

Building Plants: Markets for Technology and Internal Capabilities in DSM's Fertiliser Business, 1925–1970. By *Arjan van Rooij*. Amsterdam: Aksant, 2004. 279 pp. Notes, bibliography, appendix, figures, tables. Paper, \$34.95. ISBN: 90-526-0138-0.

Reviewed by Kees Boersma

This book contributes to a growing body of literature on the history of industrial research and development. Arjan van Rooij has explored the archives to uncover material on the innovative strategies of the Dutch State Mines (DSM), a chemical company that started in 1902 as “de Staatsmijnen” (the State Mines). During the twentieth century, DSM grew from a state-owned firm that operated exclusively in the coal mines of southern Holland into a multinational chemical company. Around 1920, DSM's chief executive officer, Frederik van Iterson, decided to diversify the company's portfolio in order to reduce the company's dependence on coal. Because its waste products (like nitrogen and phosphate) formed useful raw material for manufacturing fertilizers, they became DSM's first new product. During the 1920s, DSM became the largest Dutch producer of the fertilizer ammonium sulfate. However, the step toward diversification was not straightforward, as DSM initially did not have the necessary expertise for developing complex products like ammonia.

Previous historians have described the growth of the company's in-house research, but van Rooij has chosen to tell a different story. During the 1920s, DSM decided to hire chemical-engineering contractors who were capable of building a complete chemical plant: “patents were not wanted, only a complete plant” (p. 73). The company hired engineering contractors, who designed the technology for synthesizing ammonia and made it readily available on the market. The contractors were crucial to the diffusion of technology, and they provided the opportunity for DSM to make use of a large-scale fertilizer plant: “DSM relied on the market for technology to build its ammonia synthesis plant. The company never even contemplated developing its own process. There was no need for this, as several processes were already available and engineering contractors were capable of designing and building industrial scale plants” (p. 76).

In the literature, engineering contracting is a well-known phenomenon. Ralph Landau and Nathan Rosenberg (in Rosenberg, Landau, and Mowery, eds., *Technology and the Wealth of Nations* [1992]) suggest that engineering contracting was an American invention that was exported to Europe after the Second World War. This picture is enhanced by van Rooij: although American engineering contractors became important in Europe after the war, by the 1920s and 1930s there was a market for chemical technology in Europe—a situation that has been ignored in the literature so far.

This is, however, not the only story told in this book. In relation to the economically oriented innovation literature, van Rooij is concerned with the problems of technology transfer and the companies' strategies on the market. In economic thought, as influenced by David Teece (i.e., his article in the *Annals of the Academy of Political and Social Science* [1981]), the idea is that imperfections hinder the functioning of markets for technology and make in-house R&D inevitable for firms that want to be innovative and competitive. The patent system, for example, would disrupt the ideal technology transfer. Nevertheless, van Rooij argues that technology transfer should not be treated as a general category. For example, if the technology is mature, its transfer becomes easier, because many suppliers and buyers operate on a growing market. Moreover, the DSM case has shown that buying a complete plant is easier than buying patents—what an ammonia plant was supposed to do could easily be specified in a performance contract. For DSM, patents were more important in some cases than in others, but in the end they were not essential for its market strategy. The protection of the technology by means of patents was far more important from the perspective of the patent owner, but it was not crucial for DSM, the company buying the technology.

This focus makes the book relevant: it is not so much a (hi)story of an isolated industrial research laboratory in the best tradition of R&D historians, but rather an analysis centering on research and engineering and on the companies that could be hired to deliver knowledge for the construction of plants. The innovation strategies of “defensive” companies like DSM were a vital factor in technology transfer and acquisition. Although its internal capabilities—to understand the state-of-the-art technology—were important for DSM, this did not mean that it exclusively internalized the knowledge it was seeking. The opposite is true: DSM badly needed the outside-

company knowledge held by engineering contractors. With his focus on plants and the activities required for building a complete plant, van Rooij provides an interesting heuristic for analyzing both technology acquisitions and the development of internal capabilities.

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