

CDP2-K

Inspector Sgt. Nigel Ambercromby of Scotland Yard. Worthless Chemical has been making tirene (A) from bulatane (B) (both dark liquids) using a 8.0 ft³ CSTR followed by a 3.1 ft³ PFR. A conversion for an entering flow rate 1 ft³/min a conversion of 81% is achieved using this arrangement. The rate is shown as a function of conversion in Figure CDP2-K, and the shape of which is a highly unusual functionality never seen before in real practice, and which we're unlikely to see again (proprietary with Worthless Chemical).

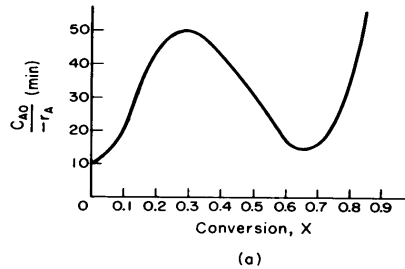


Figure CDP2-K Levenspiel plot for bacteria growth.

The CSTR is identical to one of the battery of CSTRs shown in Figure CDP2-K, except the feed and exit streams are at the top.

There is a preheater upstream of the CSTR that heats the feed to 60°C. One morning the plant manager, Dr. Pakbed, arrived and found that the conversion had dropped to approximately 24%. After inspecting the reactors, the PFR was found to be working perfectly, but a dent was found in the CSTR that may have been caused by something like a fork lift truck. He also notes the CSTR, which normally makes a “woosh” sound, is not as noisy as it was yesterday. The manager suspects foul play and calls in Sgt. Nigel Ambercromby from Scotland Yard. What are the first four questions Sgt. Ambercromby asks? Make a list of all the things that could cause the drop in conversion. Quantify the possible explanations with numerical calculations where possible. Dr. Pakbed tells Sgt. Ambercromby that he must achieve a conversion greater than 50% to meet production schedules downstream. Sgt. Ambercromby says, “I think I know how you could do this immediately.” What does Ambercromby have in mind? [with Dan Dixon, ChE 344 W’97]