

ScienceDirect®

CHEMICAL R&D

Case Study: Outperforming the competition with bio-based chemicals

ScienceDirect helps to fast-track the development and production of a new polymer from a bio-feedstock while saving \$200 million in manufacturing costs



Summary

A senior researcher and technology leader shares how his R&D team at a large global diversified chemical company used the breadth and depth of scholarly research from ScienceDirect to find an optimal bio-based monomer, derived from corn starch, that his firm can use to create a commercially successful new polymer.



“ScienceDirect offers a vast breadth of information, which is crucial in helping us take our research to the next stage. We saved more than a year of research time and \$200 million in scale-up savings by finding the answers we needed in this excellent resource.”

—Llewellyn Corlett, Senior Researcher & Technology Leader



Challenge

Green chemistry is much sought-after,” explains Llewellyn Corlett, a senior researcher at a global diversified chemical company.* “Customers love green solutions, but they’re not willing to pay a premium for greenness specifically; only for high performance,” he observes. Spurred by these market pressures, Corlett and his team set out to convert renewably sourced biological feedstocks into new polymers for a variety of applications — from paints to cosmetics to packaging — while simultaneously outperforming non-renewable competitors.

The team sought to use a monomer derived from corn starch to create a polymer with the right properties (molecular weight, viscosity and color) for a desired end-use, through a bacterial fermentation. The company also set an internal purity benchmark for the monomer at close to 99.99 percent. “But the first few batches were all dark brown and foul-smelling,” Corlett recalls. “We felt a lot of pressure to come up with a solution quickly that was also less expensive than the petrochemical-based product.”

The challenge was heightened by the fact that the team was operating in unmapped territory. They were the first in the world to work on this type of project at such a large scale. The team needed to develop a viable process that was compatible with the firm’s existing manufacturing processes and which wouldn’t require significant capital investment. “I told my team, ‘Go search for information on any remotely similar project, we need to come up with solutions that will help us to perfect the technology without costing too much money — and we need to do it fast,’” Corlett says.

*For confidentiality purposes, names have been changed.

“Effective R&D demands that we keep track of other teams’ progress, watch for potential limitations, and make appropriate modifications at every stage. ScienceDirect makes it easy to track those developments across thousands of sources — which is why it’s an integral part of our R&D process.”

– Llewellyn Corlett
Senior Researcher & Team Leader

Solution

Exploring the breadth of information

To find viable solutions, Corlett and his team turned to ScienceDirect and began searching through chemical, process and analytical solutions in a multitude of disciplines such as biology, biotechnology, molecular sciences and bio-engineering. They quickly became excited about the breadth of information available on ScienceDirect, as well as the simplicity of browsing related papers by topic and keyword. The team approached their puzzle as an integrated system, pursuing lines of investigation around monomer purification, polymerization, fiber spinning and commercial applications.

Discovering green, compatible processes

Team members discovered research on a green manufacturing process that produced sufficiently pure monomers from bio-feedstocks. They also found details of a polymerization process that could utilize the bio-based monomer and be performed with the firm’s existing in-house manufacturing facilities. This finding avoided having to invest \$200 million in a completely new production line.

