

Mixing with the majors

The award for Best Innovation by an SME goes to NiTech Solutions for its approach to commercializing its advanced mixing reactors at Genzyme

JOHN BAKER LONDON

Changing the way large pharmaceutical, chemical and food companies approach manufacturing poses a significant challenge. Companies like these do not make process changes readily, especially when high-value products are involved.

But NiTech Solutions, based in East Kilbride, Scotland, UK, believes it can stimulate change with its patented baffled reactor technology. This platform technology offers improved mixing, particularly of multiphase systems, and enables producers to move from batch to continuous processing, saving energy, material and capital costs, while producing more consistent product quality.

The technology start-up, founded by Professor Xiong-Wei Ni and spun-out of Heriot-Watt University in Edinburgh in 2003, has just scored a major success with Genzyme, one of the world's leading biotechnology companies. At its Haverhill site in the UK, the company has installed what is regarded as the world's largest patent-protected plant for continuous manufacture of an active pharmaceutical ingredient (API), using NiTech's Tubular Baffled Reactor.

NiTech's managing director, Ian Laird, says working with a company such as Genzyme "demonstrates that our technology can make

significant impacts on even the most forward-thinking of companies. I believe that projects like this demonstrate what can be achieved when companies embrace innovation in chemical manufacturing processes."

Other companies are also interested in the baffled reactor technology. NiTech is in development work with major players in the food and pharma sector, developing the technology for continuous mixing, reaction and crystallization processes. "We started off in the early years targeting the transesterification processes used in biofuels production," notes Laird. "But recently we have been focused on crystallization, which is attracting growing interest." NiTech is now working with the likes of pharma company AstraZeneca and specialty chemical manufacturer Croda International, both of the UK, and Japan's FujiFilm to improve their manufacturing processes.

GENZYME COLLABORATION

But how does a small start-up company get itself noticed by the majors? Laird explains that the Genzyme project, which took 18 months of collaborative work, came about after Genzyme spoke of its challenges with a three-phase reaction at a conference NiTech was also attending.

The company was considering using two 150m³ pressurized stirred tank reactors to make the required API in volumes of hundreds of tonnes/year. But as a result of the partnership, it has installed a NiTech reactor that is less than 3m high and has a much smaller footprint. The reactor volume is less than 1m³ for the same output and this provides one of the best industrial examples of "process intensification."

The reactor creates uniform mixing throughout the solid/gas/liquid system and offers predictable scale-up and plug flow conditions. Initial work saw NiTech testing the chemistry in one of its batch Oscillating Baffled Reactors. Then the process was moved to a continuous pilot plant for proof of concept and optimization, which saw the reaction speeded up by a factor of 30.

Laird believes there is an increasing shift toward considering continuous processes rather than batch, as companies seek to improve operational effectiveness through lower capital and operating costs and tighter control on final product quality.

Work with AstraZeneca, for example, using NiTech's Continuous Oscillating Baffled Reactor, has shown that for one process, newbuild costs could be 20% lower, operating costs £300,000 (\$467,000, €358,000) less per year, and the process could take minutes rather than hours.



"Our technology can make significant impacts on even the most forward-thinking of companies"

IAN LAIRD

Managing director, NiTech Solutions

Although emerging reactor technologies have been around for many years, says Laird, it is only recently that they have moved from being focused on new science to address the manufacturing needs of industry, largely as a result of the work of the likes of NiTech.

VITAL SUPPORT

"Companies like GSK, Pfizer and AstraZeneca appreciate that there is a huge amount of work to be done to make the transition from batch to continuous processing. Their support for continuous crystallization highlights the needs of end-users and has encouraged Scottish Universities to recruit nine postdoctoral scientists to increase the understanding of the base technology and make it more robust."

NiTech has also engaged in a variety of collaborative development activity with support through the UK's Technology Strategy Board and through EU programs such as FP7. In addition to working with technology institutes in countries such as Denmark, France and Singapore, NiTech is supporting Strathclyde University, also in Scotland, in the creation of a world-class Centre of Excellence in Continuous Manufacturing and Crystallisation.

Laird hopes to build on the success of the Genzyme project. "There is a lot of awareness growing in this area and Genzyme are real leaders, having got something up and running that some thought was a step too far. But it can be done and Genzyme are showing real leadership by breaking the mental barrier." ■



NiTech's reactors have a small footprint



For more information on NiTech Solutions go to nitecholutions.co.uk