STUDIES ON POWER CONSUMPTION IN A STIRRED TANK FOR SOLID-LIQUID SYSTEMS USING TWISTED BLADE HYDROFOIL IMPELLER AND TEMPERATURE RISE AND ELECTRICAL POWER INPUT TECHNIQUES

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Abstract

The technique of measurement of power input by using the temperature rise method first reported by of Panja and Rao (1) for a 16 cm dia. Standard tank and later extended to a 50 cm dia. Tank by Phaneswara Rao et al (2) for liquid phase systems has been extended to solid liquid systems in the present work. Also, the electrical power input measurement technique first introduced by Phaneswar Rao et al (2) has also been further investigated for solid liquid systems in the present work. Power input for solid liquid suspensions in a 50 cm diameter standard tank for various loadings of 2mm dia. solid particles taken in water was measured by measuring the electrical power drawn by hydrofoils of different designs and inclined blade turbine Power input was found by finding the electrical power drawn by the impeller under load and no load conditions so as to correct the power drawn by the impeller to overcome friction at the bearings and other power losses within the motor. In addition power input was measured by using the temperature rise method of Panja and Rao ( ) for different solid loadings and the results so obtained compared were also found to be in close agreement with the power input found by using the electrical power input method. Panja and Rao ( ) showed that the power input data for standard six flat blade hub mounted turbine obtained by using the temperature rise method gave results which were in close agreement with the power input data reported in the literature obtained by using torque and speed measurement. The twisted hydrofoil impellers were found to draw less power than untwisted hydrofoil impellers for different solid loadings.

References:

1. Panja, N.C. and D. Phaneswara Rao, "Power input measurement from temperature rise data in mechanically agitated contactors", Trans. Inst. Chem.Engrs(London), 71, Part A, 24 (Jan. 1993).
2. Phaneswara Rao , D., Chander Sekhar Mahey and Nitesh Singh, “Studies on power consumption from temperature rise data in a stirred tank” , paper presented at the AIChE annual meeting held at Philadelphia (2008)

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I wish to be considered for an oral presentation. I anticipate submitting a full paper to the special issue of the Canadian Journal of chemical engineering.