmental assessment ever conducted on lead and its uses and has included a review of over 2,000 published documents. Furthermore, the industry has provided over 100,000 additional data points on environmental emissions and occupational exposure to supplement the literature. The project is on course to be completed by the end of 2004, at which time full results of the work will be published.

At the European Union level an important issue has been the European Commission's proposal for a New Chemicals Policy. This includes a system according to which manufacturers and importers would be responsible for assessing the risks associated with their substances. Indeed for substances of high concern (possibly including lead), positive authorisation would be required for their continued use.

There have been a number of other important issues at EU level. In 2000 the EC's Scientific Committee on Occupational Exposure Limits (SCOEL) had released its recommendation for new lead in blood (30 µg/dl) and lead in air (100 µg/m<sup>3</sup>) limits. The LDAI has continued to work closely with the Eurométaux Intersectorial Lead Group in co-ordinating the collection and analysis of socio-economic data, which will be considered in the next stage of the review.

Another significant issue addressed during the year was the development of an EU Water Framework Directive that would replace existing legislation on water quality. A Eurométaux project team is responsible for related scientific issues, particularly the potential classification of lead as a priority hazardous substance, which would result in a requirement for emissions to be completely phased out by 2020. In parallel, the EC continued to develop proposals for an EU-wide quality standard for lead, as well as compiling data on emissions of lead in order to inform forthcoming discussions on emission reduction measures.

Consultations took place through much of the year on the EU Batteries Directive and a proposal for a new directive on batteries and accumulators, and spent batteries and accumulators, was adopted by the EC in November 2003. Where the earlier 1991 EU Batteries Directive only required that batteries be separately collected and disposed of, the new proposals would lay down collection and recycling targets for various scrap battery streams.

For lead-acid batteries, the proposed directive requires that schemes be established for the take-back of industrial batteries and accumulators, and for the collection of spent automotive batteries and accumulators. Landfilling and incineration of industrial and automotive batteries and accumulators would be prohibited. Although no specific collection targets are proposed for lead-acid batteries, all collected industrial and automotive batteries and accumulators must enter a recycling process. Furthermore, all the lead and a minimum of 65% by average weight of the materials contained in lead-acid batteries and accumulators must be recycled.

Table following pages.



**Lead ('000 t) (over two pages)**

	Mine Production (Metal Content)			Metal Production			Metal Consumption Refined Metal		
	2001	2002	2003	2001	2002	2003	2001	2002	2003
<b>EUROPE</b>	<b>326</b>	<b>247</b>	<b>210</b>	<b>1,889</b>	<b>1,763</b>	<b>1,575</b>	<b>2,066</b>	<b>2,037</b>	<b>2,018</b>
Albania	-	-	-	-	-	-	1	1	1
Austria	-	-	-	22	21	21	59	60	67
Belgium	-	-	-	100	88	70	40	34	35
Bosnia	-	-	-	-	-	-	6	6	7
Bulgaria	16	24	16	83	66	66	14	16	15
Croatia	-	-	-	-	-	-	5	5	6
Czech Republic	-	-	-	30	29	26	80	80	81
Denmark	-	-	-	-	-	-	1	1	1
Finland	-	-	-	-	-	-	2	3	3
France	-	-	-	230	203	101	265	230	240
Germany	-	-	-	375	378	352	403	381	392
Greece	27	29	2	5	5	5	7	9	8
Hungary	-	-	-	-	-	-	11	11	11
Ireland	45	32	50	10	7	-	34	42	24
Italy	4	4	5	222	193	199	284	286	290
Macedonia	20	15	5	20	12	4	7	7	5
Netherlands	-	-	-	20	18	17	30	29	28
Norway	-	-	-	-	-	-	2	4	2
Poland	53	57	42	66	66	60	59	70	47
Portugal	-	-	-	4	4	4	24	20	21
Romania	20	18	16	29	28	28	23	21	13
Russian Federation	14	19	20	58	63	65	94	111	98
Serbia & Montenegro	5	-	1	-	-	-	4	7	9
Slovak Republic	-	-	-	-	-	-	5	5	5
Slovenia	-	-	-	14	13	14	15	19	19
Spain	36	6	2	122	116	110	231	238	223
Sweden	88	44	51	75	65	76	10	5	5
Switzerland	-	-	-	10	9	9	13	7	9
Ukraine	-	-	-	12	12	10	-	-	-
UK	-	-	-	382	368	338	315	310	330
Other CIS	-	-	-	-	-	-	22	20	22
<b>AFRICA</b>	<b>150</b>	<b>130</b>	<b>112</b>	<b>125</b>	<b>144</b>	<b>148</b>	<b>123</b>	<b>135</b>	<b>159</b>
Algeria	1	1	1	6	6	6	20	21	21
Egypt	-	-	-	-	-	-	9	9	10
Kenya	-	-	-	1	1	1	3	3	3
Morocco	77	62	54	58	72	69	6	3	12
Namibia	13	12	11	-	-	-	-	-	-
Nigeria	-	-	-	3	3	3	6	6	7
South Africa	51	50	40	55	61	68	59	71	83
Tunisia	7	6	6	-	-	-	5	6	6
Zambia	-	-	-	1	1	1	1	1	1
Other Africa	-	-	-	-	-	-	14	15	15

