



## AMT TN-11

### Residence Time Distribution in the Coflore<sup>®</sup> ACR

#### Overview

This technical note looks at the residence time distribution (RTD) in the Coflore ACR continuous flow reactor. The ACR reactor (Figure 1) has a 100 mL internal volume and houses ten free-moving agitators (one per cell). By separating the flow channel into a series of discrete cells with independent dynamic mixers, the ACR offers orderly flow, low pressure drop and good mixing over a much wider range of operating conditions than PFRs or static mixers. It can also handle materials that would block a micro reactor, such as heterogenous catalyst slurries.

#### RTD Test Procedure

For the ACR, RTDs have been experimentally determined at a fixed residence time of 30 minutes and using 50% volume agitators (V50), with a bottom up flow direction, whilst varying agitation frequency. The "CSTRs in series" model was applied to the distribution curves to assess the number of theoretical stages.

The RTD curves were found through the cumulative distribution, experimentally, a step change in process media from water to a low concentration sodium chloride solution, data was recorded for at least 3 residence times using a conductivity sensor.



Figure 1: The Coflore ACR Continuous Flow Reactor.

Run #	Agitation Frequency (Hz)	Number of CSTRs in Series
1	2	15
2	4	16
3	6	10
4	8	14

Table 1: Summary of Results of the ACR RTD Testing.

#### Results

The result of this testing is summarised in Table 1. Overall, the 50% volume agitators (V50) show good performance. In the table, it can be seen that the ACR has at least 10 distinct reaction stages, with agitation frequency having a noticeable impact.