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Stereo PIV를 이용한 SI 기관의 3차원 텀블 유동 측정1-방법 및 보정

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3D Tumble Flow Measurement of SI Engine Using Stereo PIV1-Method and Calibration

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Key words : Stereo PIV(스테레오 레이저 입자영상 유속계), Tumble(텀블), Angular Displacement (각도 변위), Internal Combustion Engine(내연기관)

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Combustion in reciprocating engines is greatly influenced by fuel or mixture distribution and internal flow. At this time, the best distribution and flow characteristics cannot be absolutely determined, so it is important to implement the distribution and flow characteristics through design in accordance with the performance characteristics of the target engine. In the case of SI engines, the relationship between tumble flow and combustion has been studied a lot, and how to implement this flow characteristic has become the key to design. Usually, ISM, which can be implemented simply, is used, but there is a problem in identifying specific flow characteristics with this method. Therefore, in this study, the tumble flow is evaluated based on the three-dimensional flow measurement. The 3D flow measurement used the angular displacement method among several techniques of Stereo PIV. At the same time, the 3D result and the already verified 2D result were compared to verify the measured value. As a result of the verification, the axial speed measured in 3D is generally lower than that in 2D, which is judged to be unmeasured because particles pass in a shorter time than the laser pulse interval when the flow is high. In addition, in the case of 3D, the area near the wall where flow measurement is impossible is larger than that of 2D. This is an unavoidable phenomenon because the optical approach in 3D is not orthogonal to the laser beam. Despite these limitations, it provides sufficient qualitative information on flow properties and distribution.

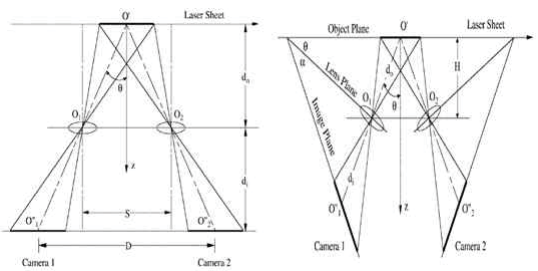

Fig.1 Translation and angular displacement method

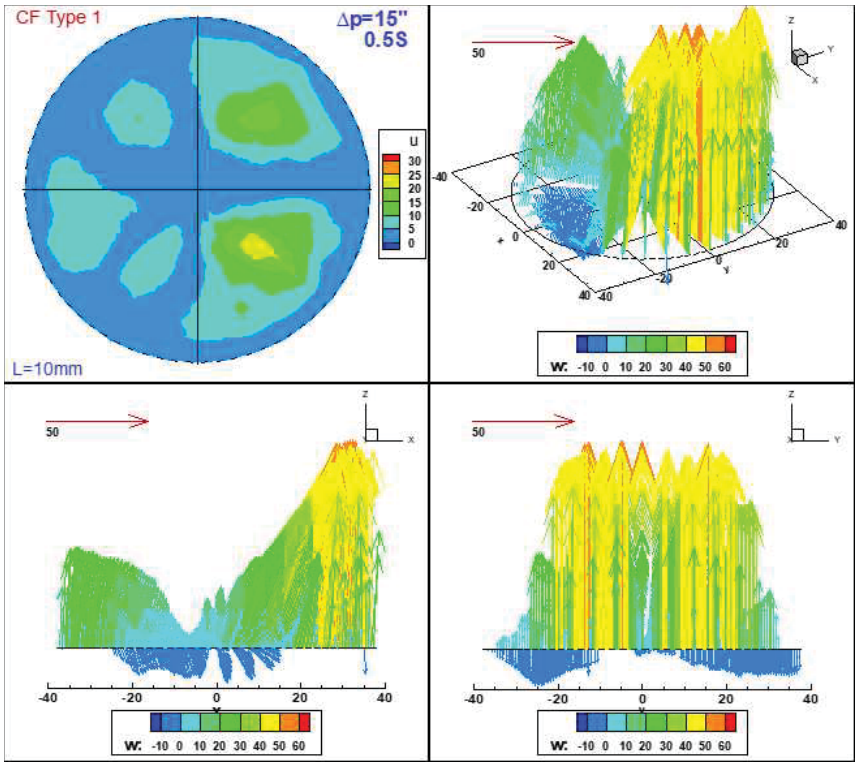

Fig. 2 2D Measurement Result

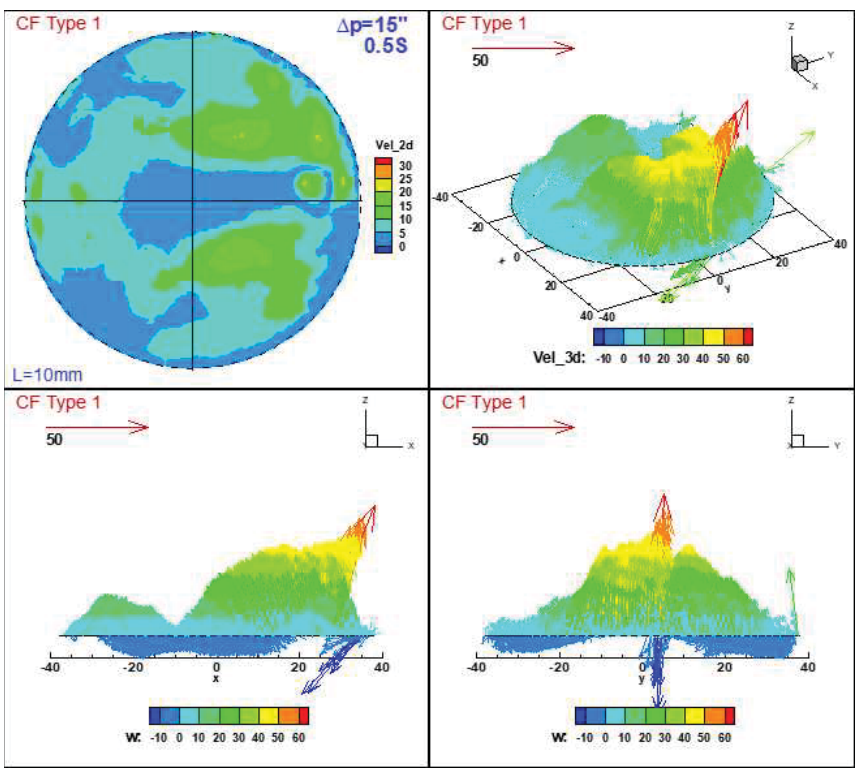

Fig. 3 3D Measurement Result