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Experimental Study of the Mixing Field Induced By A Rotating Flat Plate in a Cylinder[1] DOUGLAS BOHL, Clarkson University — In this work a flat rectangular plate is rotated along its long axis and parallel to the z-axis of a circular cylinder. The blade position is varied with respect to the cylinder wall to allow investigation of the effect of the no slip boundary on the flow structure and mixing field. The cylinder is filled with four Newtonian fluids with different viscosities that allow a Reynolds number range of 0.005 – 7800 to be investigated. Particle Image Velocimetry is used to measure the velocity in the plane perpendicular to the rotation of the plate (i.e. in the r-theta plane of the cylinder). The velocity field is post processed to provide the vorticity and local stretch rates (which can be correlated with the mixing efficiency). Results show that a vortex is formed at the tip of the mixing blade. The magnitude of this vorticity increases as the gap between the blade and the wall is decreased. The peak local stretch rate increases exponentially as the gap between the blade and the wall is decreased. The results also indicate that the peak local stretch rate is a linear function of the log of the Reynolds number.

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