



INTER-OFFICE MEMORANDUM

H.O. 331-4-79

To: T.J. Desanti

Subject: A cursory Review of the U.S.
Antimony Market

Date: 16 July, 1979

From: D.N. Zeraldo

Copies to: P.J. Raleigh ✓
D.N.Z.
FileD.J. Emery
GEN. ENGR.

JUL 19 1979

BACKGROUND

Elemental antimony is a silvery-white, brittle, crystalline solid that is a poor conductor of both heat and electricity. The atomic weight of antimony is 122 and its melting and boiling points are 630°C and 1380°C respectively.

Prior to this century, the chemical and metallurgical properties of antimony found little use. During World War I the requirement for antimonial lead for ammunition strongly stimulated demand which drew new production primarily from U.S. and Bolivian mines. U.S. demand however, slumped following the war, only to recover and grow on the strength of the expansion of the automobile industry and the requirement for antimonial lead storage batteries.

China had historically been a large producer and world supplier of antimony ore. When the Japanese invaded China in 1937 this source of supply was cut-off. In response output in Mexico and Bolivia was expanded. Output continued to grow during World War II as military demand for antimony based flameproofing compounds became dominant.

U.S. demand remained stable following the war on the support of a healthy automobile industry and was stimulated again during the Korean War in 1951-2 and thereafter by the high growth automobile industry through to the mid 1970's.

The advent of the low-antimony maintenance-free battery during the late 1970's has provided a negative factor to consumption; however, the growing requirements for fire-retardant plastics and textiles has helped to cushion the drop in demand and undoubtedly represents the application which shows the most consumption growth potential for the future.

Continued...

OCCURENCE OF ANTIMONY BEARING MINERALS

Antimony deposits are generally small, discontinuous bodies with relatively simple geology. Stibnite (SbS) is the principle ore mineral and usually is found in quartzose veins associated with such igneous rocks as granites, diorites, and monozites. The enclosing walls however, may be any rock that was traversed by the mineralizing fluids during the ore-forming process. The shallow depth of the veins and their minerology suggest low temperature creation at near-surface locations. Most stibnite deposits do not contain more than several thousand tons of ore. Major producing countries of antimony from this type of occurence are:- Mexico, China, Bolivia, Peru, and Yugoslavia.

Antimony also occurs as a constituent of other nonferrous ores such as gold-quartz veins and copper-lead-zinc sulfide deposits where minor antimony occurs locked within a complex crystal lattice (such as tetrahedrite). The antimony content is so small in many of these deposits that it can only be detected in significant quantities at some advanced stage of processing (such as the "lead softening" step in pyrometallurgical lead refining.

U.S. SUPPLY AND DEMAND

The U.S. is the worlds largest consumer of antimony. About 50% of the U.S. supply is derived from scrap and about 85% of such secondary antimony is recovered from battery-plate scrap. The U.S. has a large quantity of antimony alloys now in use that are in a continuous recycling process.

U.S. mines produce approximately 4% of the country's total annual requirement (primary & secondary) and about 10% of the country's annual primary requirement. Hence imports in the form of ores, concentrates, metal, and oxide make up a large fraction of the U.S. supply position.

The antimony supply/demand balance represented in Table 1 and Graph 1 attached shows that the U.S. antimony market was in a manageable balance between 1971 and 1973. In 1974 and again in 1975 battery demand from the automobile industry dropped significantly resulting in a large surplus and falling prices for antimony metal in these two years.

Continued...

However 1976 and 1977 were strong years for the car industry and the balance turned to deficit in 1977 as prices for metal rebounded upwards.

The demand for antimony trioxide for use in flame retardent plastics and other materials has over this same period of 1971-1978 experienced continuous growth. The automobile industry provides the bulk of demand for flame retardents. However, increasingly stringent regulations on fire retardents in plastics and textiles for automobiles somewhat masked the cyclical downturn in demand for oxide from the automobile industry during 1974 and 1975.

The year 1978 proved unspectacular as prices for both metal and oxide weakened. By 1978 most of the old antimonial lead batteries were being recycled into the low-antimony maintenance-free type. As a result a large proportion of antimony units were being removed from the battery circuit and transferred to oxide products as producers began adjusting to the shift in end use. Asarco's antimony oxide plant at its Omaha lead refinery started production in late 1978. As a result of this shift in antimony units away from the battery market, the supply of oxide increased considerably, and to the point where some softness in the price appeared in 1978 and which has continued into 1979.

The buoyant automobile industry firmed prices for metal in the first quarter of 1979 as inventory transferred from producers to consumers in anticipation of further price increases.

OUTLOOK

With automobile sales down during the second quarter of 1979 and most indicators pointing towards a recession in the U.S. for the remainder of 1979; the expectation is for a levelling or even a drop in consumption rates over the remainder of the year. Producers will gradually shift their product to oxide as the battery market shifts further to the maintenance-free type. Much of the future for antimony rests on the growth in the use of antimony based flame retardents.

PRICE FORECAST (Trioxide-U.S. \$/LB)

<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982-84</u>
\$1.72	\$1.45	\$1.45	\$1.50	\$1.60

TABLE 1:

U.S. SUPPLY/DEMAND BALANCE
(000's ST of SB)

	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978 E</u>
Mine Production	1853	1005	1276	1319	1154	638	1208	1300
Secondary Material	20917	22428	24062	23570	17964	19799	30601	16313
U.S. Gov't Stock Release	-	70	4087	-	-	-	-	-
<u>IMPORTS:</u>								
Ores	9619	17212	16679	14655	8320	10023	3438	4494
Metal	1670	2380	743	2289	2186	2124	1981	4127
Oxide	<u>2317</u>	<u>4177</u>	<u>3860</u>	<u>5203</u>	<u>8224</u>	<u>9637</u>	<u>8002</u>	<u>8854</u>
1. Total Supply	36376	47272	50707	47036	37848	42221	45230	35088
Net U.S. Consumption	35421	46855	48348	43956	33957	41443	50967	33114 E
Exports All Forms	<u>1165</u>	<u>432</u>	<u>903</u>	<u>1464</u>	<u>628</u>	<u>665</u>	<u>742</u>	<u>556</u>
2. Total Demand	36586	47287	49251	45420	34585	42108	51709	33670
3. Net U.S. Surplus (Defecit)	(210)	(15)	1456	1616	3263	113	(6479)	1418

TABLE 2:

ANTIMONY PRICES (METALS WEEK)

		NY DEALER ANTIMONY	ANTIMONY TRIOXIDE
<u>YEAR</u>		<u>¢/LB</u>	<u>¢/LB</u>
1971		56	N/A
1972		56	69
1973		78	85
1974		207	155
1975		149	181
1976		156	169
1977		123	177
1978		115	172
1979	J	127	172
	F	132	150
	M	136	150
	A	141	150
	M	153	150
	J	<u>151</u>	<u>150</u>
	YTD	140	154

GRAPH 1: COMPARISON OF US SUPPLY / DEMAND

47 4770

SEA LOGAN, INC. CYCLES & DIVISIONS
KEUFFEL & ESSER CO. MADE IN USA

NO

60
58
56
54
52
50
48
46
44
42
40
38
36
34
32

71 72 73 74 75 76 77 78

— US DEMAND
- - - US SUPPLY

DNZ
JULY 79.