<b>AMERICA</b>	<b>1,080</b>	<b>1,022</b>	<b>1,048</b>	<b>2,072</b>	<b>2,078</b>	<b>2,020</b>	<b>2,194</b>	<b>2,059</b>	<b>2,004</b>
Argentina	12	12	14	35	42	46	12	24	28
Bolivia	9	9	9	-	-	-	-	-	-
Brazil	9	10	11	47	37	35	112	112	112
Canada	154	97	82	231	251	222	55	58	52
Chile	1	-	-	-	-	-	4	-	1
Colombia	-	-	-	9	9	9	17	18	20
Honduras	7	8	9	-	-	-	-	-	-
Mexico	136	139	152	236	234	241	253	270	262
Peru	289	297	308	118	120	109	15	12	11
US	463	449	464	1,376	1,364	1,338	1,695	1,536	1,488
Venezuela	-	-	-	20	21	20	15	11	9
Other America	-	-	-	-	-	-	15	19	20
<b>ASIA</b>	<b>728</b>	<b>772</b>	<b>766</b>	<b>2,185</b>	<b>2,367</b>	<b>2,597</b>	<b>2,059</b>	<b>2,365</b>	<b>2,498</b>
China	599	641	618	1,172	1,325	1,533	700	950	1,050
India	32	34	47	63	78	82	127	130	138
Indonesia	-	-	-	18	17	18	48	61	75
Iran	18	17	17	44	39	54	70	68	72
Israel	-	-	-	20	22	25	18	21	25
Japan	5	6	6	302	286	296	284	253	247
Kazakhstan	43	43	44	159	158	141	14	15	15
Korea D.P.R.	9	10	6	7	6	7	5	5	5
Korea, Rep.	1	-	-	211	243	226	314	343	342
Malaysia	-	-	-	38	40	45	82	86	90
Myanmar (Burma)	1	2	2	3	2	2	-	-	-
Pakistan	-	-	-	3	2	2	9	9	10
Philippines	-	-	-	26	26	27	33	34	31
Saudi Arabia	-	-	-	16	17	25	14	14	22
Singapore	-	-	-	-	-	-	14	14	14
Sri Lanka	-	-	-	1	1	1	-	-	-
Taiwan, China	-	-	-	62	55	60	167	154	142
Thailand	-	3	13	30	43	45	82	111	129
Turkey	18	17	13	8	6	6	45	62	57
UAE	-	-	-	2	2	2	-	-	-
Other Asia East	-	-	-	-	-	-	3	3	3
Other Asia West	-	-	-	-	-	-	26	28	28
Other CIS	1	1	-	-	-	-	3	3	3
<b>OCEANIA</b>	<b>714</b>	<b>658</b>	<b>654</b>	<b>280</b>	<b>311</b>	<b>312</b>	<b>45</b>	<b>42</b>	<b>42</b>
Australia	714	658	654	271	302	304	41	39	38
New Zealand	-	-	-	9	9	8	4	3	4
<b>World Total</b>	<b>2,998</b>	<b>2,830</b>	<b>2,789</b>	<b>6,550</b>	<b>6,663</b>	<b>6,652</b>	<b>6,487</b>	<b>6,638</b>	<b>6,720</b>
<b>Western World</b>	<b>2,243</b>	<b>2,019</b>	<b>2,027</b>	<b>4,935</b>	<b>4,910</b>	<b>4,716</b>	<b>5,454</b>	<b>5,328</b>	<b>5,351</b>

Source: International Lead and Zinc Study Group