ZINC

THE PROPERTIES, PRODUCTION AND USES OF ZINC

Compiled by The Arizona Department of Mineral Resources from Reports of U. S. B. M. in May 1951 and U. S. Tariff Commission in April, 1954.

Zinc is one of the more common and widely used nonferrous metals and is consumed in large quantities in the manufacture of many kinds of metal products.

The commercial importance of zinc is based largely upon its properties as a corrosion inhibitor especially as a protective coating on steel in galvanized products, and upon its use in nonferrous alloys.

Following are some of the physical and chemical properties of pure zinc:

Atomic weight	65.38
Specific gravity at 68°F	7.133
Melting point, °F	787
Boiling point, °F	1724
Electrical conductivity (Silver=100)	26
Tensile strength (lb. per sq. in.)	9000 - 24000
Hardness (Moh Scale)	3 +

Most of the zinc consumed in the United States is in the form of slab zinc as recovered from ores by smelting or electrolytic refining and, to a relatively small extent, from scrap. Of the total quantity of zinc consumed in the United States during the period 1948-52, about 87 percent was consumed in the form of slab (including primary and secondary slab zinc) and 12 percent represented the zinc content of zinc pigments and salts produced from ore without first being reduced to slab.

The largest use of zinc is normally in the galvanizing of iron or steel in order to increase resistance to corrosion. The most pronounced development in recent years in the consumption of slab zinc has been its increased use in zinc-base alloys for die castings. The automobile industry is the largest user of zinc-base alloys, principally for die-cast parts and assemblies for pumps, carburetors, radiator grills, etc. Brass products accounted for the third largest use of slab zinc in 1952. Rolled zinc used for dry batteries, photo-engraving plates etc., ranked fourth in the utilization of slab zinc.

Table I shows in detail the consumption of slab zinc by uses for the years 1950 - 1953 inclusive.

Table II gives Salient Statistics of the U. S. Zinc Industry.

Table III gives a Summary of U. S. Slab Zinc Production, Imports, Exports, and Consumption for the years 1950 - 1953 inclusive.

A study of these tables indicates that the U. S. Mines enjoy their best conditions when they are producing from 60% to 65% of the domestic consumption of zinc.

Table IV was compiled from the latest available figures(1950 & 1951) to indicate the character of zinc-lead ores mined in Arizona. They show that the chief zinc-lead ores average about 8.44% zinc and 4.02% lead; and the chief zinc-copper ores average about 7.67% zinc and 2.65% copper. Zinc concentrates average about 53.73% zinc and contains about 0.05 oz. gold per ton, 3.78 oz. silver per ton, 1.39 % copper and 2.36 % lead.

The U. S. B. M. figures for 1952 gives 457,422 tons of zinc-lead ore treated at Arizona milling plants, averaging 0.06 oz. of gold and 2.92 oz. of silver to the ton, 0.40% copper, 3.74% lead, and 8.10% zinc; also 338,030 tons of zinc-copper ore, averaging 0.025 oz.gold, 1.767 oz.silver, 2.374 % copper, 0.335 % lead, and 7.030 % zinc.

The U. S. Tariff Commission's report gives the gross metal content of the ores mined in the United States in 1952, to be 1.7% lead, 3.2% zinc, 0.1% copper, 0.91 oz. silver, and 0.007 oz. gold. It reports a recovery of about 87% of the lead and 79% of the zinc.

The following tabulation is a summary of the recoverable metal content of ore mined in Arizona, the Western States and the United States in 1952, taken from U. S. Tariff Commission's Report, April, 1954.

	Recoverable Metal Content					
	Crude ore mined 1000 short tons	% Lead	% Zinc	Silver oz./ton	Gold oz./ton	% Copper
Arizona	812	2.0	5.8	2.00	.030	1.0
Western States	8,834	2.4	4.1	2.02	.016	.2
United States	25,086	1.4	2.5	0.73	.006	.1

ZINC DUTIES

	Rate of duty Under Tariff Act of 1930	Rate of duty Under Trade Agreement In effect 1/1/54	Maximum rate possible as result of "Escape Clause Action"
Zinc-bearing ore	1½¢/lb.	0.6¢/lb.	1.8¢/lb.
Zinc slabs, pigs, blocks	1 3/4¢/lb.	0.7¢/lb.	2.1¢/lb.
Zinc sheets	2¢/lb.	1.0¢/lb.	3.0¢/lb.

TABLE I

U. S. CONSUMPTION OF SLAB ZINC BY USES - YEARS 1950-1953 INCL.

Source: Report of U.S.Tariff Commission, Apr. 1, 1954

	1950	1951	1952	1953 Preliminary
Galvanizing	441,686	400,279	377,688	403,162
Zinc-base Alloys	289,527	296,434	236,689	305,346
Brass Products	139,373	143,292	155,608	177,307
Rolled Zinc	68,444	64,085	51,318	53,784
Zinc Oxide	19,187	18,223	17,205	20,487
Other	9,917	11,658	14,275	17,550
Total Consumption	967,134	933,971	852,783	977,636

U. S. CONSUMPTION OF ZINC DIRECTLY IN ORES IN THE MANUFACTURE OF ZINC PIGMENTS AND SALTS.

Zinc Content in Short Tons

1950	1951	1952	1953
134,434	133,845	109,277	118,244

TABLE III

SUMMARY OF U. S. SLAB ZINC PRODUCTION, IMPORTS, EXPORTS AND CONSUMPTION - YEARS 1950-53.

