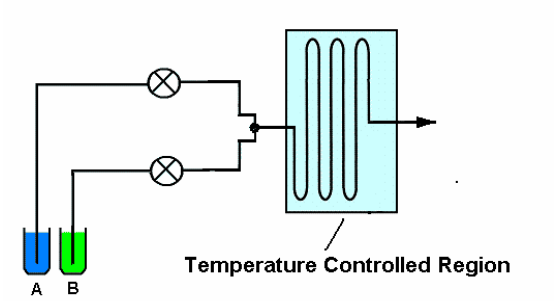
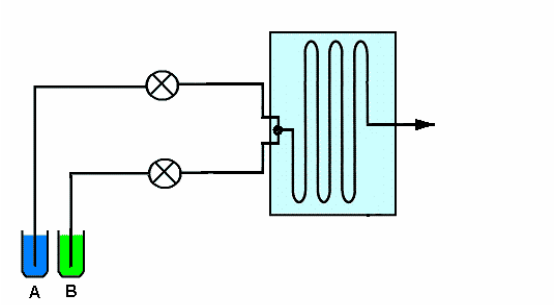
Tube Reactor with Integral Heated Mixing

Background

Until recently, the standard arrangement for controlling temperature in a flow reactor has been as shown (right). Reagents are mixed then fed into a reactor for a controlled residence time at a controlled temperature.

For many heated reactions this affords sufficient control over reaction conditions.



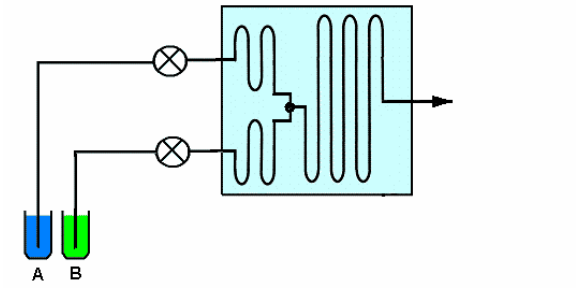


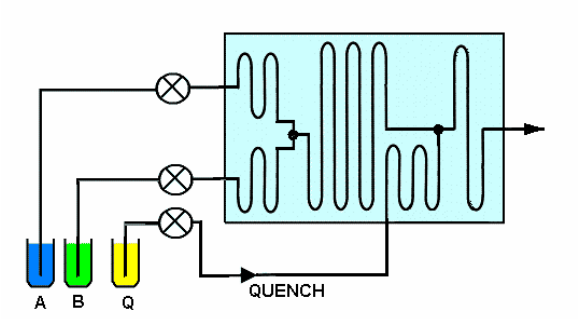
However, with exothermic reactions (especially when cooled) it is not sufficient to mix the reagents ***then*** enter the cooled area, because reagents mixed at ambient temperature will have already started reacting.

Furthermore, it is also necessary also to prevent the mixer itself from rising in temperature if the reaction is exothermic.

So it is necessary in this case to also cool the mixer. (see left).

However, cooling the mixer alone is not enough, because the reagents will enter the mixer at ambient conditions and will start reacting before they get a chance to cool to the target conditions. What is required, therefore, is pre-cooling of reagents before mixing.





Finally, with a cooled reaction, it is usually important to quench the reaction at the end of the intended residence time, because otherwise time spent by reagents outside the reactor at ambient conditions will result in significant further reaction, making determination of optimal residence time impossible.

For this reason the Vapourtec cooled reactor has all these features. Pre-cooled reagents, cooled mixer, pre-cooled quench, and a cooled quench mixing time before the reagent exits the reactor.

Does a *heated* reactor require the same precautions ?

Contd. ➔

The Problem

In some cases a heated reaction will only proceed at the raised target temperature. In fact reagents can sometimes be pre-mixed and fed with a single pump.

However, there are instances where this is not the case.

In a recent example, there were two competing reactions:

- The “desirable” reaction happened only at the raised target temperature
- The “undesireable” reaction would happen at ambient temperature

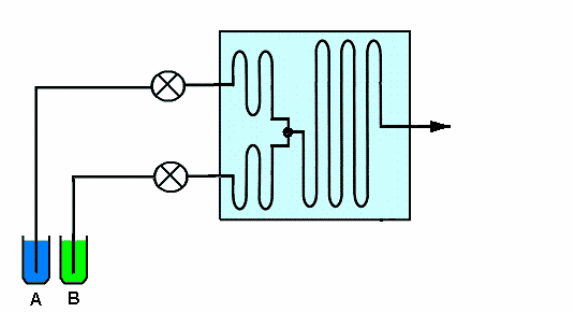
So if the reagents were mixed at ambient conditions ***then*** fed into the controlled temperature reactor, the undesirable reaction had already consumed some of the reagents and generated unwanted products.

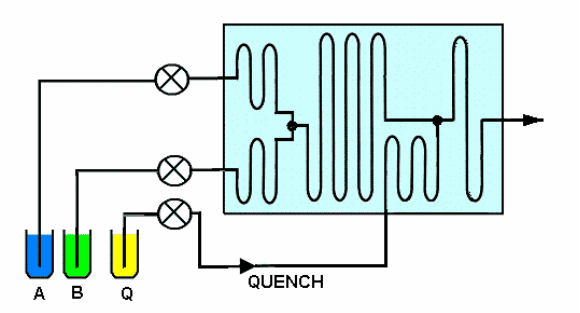
The Solution

By using a reactor with pre-heated reagents and a heated mixer, the situation described above could be handled.

The intended reaction could be favoured from the moment mixing started.

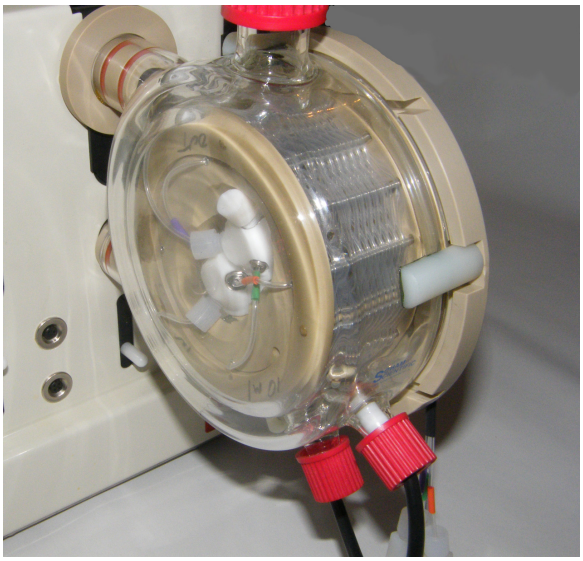
The Vapourtec heated mixer reactor is now available to all Vapourtec users. Just like the Vapourtec cooled reactor, it features a zone where the reagents equilibrate to the target temperature and then a temperature controlled mixer.





There is even an (optional) facility to quench the reaction or possibly dilute the reaction mixture to prevent precipitation before it exits the temperature controlled (heated) zone.

FAQ



Q **Is this compatible with my existing R4 reactor heater module ?**
A The heated mixer reactor & manifold is compatible with every R4, from the very first one ever built

Q **Do I simply buy a new reactor coil ?**
A No, the manifold itself is different so you need to buy a new manifold **and** reactor.

Q **Is this compatible with my existing FlowCommander™ software ?**
A Yes.

Q **What temperature range is this available for**
A Ambient to 150°C

Q **Is there a high temperature version (up to 250 °C)**
A Not yet

Q **What reactor volumes are available**
A 2,5,10ml.

Q **When is this item available ?**
A 1st February 2011

Q **How much does it cost ?**
A Please Contact Vapourtec.