Implementation of findings

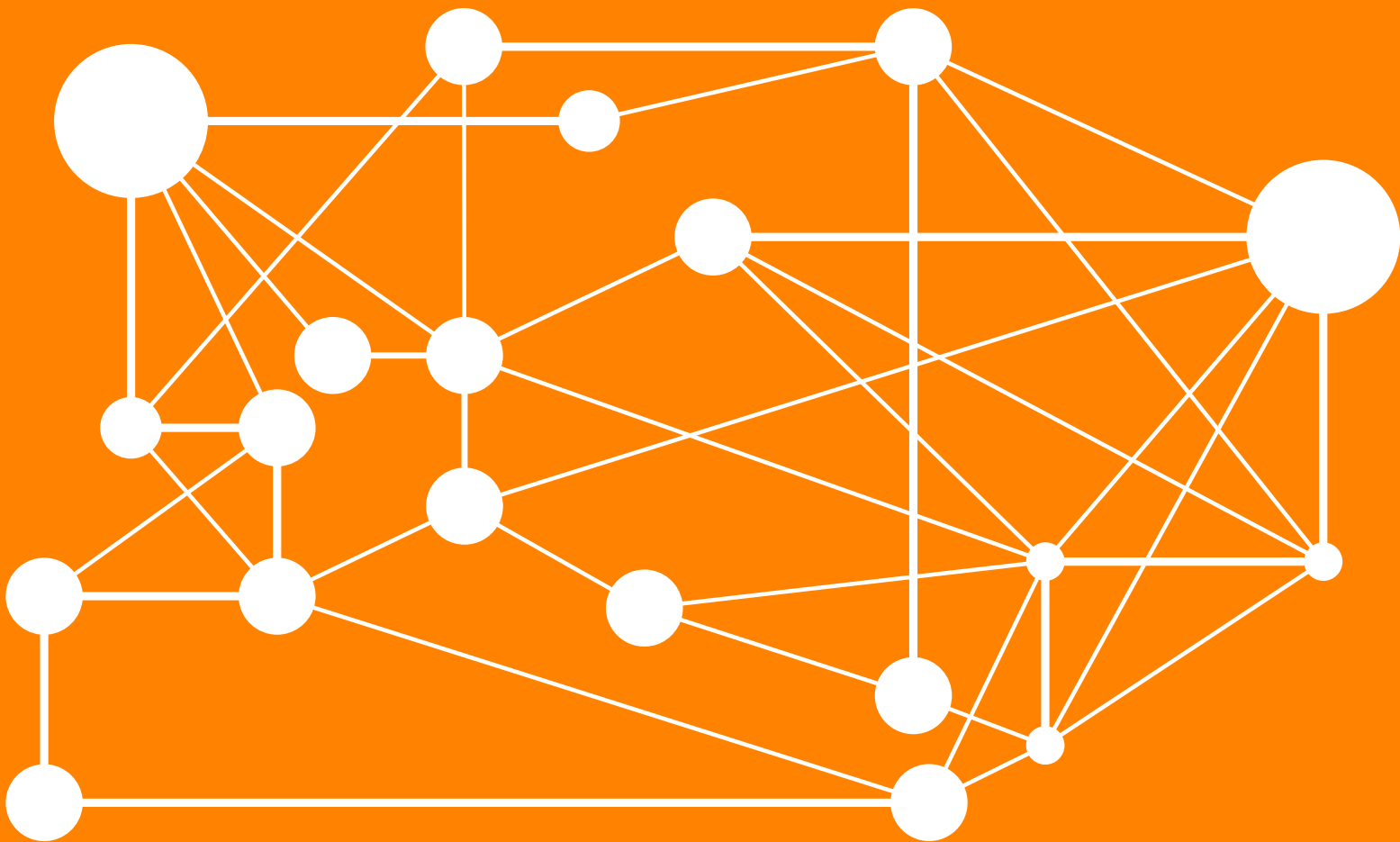
With the help of the monomer research they had discovered on ScienceDirect, Corlett and his team were able to optimize the biological processes in parallel with the development of their polymerization process to proceed much more rapidly than they would have otherwise.

Impact

ScienceDirect saved years of time in the R&D process and \$200 million in scale-up

In addition to the \$200 million they saved by repurposing their existing manufacturing facilities, Corlett and his team also shaved years off their R&D pipeline by developing new monomer purification and polymerization processes in parallel. This has enabled them to achieve a fast entry in this ultra-competitive green products market and create a product line that is generating more than half a billion dollars of revenue per year for their company.

“Taking a green product and marketing it is extremely challenging, because customers’ expectations are extremely high,” Corlett says. “But ScienceDirect gave us the breadth and depth of information we needed to develop a green manufacturing process quickly and cost effectively.”



ScienceDirect

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