



Figure 16. Maximal particle size to avoid intraparticle temperature excursion and residence time required to combust a catalyst with 1% coke (with 1% oxygen breakthrough).(7)

The fluid-bed catalytic cracking process was originally designed to circumvent the Houdry patents. The use of fine powder was based apparently on a serendipitous discovery by R. K. Stratford in 1934. In 1938, Standard Oil Company of New Jersey (now Exxon), formed a consortium of eight companies: Kellogg, Indiana Standard, Anglo-Iranian, UOP, Texaco, Royal Dutch Shell, and I. G. Farben (which was dropped in 1940) in addition to Jersey, called Catalytic Research Associates, or CRA. CRA's purpose was to develop a catalytic cracking process which would operate outside Houdry's patents.

In 1934, R. K. Stratford of Jersey's Canadian affiliate (Imperial Oil) discovered that fine clay discarded from lube oil treating had catalytic effects in thermal cracking. Four thermal crackers were eventually revamped to "Suspensoid Cracking" by adding 2-10 pounds of powder per barrel of feed. The catalyst was used in a once-through mode, while Jersey decided not to follow this route, development in 1938 switched to a continuous 0.5 BPD pilot plant in which oil vapor conveyed powdered catalysts. Results from the cyclic fixed-bed 100 BPD pilot plant in Baton Rouge showed that best yields were obtained in the early moments of cracking--underscoring the incentive to develop a continuous cracking process. It was felt that conveying a fine powder would be easier than conveying pellets.

By mid-1940, Jersey had demonstrated a powdered catalyst process in the 100 BPD pilot unit using pipe coil reactors and a mechanical pump for circulating the catalyst. Later, the pipe coil reactor and regenerator were replaced with upflow beds and the pumps were replaced with standpipes of aerated catalyst and slide valves. A stable, smooth operation was achieved in August 1940, just 19 months before start-up of the commercial unit based on these same concepts and design. The first commercial FC

