Adhesion-Increasing-Agent Jetting System "Cerajet"

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Cerajet, which eliminates drawbacks of conventional sanders such as freezing in low-temperature areas and provides an effective method to increase adhesion in the speed range from starting to running at a speed of 300 km h^{-1} or over, has been mounted on more than 500 rail vehicles including locomotives, streetcars, as well as even series 500 and 700 Shinkansen cars.

Cerajet is driven by the onboard air source and an electro-magnetic valve in the same manner as the conventional sander. See Fig. 1. Owing to the specially designed tank for an adhesion-increasing agent and jet nozzle, however, the system has advantages never seen with the sander (Table 1), to supply the agent properly between wheel and rail, and prevents it from being scattered by the train draft thanks to the high jetting speed even when the vehicle runs at a speed over 300 km h^{-1}. This exerts an extremely remarkable effect under the wet condition in the high speed range where the adhesion coefficient tends to decrease, partly due to the use of alumina (aluminum oxide) particles that are stronger in mechanical strength than conventionally used sands. Figure 2 shows an example of the installation of the system.

Figure 3 summarizes the results of emergency brake tests with a high-speed test train on a narrow-gauge line. The brake distance normally increases about 100 m when rails are wet, since wheels frequently skid. When the adhesion-increasing agent is jetted at the foremost axle linked with the application of emergency brake, however, skids are prevented almost over the entire train-set even under the wet condition to make the train stop at the same brake distance as that under a dry condition. This effect has also been confirmed in the operation of Shinkansen trains at 300 km h^{-1}.

It has also been proved that Cerajet effectively enhances the adhesive effect when used for locomotives to prevent skids at start and substantially cuts the running cost when compared with the conventional sander for the differences in the fuel cost and refilling cycle.

As Cerajet exhibits a high adhesion-increasing effect even on rails covered with fallen leaves, it has been mounted for skid prevention on a number of EMUs and DMUs running in mountainous areas.

Railway Technical Research Institute implemented Cerajet field tests in the UK, Germany, and Taiwan in 2001 and 2002, and will promote overseas marketing in the immediate future.

ACKNOWLEDGEMENT

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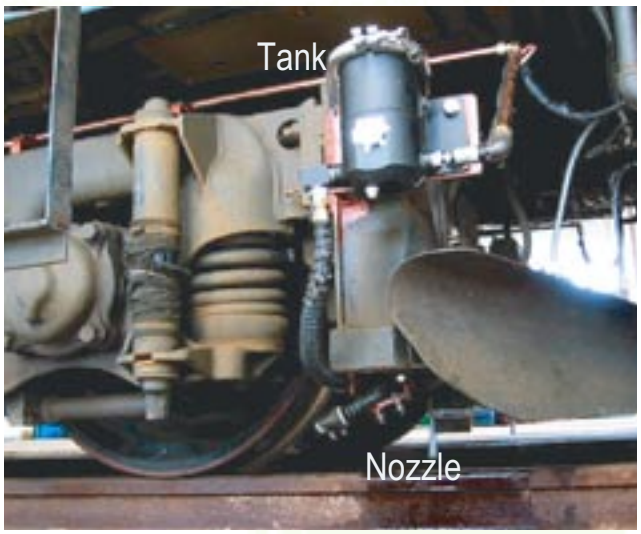

Figure 2. Equipment for supplying Cerajet.

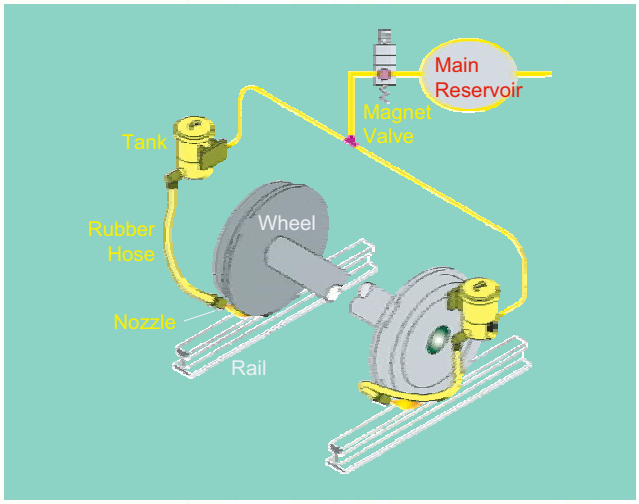

Figure 1. Cerajet.

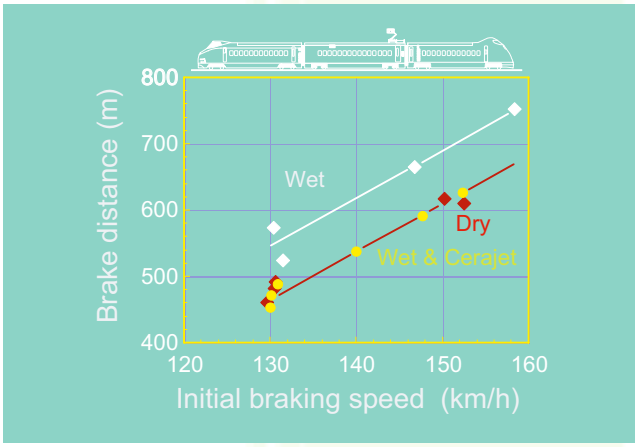

Figure 3. *TRY-Z* with Cerajet.

Table 1. Cerajet *vs.* Conventional Sanders[a]

	Jetting speed	Jetting quantity / g min^{-1}	Adhesion promoting material	Refill frequency in average
Cerajet	100 m s^{-1}	20-50	Alumina sand	Once ten days
Conventional sanders	Just dropping	1500	Natural sand	Twice a day

[a] Data from diesel cars working in Japan during a season with fallen leaves.