Using the Britest tools to troubleshoot reaction issues at Infineum

This is what we were getting.

The Challenge

Raw material specifications and process conditions for one of our free-radical polymerizations did not consistently ensure the product would perform as expected.

The goal of the study was to gain a fundamental understanding of the influence of raw material composition and process conditions on the properties of the polymer.

This is what we wanted

Approach

An interdisciplinary team was assembled, including plant engineers, engineers specializing in the process, lab technicians responsible for the lab work, and chemists. The team also contained people not familiar with the process or chemistry to act as “cold eyes”.

The following Britest tools were applied:

PDD

Described the process at our manufacturing locations and labs.

Also used to try and determine how suppliers were producing the monomers for the process.

Transformation Map

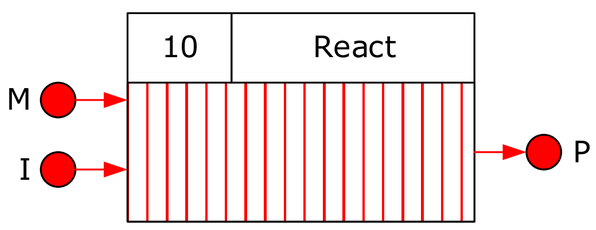
Helped visualize the chemistry and mass transfer that occurs in the reaction.

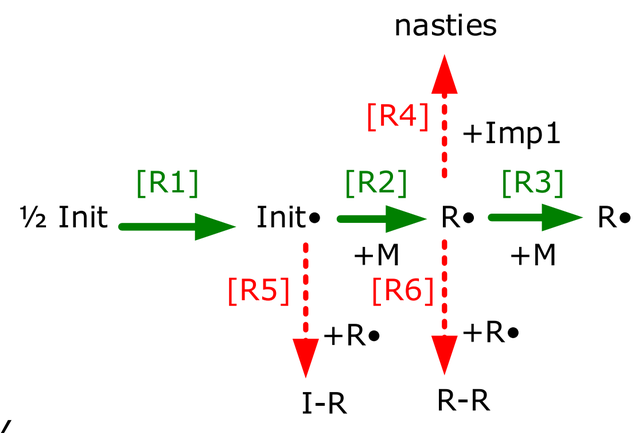
Showed that impurities, usually ignored, become very important in the polymerization process.

DFA

Reemphasized the importance of impurities in the polymerization process.

Highlighted alternate strategies for running the reaction.





	[R1]	[R2]	[R3]	[R4]	[R5]	[R6]
Init	+					
Init•	P	+			+	
M		+	+			
R•			+/P	+	+	
R-R						
I-R						
Imp1				+		
nasties				P		
T	++	+	+	+	+	+
ΔH	endo	exo	exo	exo	exo	exo
rate	mins	fast	fast	fast	fast	fast

Note: diagrams of Britest tools are illustrative only

Outcome

The raw materials coming into the process, and not the process itself, were the issue. Furthermore, species in the raw materials that were considered inert were in fact the cause of the problems.

Benefits

With this new knowledge, new specifications were agreed with our raw material suppliers to provide us with monomers fit for purpose. Savings of **~$350k/year** resulted. The work also gave the understanding to develop new components faster, accelerating future development programs.

Performance you can rely on.

Infineum