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Section Information

The Control and Monitoring section of Processes welcomes high-quality manuscripts concerning control and monitoring methodologies, including related topics such as simulation, modeling, identification, and optimization, for solving problems related to process systems engineering. This section encourages submissions focusing on novel methodologies and their analysis, including applications using novel and existing methodologies.

All submissions in this section should relate directly to process systems engineering within the aims and scope of the journal Processes (chemistry, biology, materials, and allied engineering fields). Contributions that are purely computational in nature without a clear relationship to the aims and scope of this section will not be accepted. To facilitate the rapid, open exchange of knowledge, all authors are strongly encouraged (but not required) to submit any associated source code, models, simulations, software, and data either as supplementary material and/or to an open-access repository such as LAPSE (the Living Archive for Process Systems Engineering).

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Featured Papers

DOI:10.3390/pr10020275

Gas Dispersion in Non-Newtonian Fluids with Mechanically Agitated Systems: A Review

Authors: Paloma Lins Barros, Farhad Ein-Mozaffari and Ali Lohi

Abstract: Gas dispersion in non-Newtonian fluids is encountered in a broad range of chemical, biochemical, and food industries. Mechanically agitated vessels are commonly employed in these processes because they promote high degree of contact between the phases. However, mixing non-Newtonian fluids is a challenging task that requires comprehensive knowledge of the mixing flow to accurately design stirred vessels. Therefore, this review presents the developments accomplished by researchers in this field. The present work describes mixing and mass transfer variables, namely volumetric mass transfer coefficient, power consumption, gas holdup, bubble diameter, and cavern size. It presents empirical correlations for the mixing variables and discusses the effects of operating and design parameters on the mixing and mass transfer process. Furthermore, this paper demonstrates the advantages of employing computational fluid dynamics tools to shed light on the hydrodynamics of this complex flow. The literature review shows that knowledge gaps remain for gas dispersion in yield stress fluids and non-Newtonian fluids with viscoelastic effects. In addition, comprehensive studies accounting for the scale-up of these mixing processes still need to be accomplished. Hence, further investigation of the flow patterns under different process and design conditions are valuable to have an appropriate insight into this complex system.

DOI:10.3390/pr10051004

Numerical Study of the Effect of the Reynolds Number and the Turbulence Intensity on the Performance of the NACA 0018 Airfoil at the Low Reynolds Number Regime

Authors: Jan Michna and Krzysztof Rogowski

Abstract: In recent years, there has been an increased interest in the old NACA four-digit series when designing wind turbines or small aircraft. One of the airfoils frequently used for this purpose is the NACA 0018 profile. However, since 1933, for over 70 years, almost no new experimental studies of this profile have been carried out to investigate its performance in the regime of small and medium Reynolds numbers as well as for various turbulence parameters. This paper discusses the effect of the Reynolds number and the turbulence intensity on the lift and drag coefficients of the NACA 0018 airfoil under the low Reynolds number regime. The research was carried out for the range of Reynolds numbers from 50,000 to 200,000 and for the range of turbulence intensity on the airfoil from 0.01% to 0.5%. Moreover, the tests were carried out for the range of angles of attack from 0 to 10 degrees. The uncalibrated γ–Re_θ transition turbulence model was used for the analysis. Our research has shown that airfoil performance is largely dependent on the Reynolds number and less on the turbulence intensity. For this range of Reynolds numbers, the characteristic of the lift coefficient is not linear and cannot be analyzed using a single aerodynamic derivative as for large Reynolds numbers. The largest differences in both aerodynamic coefficients are observed for the Reynolds number of 50,000.

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