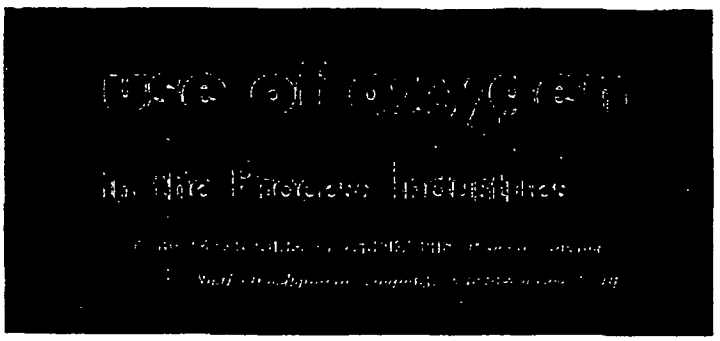
● Recent announcement of the new Elliott process for *low-cost oxygen* stimulates the imagination of the process engineer in envisaging the many uses to which oxygen can be put in the process industries. One of the most sensational of the new uses in which *low-cost oxygen* will play a major part is the Fischer-Tropsch process for converting natural gas and coal to liquid fuels. To those people who shivered through last winter's fuel oil shortage or who have worried about a curtailment of their summer driving because of the announced possibility of a gasoline shortage, this method of extending our liquid fuel reserves has very real importance. In addition, the United States has recently become a net importer of crude oil, and if war should cut off our major sources of foreign oil supplies, this process might prove to be a savior. Two such plants are already being built, one at Brownsville, Texas by Carthage Hydrocol, Inc. and the other at Garden City, Kan., by Stanolind Gas and Oil Company (temporary suspension of this project has recently been announced). Each of these plants will consume about 2000 tons per day of oxygen, an amount greater than the present national consumption of oxygen for *all* purposes.

A second important use to which low-cost oxygen is being put is in increasing the output of the steel industry. Again, to those of us who have been irked by the unavailability of automobiles, refrigerators, and other items dependent on the basic steel supply, this application has a very real meaning. Briefly, in making open-hearth steel, the use of oxygen gives a more rapid combustion and decreases the production time, thus increasing production from the present open-hearth furnaces. In making steel in Bessemer converters, an oxygen-enriched blast enables the amount of scrap melted to be materially increased and also improves the metallurgy. For blast furnaces, the use of oxygen is most attractive with processes which require an unusual amount of high-grade heats (ferrosilicon and ferromanganese) but is also likely to give fuel savings and increased output in ordinary iron-making. It has been estimated that if all the blast furnaces in the United States were to be converted to the use of enriched air, it would take approximately 35 times the present national production of oxygen to supply these needs.

With oxygen production figures like those above being quoted, the imaginative process engineer conjures up a picture of the chemical plant of the future where oxygen will be as readily available for processing needs as steam and cooling water are in the present plant areas. There are many chemical processes in which the use of oxygen is now marginal, requiring only availability at a reasonable price to make its use a reality. We have only to look at reports on the former German chemical industry to see what a few of these uses might be. The Germans used oxygen in the cracking of ethane, a waste refinery gas, to ethylene, a very important starting material for such useful chemicals as ethyl alcohol, ethylene glycol (antifreeze) and vinyl chloride (vinyl plastics). They used oxygen to convert methane to formaldehyde (Bakelite plastic), coal to city gas, acetaldehyde to acetic acid (acetate rayon), and methane to hydrogen. In this country, oxygen has been talked about for use in converting sulfur or pyrites to sulfur dioxide, sulfur dioxide to



sulfuric acid, hydrogen chloride to chlorine (Deacon process), coke to carbon monoxide to alcohols and aldehydes (oxo process), and many others.

The waste product of the new oxygen processes, nitrogen, will also come into its share of usefulness. Nitrogen is the most important ingredient of fertilizers and our present technology includes many methods of fixing raw nitrogen gas into the nitrogen-bearing compounds that are used for this purpose. It is anticipated that some of the nitrogen produced concomitantly with the oxygen will be so used. In addition, nitrogen is excellent for blanketing processes where it is important to exclude air—undoubtedly the plant areas having oxygen facilities available will make good use of part of the waste nitrogen for this purpose. Whatever credit can be taken for nitrogen will lower the cost of oxygen.

The appearance of oxygen as a heavy chemical leads to a broad review of the whole field of oxidation reactions. There will be the possibility of new processes along with improvements and economies in old processes. Tonnage oxygen means a revolution in a large segment of chemical industry.