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Swirling flow in model of large two-stroke diesel engine K.E. MEYER, K.M. INGVORSEN, Department of Mechanical Engineering, Technical University of Denmark, Building 403, DK-2800 Kgs. Lyngby, Denmark, S. MAYER, MAN Diesel & Turbo, Teglholmsgade 41, DK-2450 Copenhagen SV, Denmark, J.H. WALTHER[1], Department of Mechanical Engineering, Technical University of Denmark, Building 403, DK-2800 Kgs. Lyngby, Denmark — In large two-stroke uniflow scavenged marine diesel engines fresh air is blown in through angled ports in the bottom of the cylinder liner forcing the burned gas out through an exhaust valve in the cylinder head. The scavenging flow is a transient (opening/closing ports) confined port-generated turbulent swirling flow, with complex phenomena such as central recirculation zones, vortex breakdown and vortex precession. A scale model of a simplified cylinder is created with a transparent cylinder five diameters long. The flow in the experiment has a Reynolds number of 50,000 based on the cylinder diameter and bulk velocity. Stereoscopic Particle Image Velocimetry (PIV) is used to investigate the flow for cases with both static and moving piston. Port angles of 0, 10, 20 and 30 degrees are considered. Although the flow has a relatively low swirl number of around 0.4, a central recirculation zone is observed indicating a vortex breakdown. The steady flow is analyzed with proper orthogonal decomposition revealing systematic variations in the shape and location of the vortex core. Transient measurements using phase-locked PIV are carried out with moving piston. The transient measurements reveal a sudden rapid change in flow topology as a central recirculation zone is formed.

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