NiTech® Technology Industrial Reaction Examples

*These slides summarise cases where NiTech® technology has been applied in industry for reactions.*
Content

Industrial Reaction Applications

• Gas/Liquid/Solid Reaction (Genzyme)

• Liquid-Liquid Reaction with Dynamic Separation Example
Gas/Liquid/Solid Reaction – (Genzyme)

Genzyme was designing the production of a new active ingredient and was interested in potential capital and operating savings offered by NiTech’s technology.

Stage Gate 1 = batch OBRs demonstrated the feasibility

Stage Gate 2 = continuous pilot unit with 25 L of working volume

NiTech Full-scale Reactor Installed (2007)

Safer, Greener, Faster and Cheaper
Gas/Liquid/Solid Reaction – (Genzyme)

- Reaction time 60 times lower so two 150 m³ STRs could be less than 3 m high and with reactor volume of less than 1 m³.
- The NiTech reactor offered uniform mixing throughout the system and predictable scale-up under plug flow conditions.
- The plant was running, with FDA approvals in place within two years.
- It now processes twice the rate originally assumed (eliminating the need for debottlenecking upgrades).
- Robust technology, with maintenance levels a fraction of those needed by pressure vessels.
- Continuous processing has eliminated auxiliary feed and collection vessels.
- Sophisticated process analytics enables good control of quality, not possible in conventional batch.
- All steps executed continuously with no intermediate testing, except control system data.
- Automation enables operation without supervision, in marked contrast to batch.

Safer, Greener, Faster and Cheaper
NiTech® identified an opportunity to intensify a long residence-time reaction:
- involves a reversible reaction between two reactants to produce two products
- products are separated in large gravity settling tanks

A COBR was set up which removed the by-product in-situ to enhance the forward reaction:
- 0.78 L/min through a 16 m long DN40
- The by-product was removed by gravity separation in un-baffled tube sections

The bespoke COBR removed up to 40% of the by-product during the reaction phase.

Reductions in footprint were achieved by:
- reducing the size of downstream gravity settling vessels; and
- increasing conversion, and so, reducing reactor volume for a set throughput.