

ZINC

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Both world mine and metal output exceeded 9 Mt for the first time in 2001, following rises of 5.5% and 3.3%, respectively. However, when combined with a 1% fall in world use of zinc, this led to an increase in LME inventories and producer stocks. As a result, Zinc prices fell steadily throughout 2001 from a January average of US\$1,033/t to US\$755/t in December.

Mine Production

There has been a steady rise in zinc mine production over recent years. This trend continued in 2001, with world zinc mine production reaching 9.2 Mt. The increases were predominantly in the Americas, Asia and, to a lesser extent, Australia. China and Australia are the world's largest and second largest producers, respectively, of zinc concentrates.

European mine production was unchanged over 2000, with increases in Ireland (up 35,000 t) and Greece (up 12,000 t) offsetting small decreases in Poland, Spain and Sweden. Australian mine production had been boosted significantly in 2000 by a major new mine. Output continued to grow in 2001 (up by a further 97,000 t).

In the Americas, mine production grew by 208,000 t. Output from two new mines in Peru and Mexico resulted in increases of 146,000 t and 42,000 t, respectively. Higher output at the Bell Allard, Brunswick and La Ronde mines saw Canadian mine production increase by 50,000 t, whilst US production fell by 39,000 t.

In Asia, there was a further substantial increase of 171,000 t to 2.72 Mt, now comprising 30% of the world total. Mine production in China continued to grow (up 150,000 t). Increases were also reported from India (up 14,000 t) and Kazakhstan (up 28,000 t).

It was also notable that China's net imports of contained zinc in concentrates amounted to

377,000 t in 2001. This was the first time China's imports of zinc concentrates had exceeded its exports - a major change to the country's position in this market.

Metal Output

Production of zinc metal increased in Europe (up 112,000 t); Africa (up 6,000 t); Asia (up 241,000 t), and Australia (up 62,000 t). These increases were partially offset by significant reductions in metal output within the Americas.

In the Americas, Canadian production fell by 122,000 t owing to a significant decrease in output from Teck Cominco's Trail smelter. This followed the company's decision to sell power from its Waneta hydroelectric plant during US power shortages. US metal production fell by 64,000 t largely because of production cuts at Zinc Corporation of America's Monaca facility. However, Mexican production grew by 67,000 t with increased production at Penoles' Torreon plant following an expansion project.

Output in Europe rose by 4.0%, principally as a result of the commissioning of a 120,000 t/y capacity expansion at Asturiana de Zinc's San Juan de Nieva plant in mid-2001. After recovering from production problems in 2000, Britannia Zinc's Avonmouth smelter increased UK output by 11,000 t. Production increases were also observed in Finland (up 26,000 t); France (up 11,000 t) and Italy (up 19,000 t).

Asian output rose by 241,000 t, due largely to a further significant increase in Chinese production of 159,000 t. Increases were also seen in India (up 30,000 t); Iran (up 18,000 t) and Korea (up 31,000 t).

Secondary Recovery

Zinc is an inherently recyclable non-ferrous metal and there is a long history of zinc recycling. Continued development of zinc recycling is seen as a key opportunity for the zinc industry.

There are three principal ways in which zinc can be produced from secondary sources. These are:

- production of ingot indistinguishable from that made from ores, by refining from lower-grade scrap and residues;
- production of zinc and alloy ingots by simply remelting and treating high-grade scrap;
- direct use of zinc-bearing secondary materials in, for instance, secondary brass and zinc chemicals with no prior treatment (beyond sorting and grading).

The International Lead Zinc Study Group reported that total recovery of zinc by all the above means rose again in 2001 to 2.1 Mt.

Growth in zinc recycling has come from the production of refined zinc from secondary raw materials which has risen by 20% since 1998 (up 102,000 t) as technologies for the economical treatment of residues have improved and disposal costs have increased. Those residues consist principally of dusts arising from electric arc furnace production of secondary steel from scrap containing galvanised steel. The zinc content of such materials varies from around 5% to over 30%. The higher zinc dust can be recovered directly in thermal zinc refining plants. Lower grades need to be treated to increase zinc content to about 50% at which level it may be acceptable as feedstock for electrolytic or thermal zinc production.

Efforts are under way to establish common methods of expressing recycling rates for the non-ferrous metals. Using the proposed 'Recycling Input Ratio' (ie, total secondary sources/[output of primary refined metal + total secondary sources]) about 30% of zinc demand is met by recycling.

The proposed 'Recycling Efficiency Ratio' (ie, total quantity recycled/total quantities available for recycling) suggests 86% of zinc available for recycling is recycled. Most of the

remainder is in the form of low-zinc electric arc furnace (EAF) dusts, which are currently awaiting technical improvements that will enable them to be recovered economically.

Whilst recovery to refined zinc is limited by technical and economic issues, recovery by remelting and by direct use is limited by the availability of the relevant, usually high grade, scrap and residues. Availability of scrap for recovery by these methods is limited by production of scrap and residues from current uses of zinc (the so called 'new scrap') and by the 30+ years average lifetime of a product containing zinc. Consumption of zinc 30 years ago was only about 60% of present levels, so limiting the amount of old scrap potentially arising. For this reason, the tonnages of zinc recovered by these processes have remained virtually unchanged over the past three years or so, and scope for substantial increases are limited.

