Abstract: In the regenerator of an industrial fluid catalytic cracker (FCC), uniform distribution of its solids reactant, i.e. spent catalyst, plays a crucial role in obtaining better regenerator performance. In traditional FCC unit designs, there was usually no spent catalyst distributor or some intuitive designs with simple structures, i.e. boat or pipe distributors in most China’s FCC units (1). In this study, we built a large cold experimental installation to evaluate the performances of various spent catalyst distributors. Distribution uniformity and solids flow resistance were the main target indices for distributor performance evaluation. The experimental results indicate that the boat distributor has the poorest performance, as solids flows preferentially through the few front openings. At high gas flowrates, the pipe distributor can obtain a relative uniform solids distribution, but its flow resistance is also higher. Good flowability of solids that is difficult to maintain throughout the distributor was found to be the root cause of their bad distribution performance. Referring to the idea of an air-slide solids transportation system (2-4), a new slot spent catalyst distributor was proposed. Its performance was systematically evaluated in a large cold model unit. It was found that the new slot distributor has a critical superficial gas velocity, beyond which good solids distribution uniformity and high solids transportation capacity can be both maintained. Compared with traditional boat and pipe spent catalyst distributors, the new slot distributor is much more advantageous comprehensively, e.g. in solids distribution uniformity, solids transportation capacity and operating flexibility.

Key Words: spent catalyst distributor; FCC; experimental; distribution

References:

Fig. 1 Schematic of the mechanism of the tested model of the new slot catalyst distributor

Fig. 2 Comparison of heterogeneity indices of the three spent catalyst distributors