

COPPER AND ALUMINUM

Copper producers are faced with the question of again starting to search for more outlets for copper in order to offset the inroads of the aluminum industry.

A study of the United States aluminum and copper statistics covering the past 24 years (1928 to 1951), compiled by the Arizona Department of Mineral Resources and shown on the preceding pages, shows that the apparent consumption of new aluminum in the United States in the year 1928 was only one-seventh (14.4%) of the apparent consumption of new copper, whereas new aluminum is now being consumed at the rate of two-thirds (67.6%) of the present copper consumption.

This growth in aluminum consumption naturally gives food for thought to the copper producers. Of course, at the present time, both aluminum and copper are in short supply, and it is necessary to import both metals to supply the demands. The net imports for the past five years have averaged 9.7% of the total aluminum consumption and 8.8% of the total copper consumption.

To find an answer to the above question, we should try to show the present uses of these metals and in what quantities they are being used in industry; their distribution; and the changes in distribution that have taken place in the past quarter of a century. Accurate comparative data are almost impossible to obtain, but the following discussion is based upon statistics published by the U. S. Bureau of Mines and the American Bureau of Metal Statistics.

Many important uses for aluminum are based upon its physical and chemical properties, of which light weight is of chief importance. Weight was a factor in the early use of aluminum for kitchen utensils and its subsequent use in automobiles, airplanes, and other means of transportation. Aluminum competes with copper as an electrical conductor. It competes with steel in its use in light structural material, made strong by alloying and heat treatment. It is used in foil, in paints, wire, rivets, bolts, nuts, screen, corrugated sheets, etc., etc. The resistance of aluminum to acid corrosion by the atmosphere encourages its use as roofing and in the dairy industry. In transportation, aluminum is gaining wider application.

Except for lightness, copper has most of the qualities above described for aluminum, and in addition is a much better conductor of electricity. For example, aluminum wire offers about sixty percent more resistance to electricity than copper wire of the same diameter. In general, copper wire has about twice

the breaking strength of aluminum wire of the same diameter. Because aluminum has only about one-third the weight of copper, it is most competitive with copper in heavy transmission lines. It's light weight permits the use of fewer towers. However, in the smaller transmission lines and in electrical equipment such as motors and generators, conductivity and not weight, is the major factor, and copper is the choice of manufacturers. In general, copper and the several copper alloys are valued for the uses to which they are especially adapted, and for that reason have resisted substitutions for cheaper substances.

Copper has more than held its own in its use for the manufacture of all wire products. For example, in the period 1935-1939, inclusive, 48% of the total copper production was used for this purpose, while for the years 1947, 1948 and 1949, this proportion increased to 55%.

In the manufacture of airplanes, aluminum has made enormous strides. To be sure, this light metal has invaded the field of steel rather than copper in aircraft, although in the field of general transportation, which includes automobiles, trucks, busses, and railway cars, as well as airplanes, records for the period 1933-1938 inclusive, show that 29% of the total aluminum consumption was used in this field, as compared with 18% in 1950. In tonnages, this was 26,800 tons in an average early year, as compared with 162,000 tons in 1950. Comparable figures for copper were 13% or 105,000 tons in 1928 and an estimated 10% or 145,000 tons in 1950.

In the building industry, aluminum has made its biggest inroad into the copper field. For example, the aluminum figures for 1928 were 8% or 9,300 tons, as compared with 6% or 50,000 tons of copper, and in 1950 aluminum was 19% or 178,000 tons, as compared with an estimated 10% or 145,000 tons of copper.

In general, although the aluminum industry is expanding more rapidly than the copper industry, it is apparent that most of its increased production will be directed to the structural branch of the airplane industry where copper is not in competition. On the other hand, with the airplane industry destined to make tremendous expansion for many years to come, regardless of peace or war, there promises to be a big market for copper which is favored over aluminum in the electrical systems of all airplanes. Likewise, in the building industry, the preference for aluminum is shown in the structural lines, such as roofing and window frames, while brass is still being favored in plumbing fixtures.

The growth of the aluminum industry need not disturb the copper producers, because the additional aluminum is being consumed in uses that are out of the copper field. Copper will always be in style for the particular uses to which it is especially adapted. The main worry for copper producers is to maintain its present productive capacity by the development of more ore to replace its depleting ore-bodies, and present indications are that they are doing just that.

UNITED STATES ALUMINUM STATISTICS FOR PERIOD 1923-1951, INCL.

Compiled by: Arizona Department of Mineral Resources - Source: Minerals Yearbook, U.S.B.M.

	<u>Tons Primary Aluminum Produced</u>	<u>Net Imports Primary Aluminum</u>	<u>Apparent Con- sumption of new Aluminum</u>	<u>Tons Secondary Aluminum Produced</u>	<u>E. & M. J. Price of New Aluminum</u>
1928	105,000	11,560	116,000	47,800	24.3
1929	112,500	16,924	130,911	48,400	24.3
1930	114,500	4,066	118,585	38,600	23.8
1931	88,772	5,066	93,839	30,300	23.3
1932	52,442	1,874	54,318	24,000	23.3
1933	42,563	4,769	47,332	33,500	23.3
1934	37,089	5,113	42,202	46,400	22.2
1935	59,648	9,661	68,309	51,400	19.5
1936	112,465	11,973	124,443	51,500	19.0
1937	146,341	19,927	166,238	62,600	19.8
1938	143,441	2,561	89,523	38,800	20.0
1939	163,500	-27,342	167,646	53,900	20.0
1940	206,280	- 9,451	227,017	80,400	18.8
1941	309,067	5,953	302,788	106,900	16.5
1942	521,106	73,365	588,969	196,500	15.0
1943	920,179	17,957	877,349	314,000	15.0
1944	776,446	-87,139	744,627	325,600	15.0
1945	495,060	328,216	797,052	298,400	15.0
1946	409,630	25,913	461,877	278,100	15.0
1947	571,750	-46,695	524,229	344,800	15.0
1948	623,456	40,041	665,875	286,800	15.7
1949	603,462	48,424	635,956	180,800	17.0
1950	718,622	167,249	898,341	243,700	17.7
1951*	830,000	150,000	980,000	250,000	19.0

*Estimated

- Minus sign indicates excess of exports over imports.

Tons U.S. Mine Production
New Copper

Tons U. S. Primary
Aluminum Produced

E.&M.J. Price of Copper

--- E.&M.J. Price of Aluminum