Prices

LME prices at the end of 1999 had increased to US\$1,245/t. Prices in 2000 fell in January and February, recovering in subsequent months and peaking at US\$1,224/t in September before declining to US\$1,059/t by December. That decline continued throughout 2001, with the monthly average LME price dropping to US\$755/t in December 2001. Prices recovered slightly early in 2002 with a daily price of US\$843/t reached on March 19.

The reasons for price movements are complex. However, the global economic slowdown during 2001 had an impact on zinc demand whilst metal supply continued to increase. A decline in zinc prices was therefore inevitable although the extent of that decline has been unprecedented.

Demand

A 1% fall in global zinc use was heavily influenced by a decline of 15% in US zinc demand. Adverse economic conditions also resulted in decreases in zinc demand in Japan (down 43,000 t) and the Republic of Korea (down 27,000 t). In most other regions or

countries, zinc demand held up well in the face of difficult economic conditions affecting zinc's main markets of construction and automotives. Demand in China continued to grow (up 130,000 t). Zinc demand also rose in India (up 16,000 t) and Indonesia (up 14,000 t).

It is worth noting that growth in world zinc demand in the period 1997-2001 was 4.2% per annum - higher than world economic growth.

European zinc use rose by 20,000 t to 2.7 Mt in 2001. There were mixed trends within Europe - perhaps reflecting the differing impacts of reductions in capacity of some of the European steel industry's continuous galvanising lines.

The first-tier uses of zinc are estimated to be:

Zinc coatings	50%
Brass	18%
Zinc alloys	13%
Zinc chemicals	8%
Semis	6%
Other	5%

In terms of market application, zinc uses can be segmented as follows:

Construction	48%
Transport	23%
Machinery/equipment	10%
Consumer durables	10%
Infrastructure	9%

There are no significant challenges to zinc's main uses and markets and growth in zinc demand in the western world is presently constrained by adverse economic conditions. In fact, there are significant prospects for growth in certain zinc-coating technologies such as hot dip galvanising, in particular in developing economies. Continued industry

market development efforts combined with economic recovery can be expected to return zinc demand at least to its historical long-term growth trend of 2% per annum.

World zinc demand is dominated by its use as a protective coating for steel. These coatings take various forms, the most prominent being hot dip coatings (galvanising) applied to either fabricated articles (ie batch or general galvanising) or applied continuously to steel strip (ie, continuous or sheet galvanising). Coatings applied to steel strip are also applied electrolytically (ie, electrogalvanising) but this method has become less important as hot dip galvanising technologies have developed.

General galvanising is mainly used to protect steel used in construction and infrastructure such as fencing, highway guard rails, but it has wide range of other applications that make the process rather resilient to external market factors.

Continuous galvanised steel sheets have found growing application in white goods, construction applications and in automotive body panels. Zinc coatings on steel sheets are thinner and more ductile than those applied by general galvanising. Hence these steel sheets can be formed (pressed) to their final shape after coating.

Zinc castings, which account for about 13% of zinc use, are used in a wide variety of manufactured products including cars, appliances, door locks, window fittings and tools. Zinc in these applications is the subject of intense competition, both from other metals and from synthetic materials. Whether zinc will retain those applications probably depends on the ability of the zinc and casting industries to convince designers that 'traditional' materials, such as zinc, are the best solution to design and production requirements. The zinc industry is currently making strenuous efforts to educate designers about the advantages of the zinc castings, as well as ensuring that die casters themselves are capable of producing castings to the exacting standards now required.

Zinc Statistics ('000 t)

	Mine Production ¹			Metal Production			Metal Consumption		
	1999	2000	2001	1999	2000	2001	1999	2000	2001
Europe	946	1,063	1,064	2,692	2,776	2,888	2,610	2,715	2,733
Austria	-	-	-	-	-	-	48	47	48
Belgium	-	-	-	232	264	256	275	285	265
Bosnia	1	0	0	-	-	-	7	8	8
Bulgaria	11	10	11	84	84	88	9	10	10
Finland	20	16	20	225	223	249	36	47	70
France	-	-	-	318	318	329	298	310	328
Germany	-	-	-	361	357	364	561	532	553
Greece	18	17	29	-	-	-	18	21	18
Ireland	200	263	298	-	-	-	2	2	3
Italy	0	-	-	145	170	183	336	385	355
Macedonia	21	25	20	49	58	52	9	10	10
Netherlands	-	-	-	221	217	221	106	106	108
Norway	-	-	-	144	138	145	21	23	34
Poland	154	157	145	179	179	175	92	109	110
Portugal	-	-	-	-	-	-	14	12	11
Romania	27	27	28	29	52	52	20	22	22
Russian Fed	161	163	164	232	242	250	120	137	150
Spain	154	204	185	383	391	427	190	203	218
Sweden	175	177	159	-	-	-	38	40	27
Ukraine	-	-	-	0	-	-	62	65	65
UK	-	-	-	89	76	87	220	210	190
Yugoslavia	4	4	4	1	8	10	8	10	10
Other Europe	1	1	1	0	0	0	121	122	⁽²⁾ 120
Africa	268	255	258	135	129	135	157	169	166
Algeria	5	6	7	27	26	26	8	10	11
Morocco	112	104	107	-	-	-	7	9	9
Namibia	35	40	41	-	-	-	⁻⁽³⁾	⁻⁽³⁾	⁻⁽³⁾
Nigeria	-	-	-	-	-	-	9	8	8
South Africa	70	63	62	108	103	109	87	92	89
Tunisia	45	41	41	-	-	-	5	5	4
Other Africa	1	0	0	-	-	-	41	45	45
America	3,445	3,494	3,702	1,785	1,804	1,677	2,061	2,080	1,891
Argentina	34	35	40	40	36	40	41	38	36
Bolivia	145	149	147	-	-	-	⁻⁽⁴⁾	⁻⁽⁴⁾	⁻⁽⁴⁾
Brazil	96	93	93	187	192	190	187	188	196

