Gas-liquid mass transfer performance of dual impeller system employing rushtons, concave-bladed disc (CD-6) turbines and their combination in stirred tank bioreactor

ABSTRACT

The degree of oxygenation in stirred tank bioreactor is normally described and characterized by the volumetric gas-liquid mass transfer coefficient (kLa). Throughout this study, the gas liquid mass transfer performance of dual impeller stirring system employing either two Rushton turbines (RT), two Concave-bladed disc (CD-6) turbines or the combination of both was comparatively investigated in Newtonian and non-Newtonian fluid systems. Static gassing-out technique was applied in all experimental kLa determinations and subsequent modeling of mass transfer correlations for all configurations were developed by incorporating the effects of power number (N3D2) and superficial velocity (Vg) on kLa. Ultimately, the use of dual CD-6 stirrers on a mixing shaft improved the oxygen transfer rate (OTR) by about 5-50 % and 18-65 % higher than the conventional RT-RT system in Newtonian and non-Newtonian systems, respectively.

**Keyword:** Concavebladed disc turbine; Correlation modeling; Oxygen transfer; Rushton turbine; Volumetric gas-liquid mass transfer coefficient