Source: U. S. B. M.

ZINC	1950	1951	1952	1953 Preliminary
Stocks at reduction plants beginning of year.	94,221	8,884	21,981	85,021
Zinc produced from domestic ores.	588,291	621,826	575,828	410,000
Zinc produced from foreign ores.	255,176	259,807	328,651	510,000
Zinc metal imported.	155,974	87,983	115,151	233,000
Redistilled secondary zinc.	66,970	48,657	55,111	51,000
Total Supply	1,160,632	1,027,257	1,096,722	1,289,021
Slab & sheet zinc exported.	17,727	43,089	61,945	22,479
Stocks at reduction plants end of year.	8,884	21,981	85,021	180,843
Apparent consumption.	1,134,021	962,187	949,756	1,085,699
Reported consumption.	967,134	933,971	852,783	977,636

TABLE IV

GRADE OF PRINCIPAL ARIZONA ZINC ORES AND CONCENTRATES YEARS 1950-1951. Source: U.S.B.M.

1950:	Tons	Oz.Gold/Ton	Oz.Silver/Ton	% Copper	% Lead	% Zinc
Milling Ores:						
Zinc-Lead	613,621	0.05	3.22	0.50	4.46	9.35
Zinc-Copper	248,391	0.05	2.16	2.74	0.36	7.85
Concentrates:						
Zinc	117,133	0.05	4.01	1.29	3.04	56.09
Direct Smelting Ores:						
Zinc-Lead	3,926	0.08	2.22	0.45	18.70	7.72
1951:						
Milling Ores:						
Zinc-Lead	497,738	0.06	2.72	0.38	3.58	7.53
Zinc-Copper	433,256	0.04	2.00	2.57	0.40	7.49
Concentrates:						
Zinc	106,027	0.05	3.54	1.48	1.68	51.37
Direct Smelting Ores:						
Zinc-Lead	5,562	0.11	1.64	0.66	16.71	8.45

ARIZONA MILLING ORES IN 1952

	Tons Ore	Oz. Gold/Ton	Oz. Silver/Ton	% Copper	% Lead	% Zinc
Zn - Pb	457,422	.06	2.92	0.40	3.74	8.10
Zn - Cu	338,030	.025	1.767	2.374	0.335	7.030

TABLE II

SALIENT STATISTICS OF THE U. S. ZINC INDUSTRY

YEARS 1950-1953 INCL. SOURCE: U.S.B.M. IN SHORT TONS OF 2000 LBS.

	1950	1951	1952	1953 Preliminary
Consumers' stocks at beginning of year.	81,801	60,349	50,584	92,402
Producers' " " " " "	94,221	8,884	21,980	85,021
Mine Production recoverable zinc.	623,375	671,526	666,001	534,730
Imports, ore-concts. content.	272,538	303,038	448,699	510,000
Imports, metal.	155,974	87,983	115,151	233,000
Redistilled secondary.	66,970	48,657	55,111	51,000
Total Supply	1,294,879	1,180,437	1,357,526	1,506,153
Consumers' stocks at end of year.	60,349	50,071	92,402	84,595
Producers' " " " " "	8,884	21,981	85,021	180,843
Exports- Slabs, pigs, blocks.	12,917	36,510	57,714	17,856
Exports- Ore, sheets, plates, scrap & dust.	12,668	15,005	8,575	8,579
Sub-Total	94,818	123,567	243,712	291,873
Apparent Consumption.	1,200,061	1,056,870	1,113,804	1,214,280
Reported Consumption slab zinc.	967,134	933,971	852,783	977,636
Consumed directly in Ores.	134,434	133,845	109,277	118,244
Total reported zinc consumption.	1,101,568	1,067,816	962,060	1,095,880
Unaccounted for.*	98,493	-	151,744	118,400
Mine production recoverable zinc. (Ariz.)	60,480	52,999	47,143	27,300
Mine " " " (World)	2,346,000	2,524,000	2,780,000	2,700,000
Production of primary slab zinc.				
By sources: From domestic ores.	588,291	621,826	575,828	Not Avail.
From foreign ores.	255,176	259,807	328,651	" "
By methods: Electrolytic.	342,085	336,087	351,106	371,000
Distilled	501,382	545,546	553,373	549,000
U.S.Mine production % of apparent consumption.	51.97	63.54	59.80	44.04
U.S.Mine production + redistilled secondary as percent of apparent consumption.	57.53	68.14	64.75	48.23
Avg. price of zinc,E.St. Louis,(E.& M.J.)	13.866	18.000	16.215	10.855

* Chiefly in strategic stockpiles and smelters' stocks of zinc ore (confidential).

Arizona Department of Mineral Resources July, 1954