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On the performance of static mixers

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The performance of various static mixers, like the Multiflux mixer, the Kenics mixer, the Ross Low-Pressure Drop (LPD) and Low-Low-Pressure Drop (LLPD) mixer, the standard Sulzer SMX mixer, and the recently developed new designs of the SMX, known as SMX(n), and variations thereof, the SMXn, and a new splitting serpentine channel known as the Dentincx mixer, is compared using as criteria (i) energy consumption, measured in terms of the dimensionless pressure drop, (ii) compactness, measured as the dimensionless length, and (iii) quality of the resulting uniformity in striation thicknesses, as a measure for perfectness the way the baker's transformation is performed. All analyses are based on applying the Mapping Method as the most powerful tool present today to analyze distributive mixing and to optimize mixing protocols and mixer designs. As a quantitative mixing measure the cross section averaged, flux-weighted, discrete, intensity of segregation is used, as is follows directly from the Mapping results. Mixers with simple geometries give the lowest pressure drop, at the cost of long lengths with as the winner the Kenics mixer. Most compact are the new designs of the Sulzer geometries, the SMX(n) and the SMXn. The Multiflux performs best in mimicking the optimal baker's transformation but the much more easy to fabricate Dentincx mixer comes close.