

prices would encourage less essential consumption and the need to conserve helium for essential applications will be a matter of increasing concern with time as the depletion of natural helium sources becomes more apparent.

INDIUM

Compared to foreseeable needs both world and domestic resources are very large. Domestic production capability is very large. Indium production results entirely from the treatment of flue dusts and residues issuing from the smelting of base metal ores (zinc). The value of indium output is negligible in relation to the principal products and neither indium price or demand advances would have any economic impact on overall operations. Indium is used in specialized electronic components and some alloys. The extent to which it might substitute for other elements or find new applications has not been exhaustively explored.

IODINE

World and domestic resources are large. Certain brines are the present source of domestic iodine (see section on bromine). Elsewhere it is produced as a byproduct in the production of nitrates, natural gas, and seaweed. Some new industrial employment of iodine shows promise of increasing the demand somewhat but no supply problem is foreseen.

IRON

Iron bearing substances are abundant and are widely distributed throughout the world. The degree to which these might be classified as ores, in a commercial sense, depends upon quality, in terms of prevailing technology; accessibility, in terms of competitive position with regard to other available sources; and security, in terms of the extent to which supplies are insured. The essentiality of iron to an industrialized economy provides a powerful incentive for any country to supply as much of its raw material needs from domestic sources as is possible at reasonable costs. Any advances in technology that tend to reduce domestic production costs, and permit the commercial employment of iron-bearing substances that are present in abundance, are in the national interest.

The essential need for iron is in the production of steel. The capacity of the domestic steel industry to compete effectively for domestic and world markets is, in turn, a function of cost reductions permitted by technologic advances, process perfection, and product improvement. The United States industry faces stiff competition in both the domestic and foreign markets. New and expanded steel-making facilities have increased rapidly in many countries, and an over-capacity exists in the industry. Trade patterns are affected to some extent with governments, including the United States, exerting a strong influence on pricing policies.

The recycling of scrap is a major increment in the iron (steel) supply pattern and, in addition, substantial quantities of scrap are exported. Yet unreclaimed end products, largely composed of steel, are wasted in such quantities that visible accumulations are seen as a present and growing environmental problem. Means of commercially returning such wastes more effectively to the reuse cycle await development. The rapid trend to basic oxygen converter in steelmaking will continue and open hearths will have virtually disappeared by 2000. This process lowers the scrap to ore ratio. As a consequence, the problem of utilizing obsolete scrap will be multiplied.

It is significant that technological change has worked to the disadvantage of steel and to the advantage of labor and other metals. With respect to all kinds of durable equipment, advancing technology serves to deemphasize structure for more complicated, miniaturized, and electrified equipment requiring more assembly labor, more copper and aluminum, but rarely more steel. Growth in use of aluminum, plastics, and concrete substitutes has affected the growth of iron and steel compared with the overall economic growth.

Although most iron ore in this country has no important associated coproducts or byproducts, some iron production is the result of treating pyrites in the production of sulfuric acid and one iron ore beneficiation operation recovers apatite. However, concurrent with steel industry demand for iron is a demand for alloying materials in one form or another such as manganese, molybdenum, vanadium, titanium, tungsten, nickel, columbium, chromium, and a host of others as well as coal for coking, limestone, and fluorspar. The size of the steel industry greatly influences the demand and direct markets for many other substances.