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## Effect of Scale-up on Heat Transfer Characteristics of Cyclone Separators of Circulating Fluidized Beds

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### Abstract

*Present study has been completed on heat transfer behavior in the cyclone separators of different cross sections of three different cold circulating fluidized beds (CFBs). Steady state experiments were carried out by providing heat in the riser of a CFB and consequently examining bed-to-wall heat transfer in the cyclone separator. To study the effect of scale-up (increase in barrel diameter of cyclones) on heat transfer characteristics, experiments were conducted under similar operating conditions on three CFB setups. Cyclone design ratios i.e ratios of various dimensions of cyclone with respect to cyclone barrel diameter were maintained same for all cyclone separators belonging to three different CFB setups. Experiments were conducted twice on each CFB setup for same value of five non-dimensional air velocities at two different weights of sand inventory per unit area of the distributor plate( i.e.  $P = 1750 \text{ N/m}^2$  and  $3050 \text{ N/m}^2$ ). Effect of parameters such as superficial velocity of air and sand inventory ( $P$ ) on heat transfer characteristics was investigated for individual cyclone. Local heat transfer coefficient along the height of cylindrical portion of cyclone separators were evaluated and compared. Also, bed temperature across the barrel diameter of all cyclone separators were measured and compared. Empirical correlation was developed. Prediction of this correlation was in agreement ( $\pm 14.31\%$ ) with experimental data.*

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