

Challenge

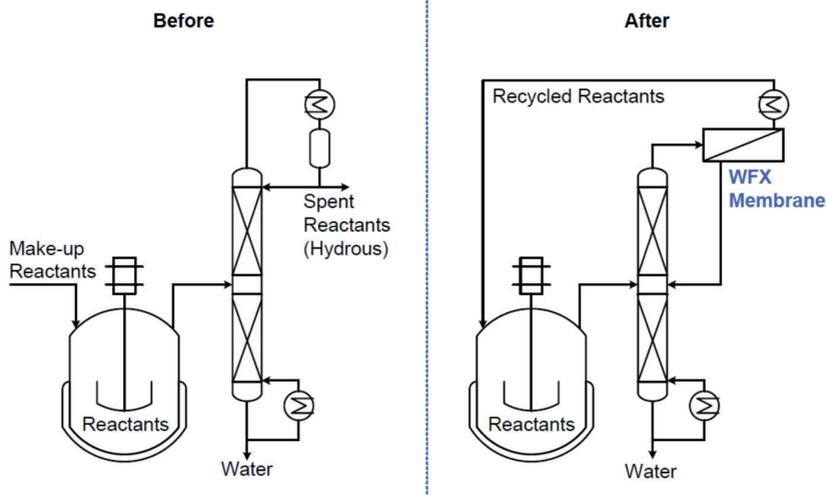
Many chemical reactions in industry are reversible in nature. Often, products with high purity can only be obtained by removing undesired by-products as they form during the reaction. In cases where water is the undesired by-product, in-situ dehydration is required in order to improve product yield.

Whitefox™ Solution

Whitefox vapour permeation technology can remove water in-situ from a reacting mixture. This raises the yield of the desired product to nearly 100% while simultaneously increasing the rate of reaction.

Our customers benefit from the following key features:

- Direct integration with reactors
- Azeotrope agnostic and chemically inert membrane-based design
- Tolerance to feed water concentrations of up to 50wt%
- Production of an ultra-dry retentate – achieving near full conversion
- Wide range of applications (including alcohols, ketones, ethers, esters)
- Improved overall financial return



Customer Benefits – Case Study

A pharmaceutical company in Europe approached Whitefox to understand the benefits of installing a membrane dehydration unit directly after their reactor in place of a standard distillation column. Our calculations showed that the Whitefox process would remove water more efficiently than distillation from the reacting mixture, leading to faster conversion rates and to increased production capacity. The impact of Whitefox technology on the process is demonstrated in the table below.

Parameter	Reactor and Distillation Column	Reactor and Whitefox solution
Conversion Time	24 hours	10 hours
Production Capacity	600 tonne/yr	1,440 tonne/yr
Annual Revenue Increase	--	3,000,000 US\$/yr

Case study assumptions:

Reactor volume: 8m³; Total batch time: 48 hours; Number of operating days/year: 150; Product price: 3.50 US\$/kg.

By completely dehydrating the reactor contents, reaction rates were improved and conversion times were reduced by more than half. This led to a doubling of plant capacity and a potential revenue increase of US\$ 3 million per year.



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