

# Aux. Brake Apparatus by Air Compression and Release for Stop of Heavy FCV Regenerative Brake (Sec. Report)

Improvement Effect on Brake Performance by Super Charging to Inlet Air

Yasufumi Iijima<sup>1)</sup> Yamaguchi Ryo<sup>1)</sup> Ishimoto Takane<sup>1)</sup> Toshinori Fujita<sup>1)</sup> Takashi Shibayama<sup>1)</sup>

The battery capacity of FCV is relatively small, so, though it might happen rarely, state of charge might become full on long steep downhill road, that leads to failure of regenerative brake. To make countermeasure, simple structure auxiliary brake has been proposed in last report.

In this report as second report, improvement effect on brake performance by super charging to inlet air will be reported.

**KEY WORDS** EV and HV systems, brake control, Heavy FCV, Auxiliary Brake (A3)

The basic principal of studied auxiliary brake is shown in Fig.1. Braking force is obtained by reciprocating motion of the piston between bottom dead center(hereafter BDC)and top dead center (hereafter TDC) . Air is compressed during compression stroke immediately after BDC and resistance force caused by the compressed air generates braking force. Immediately before TDC, air exhaust hole will be opened by stroking piston seal and the air will be released. Then air pressure becomes atmospheric pressure around TDC. Immediately after TDC, the stroking piston seal will cut off the air passage between air chamber and external air again, then, expansion stroke begins. During expansion stroke, the air chamber pressure becomes lower than atmospheric pressure so that resistance force is also generated and braking force is also obtained. Immediately before BDC, air is breathed through air intake, and air chamber pressure becomes to atmospheric pressure again. This apparatus is expected be installed into transmission of heavy duty FCV truck as shown in Fig.2.

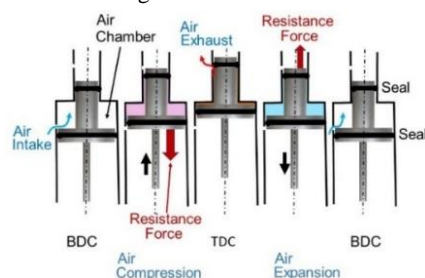


Fig. 1 Structure and principle of studied auxiliary brake

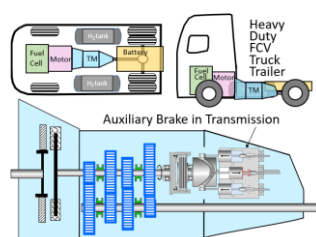


Fig.2 Typical concept of auxiliary brake in transmission

Capacity of studied auxiliary brake can be adjustable by controlling the compressed air exhausting timing. Piston stroke position where air

exhaust begins is adjustable as shown in fig.3.

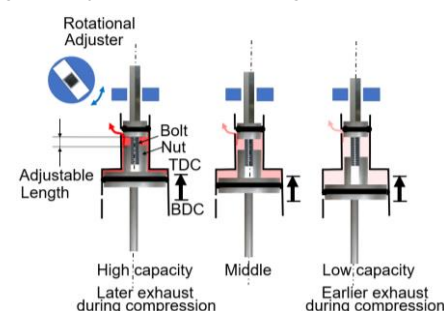


Fig. 3 Structure of brake capacity adjusting device

Basic characteristic has been reported in 2022 Annual congress (Spring) by the author. And to obtain higher performance is important next challenge. To realize higher performance, super charge intake air system has been added as shown in Fig.4.

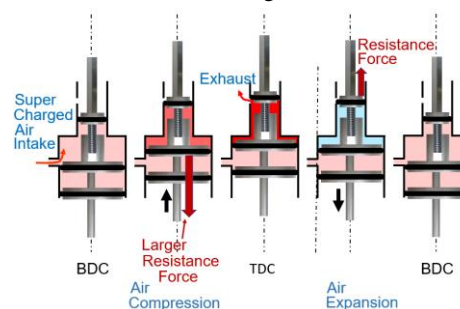


Fig.4 Super charged system for obtaining higher performance

The effect of the super charging system has been confirmed by experiment. As shown in Fig.5, effective higher performance has been obtained by the additional super charging system.

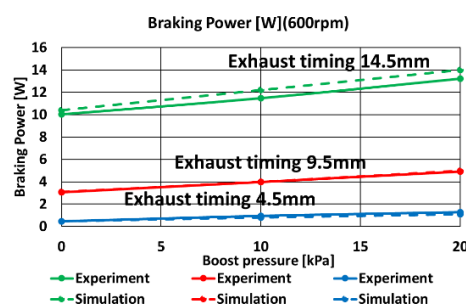


Fig.5 Sensitivity of effect by super charging