Zinc Statistics ('000 t) (Continued)

	Mine Production¹			Metal Production			Metal Consumption		
	1999	2000	2001	1999	2000	2001	1999	2000	2001
Canada	1,021	1002	1,052	777	780	658	169	176	181
Chile	32	31	33	-	-	-	8	10	12
Columbia	-	-	-	-	-	-	18	18	18
Honduras	41	43	48	-	-	-	-(4)	-(4)	-(4)
Mexico	363	393	435	219	233	300	200	212	210
Peru	900	910	1,056	191	200	190	64	66	64
US	813	837	798	372	363	299	1,342	1,340	1,141
Venezuela	-	-	-	-	-	-	16	15	16
Other America	-	-	-	-	-	-	16	17	17
Asia	2,258	2,553	2,724	3,412	3,736	3,977	3,338	3,669	3,759
Bangladesh	-	-	-	-	-	-	38	44	48
China	1,476	1,710	1,860	1,703	1,919	2,078	1,200	1,350	1480
Hong Kong	-	-	-	-	-	-	6	6	6
India	185	208	222	189	204	234	254	270	286
Indonesia	-	-	-	-	-	-	55	87	101
Iran	98	102	105	24	47	65	57	58	62
Israel	-	-	-	-	-	-	11	11	11
Japan	64	64	45	633	654	644	634	676	633
Kazakhstan	283	322	350	243	262	266	32	34	35
Korea DPR	37	34	32	40	37	35	17	15	15
Korea Rep	10	12	5	430	477	508	389	438	411
Thailand	24	27	27	95	101	110	83	90	92
Turkey	57	48	46	27	0	2	74	83	84
Uzbekistan	0	0	-	27	34	35	8	8	8
Vietnam	18	22	28	-	-	-	34	36	40
Other Asia	5	5	5	-	-	-	⁽⁵⁾ 445	⁽⁵⁾ 463	⁽⁵⁾ 447
Oceania	1,110	1,379	1,476	344	494	556	226	231	238
Australia	1,110	1,379	1,476	344	494	556	210	217	222
New Zealand	-	-	-	-	-	-	15	14	16
World Total	8,026	8,744	9,225	8,369	8,939	9,232	8,392	8,863	8,787

¹ Metal Content.² Includes: Croatia 10: Czech Republic 20: Denmark 9: Hungary 15: Slovakia 28: Slovenia 15: Switzerland 19: Other 4.³ Included in Other Africa.⁴ Included in Other America.⁵ Included in Other Asia.

Source: International Lead Zinc Study Group.

Note: Some data for 2001 may be subject to revision.

Brass, the oldest and still the second most important market for zinc, is so diverse that it has seemed immune to large-scale substitution. Used in the form of castings, sheet, rod, extrusions, tube, wire and stampings, it finds its way into enormous numbers of manufactured products: it is difficult to find anything manufactured that does not contain at least a small amount of brass. Nevertheless, demand for brass now generally follows overall economic conditions.

Future

Demand in 2002 is expected to return towards its recent growth rates of around 3% if the early indications of world economic recovery are realised. However, there are no indications of significant reductions in either mine production or refined metal output and the zinc market would therefore continue in oversupply for 2002.

The world zinc industry has been quick to embrace the concept of sustainable development and members of the

International Zinc Association (IZA) formally adopted IZA's Sustainability Charter in October 2001. The industry presently pursues a two-year Sustainable Development Action Plan that brings together actions directed at tackling environmental, social and economic factors affecting the industry.

The zinc industry is also investing heavily in research into the environmental aspects of zinc. A substantial research programme will conclude in March 2003 and its outcomes will be used in a risk assessment exercise being conducted within the European Union. All major base metals will undergo this regulatory scrutiny and it is hoped that the zinc industry commitment to a sound scientific approach will not only benefit zinc but also other metals for which similar scientific approaches will be valid. The underlying scientific challenge is in assessing risks from metals that are, in fact, essential in the environment and whose natural mechanisms reduce their ability (availability) to cause toxicity.