

Abstract: Industrial Constructions and Regional Competitiveness over the Long Term: The Case of the International Industrial Gases Industry, 1886 to the Present

Raymond G. Stokes
University of Glasgow
Centre for Business History in Scotland

Large-scale production of industrial gases began in the late 19th century in the United Kingdom with the founding of Brins Oxygen Company (later British Oxygen Company, or BOC). A science-based industry of the Second Industrial Revolution, it was soon revolutionised on the one hand by new production technologies, first by Carl Linde in Germany and then by Georges Claude in France, and on the other hand by large and ever increasing demand resulting from widespread adoption of welding technology.

Yet the industry was far from static: it started with a focus on oxygen, and then embraced hitherto separate branches, including acetylene, nitrogen, carbon dioxide, and others, and its original focus on welding was soon complemented by a range of other applications. Moreover, the capabilities of the most important companies in it eventually included not just the design, engineering, and construction of gas production and separation plants, but also expertise in applications technologies and in the logistics of supply and distribution to a wide variety of customers, large and small.

This paper will explore the development of this industry over the long term, between 1886 and the present. It will analyse two separate, but intertwined, developments over time. The first involves the construction of this “industry”, which was extraordinarily different in 1886 from what it has become today. The second development concerns evolving regional competitiveness of firms in the industry. The origins of industrial gases technology and applications were in Europe, and key European firms remain major players in the industry. Already in the 1920s, however, the largest producer of industrial gases in the world was in the United States, and by the 1940s leading US-based firms had caught up with – and in some cases even surpassed – the European pioneers in this area.

At the same time, until the 1950s, industrial gases markets were for the most part completely separate from one another as a result of “gentlemen’s agreements” which gave individual firms virtually exclusive rights to supply a particular geographic area. The introduction of competition policy and the arrival of Air Products, an American company formed only in 1940, first in the UK and then continental Europe in the 1960s set off a dynamic of internationalisation characterised by growing competition on the one hand and increased consolidation on the other.

Today, four firms control about 80 percent of the market worldwide. Two, Linde and Air Liquide, are European, and two, Praxair and Air Products, are American. In that sense, there has been a striking stability in terms of regional dominance of technology and sales in the industry over a very long time. Moreover, three of these four firms were among the pioneers in the industry, again an impressive instance of stability. On the other hand, the geographic location of key markets has changed considerably over time, with implications for firm strategy and competitiveness. What is more, although the overall industry is dominated by European and American firms, the development of specialised expertise in the gas mixtures used in the electronics industry from the 1960s onwards, for instance, has formed an important development as well, enabling growth of competitive firms in yet another region.