

For performance improvement and emission reduction of engines, the demands for the spray properties of the injector are considered to be more advanced. Especially in direct injection gasoline engines, the spatial distribution of the spray (injection fuel) largely influences the engine performance. As for the measurement method of the spatial spray distribution, the sampling cell method¹⁾ is the most popular but it has problems in that the measurement takes a long time.

To overcome this problem, we have developed a new method of measuring spatial spray distribution using a spray capture sheet (paper) which changes colors due to moisture adsorption. This measurement method has the following features:

- (1) Easy measurement in short time is realized.
- (2) The distribution fluctuation for every injection can be measured.
- (3) The measurement in the pressurization field simulating the inside of the engine cylinder becomes possible.

The outline of the measuring system and the principle of the measurement are shown in **Figs. 1** and **2**, respectively. When the volatile fuel is sprayed on the sheet, the fuel attaches to the sheet and the sprayed part of the sheet changes color to black due to the wetting. As the fuel vaporizes, the sheet dries from the part where the attached spray amount is small and the sheet color returns to white (**Fig. 2(A)**). The spatial distribution of the spray was observed by coloring the images of the vaporization process using an image processor (**Fig. 2(B)**).

The spatial spray distribution measured by this

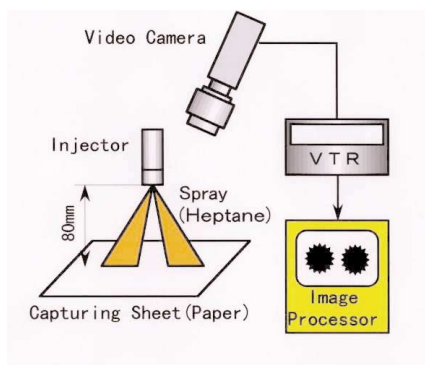


Fig. 1 Measuring system.

method is shown in **Fig. 3** in comparison with the sampling cell method and the spray momentum method²⁾. For the measurement, heptane was used as the injection fuel and a 2-jet injector was used. The difference in the flow rate of the jet between the right and left sides of the flow and the flow distribution in the jet agree well with the results of the other two methods.

References

- 1) Tani, Y., et al. : SAE Tech. Pap. Ser., No. 1999-01-0564 (1999)
- 2) Saito, A. and Kawamura, K.: Proc. the Second Int. Workshop on Adv. Spray Combust., (1998), 9809

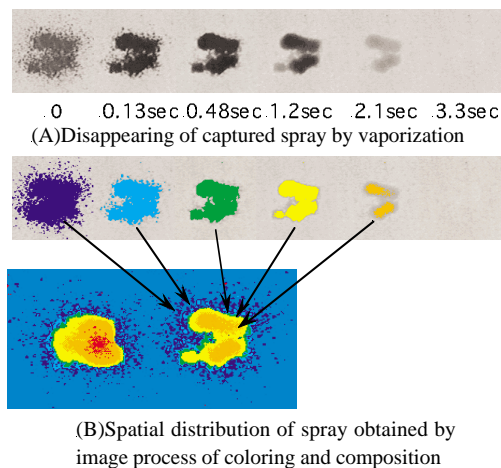


Fig. 2 Principle of measurement.

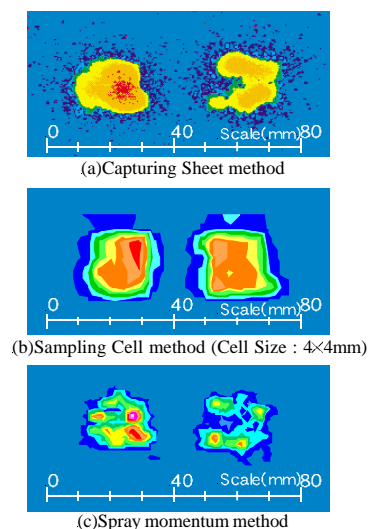


Fig. 3 Measured spatial distribution of 2-jet injector comparing with other methods.