ISSN (ONLINE) : 2395-695X
ISSN (PRINT) : 2395-695X
Available online at www.ijarbest.com

International Journal of Advanced Research in Biology, Engineering, Science and Technology (IJARBEST)
Vol. 2, Special Issue 8, February 2016 in association with
KAMARAJ COLLEGE OF ENGINEERING AND TECHNOLOGY, VIRUDHUNAGAR
DEPARTMENT OF BIOTECHNOLOGY
ORGANIZES
DBT, NEW DELHI SPONSORED NATIONAL LEVEL CONFERENCE ON CONTEMPORARY TRENDS IN BIOENERGY AND GREEN TECHNOLOGY: CHALLENGES AND OPPORTUNITIES [ORA-2016]
(25-26TH FEBRUARY 2016)

PERFORMANCE OF NOVEL AIR-INDUCING MECHANICALLY AGITATED CONTACTOR FOR SUSPENSION OF SOLID PARTICLES

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Abstract

The objective of the present study is to develop and analyze the performance of novel air inducing reactor for the suspension of solid particles in a liquid. A new method for gas-inducing mechanism was demonstrated with a simple retrofitting type of modification in a conventional mechanically agitated contactor. The hollow shaft and the hollow impeller in conventionalair inducing systems were replaced with a newly developedair-inducing tube-bundle, attached to a solid impeller shaft.The particle suspension characteristics of the air-inducing impeller system was studiedfor the suspension ofsilica particles of 165, 275 and 500 µm average sizes,with 1, 2 and 4 % (by weight) of solid loading, in water.The performance of the developed novel air-inducing reactor for the suspension of solid particles in liquid was analyzed by measuring the effects of particle size and solid loading on critical speed for solid suspension, gas holdup and power consumption. The critical speed for solid suspension was found to increase with increase in size of the solid particles and increase in weight percentage of solid loading. The gas holdup decreased with increase in size of the solid particle and decreased with increase in solid loading. The power consumption per unit volume of the gas free working fluid increased with increase in size of the solid particles and increased with increase in weight percentage of the solid particles loaded. Increase in rotation speed of the impeller increased the gas hold up for all the three sizes of solid particles and all the three levels of solid loadings considered for the present investigation. The results showed that the solid particles could be kept in suspension in liquid using the momentum of the rising bubbles formed by the induced air. It is expected that the present method of air-induction could be applied to systems with particles of different sizes and densities and liquids with different densities.

Keywords: *air-inducing reactor; gas holdup; solid suspension; critical speed.*