

## A view from the academic perspective

In the 1960s the Netherlands boasted a huge polymer industry. This industry counted on us – the universities – to ensure a substantial supply of graduates and PhD students trained in relevant fields, as well as providing refresher courses for those working in the industry. Courses were also provided at the national level to meet the industry's needs. This clearly helped to raise the level of education in polymer science, which also benefited from the availability of industry experts to teach at universities. However, owing to confidentiality issues industrial influence on academic research remained limited. Even so, a significant number of professors were able to offer PhD studentships funded by industry.

Here are some of the scientific breakthroughs of the 1960s and 1970s that can be seen as industrial successes.

- At General Electric in Bergen op Zoom, Jan Bussink – with his prior experience with the surprising miscibility of the polymer pair polystyrene and poly-*p*-phenylene oxide (product name NORYL) – succeeded in developing a range of blended and unblended aromatic engineering plastics.
- At the University of Twente, Reinoud Gaymans pioneered the production of nylon 4,6 of a high quality through multi-step polycondensation. This nylon was further developed by DSM into its Stanyl engineering plastic.
- At DSM, Albert Pennings discovered the hydrodynamically induced crystallisation of polyethylene, into which he performed more in-depth research after moving to Groningen University in 1971. Further development work was carried out at DSM, ultimately resulting in the superstrong PE fibre Dyneema.
- In the same period, fibre manufacturer AKU worked on achieving optimal orientation in fibres on the basis of the fully aromatic and highly rigid chains of poly-*p*-phenylene terephthalamide. It was not until the discovery of an ingenious solvent system for this polymer by Leo Vollbracht of AKU that the superstrong fibre Twaron could successfully be put on the market.

In 1984, Dutch polymer companies and universities, aided by 50% subsidy from the Dutch Ministry of Economic Affairs, entered into long-term collaboration on the Innovative Research Programme for Polymer Composites and Special Polymers. For us academics, this meant a Valhalla for research on topics such as bonding, surfaces, thin layers, phase separation and porous materials, as well as for research into polymers for use in medical, pharmaceutical, photoactive and electrical applications. In 1997, the polymer industry intensified its collaboration with universities via DPI, the Dutch Polymer Institute, once again thanks to funding from Economic Affairs.

In view of the close relationship that had grown between industry and academia, it was a great disappointment when around 2000 Dutch multinationals discontinued their polymer activities in the Netherlands, a turning point that had a lasting impact on our perception of the country's polymer industry.

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