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Transmitted by the expert from China

Development of Emission Test Procedure for Heavy-Duty Hybrids in China

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Status of HDH Emissions Test in China

- Emissions of conventional HDVs are tested and approved through measuring their engines on bench.
- Engine test results can not exactly reflect the HVs emissions unless the complete vehicle is taken into account.
- GB/T 19754-2005, the energy consumption test procedure, prescribed procedures to test HDHs both on road and on a chassis dynamometer.
- The chassis dynamometer and emissions measurement system for HDVs are already available in several institutions in China.

Status of HDH Emissions Test in China

- In November 2009, the Ministry of Environmental Protection (MEP) of China launched a program to develop a standard on emission test procedure for HDHs.

Technical Considerations

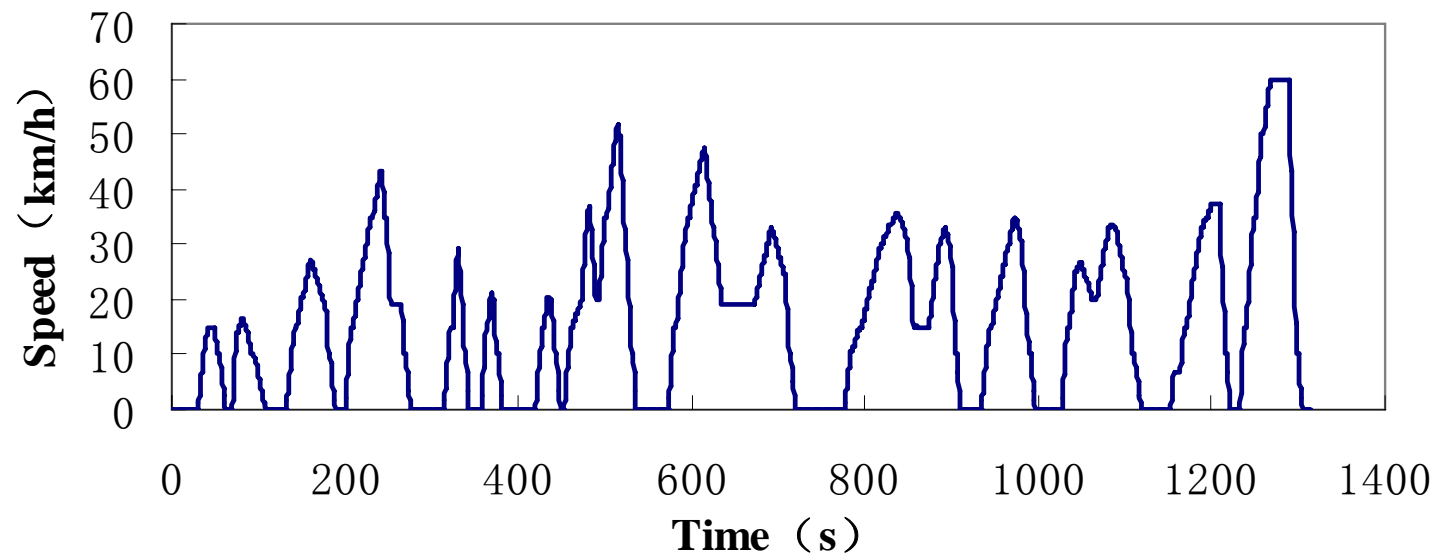
- Chassis dynamometer test is chosen as the approach to the test procedure
 - As compulsive requirement, engines for HDHs must indiscriminatingly meet the current regulation based on engine bench tests at first
 - Not only engine but contribution of electric drive system should be taken into account when testing emission of HDHs
 - Chassis dynamometer test has more significance for HDHs than only engine test
 - The standard expects to be adopted as official criteria to approve HDHs' advantages in emission reduction compared with their conventional counterparts

Technical Considerations

- On test cycle
 - Performance of hybrids significantly depends on driving cycle
 - Most hybrids are designed for some special conditions
 - Cycles of hybrids are evidently different from that of conventional ones in real world
- China City Bus Cycle (CCBC) is considered as test cycle of hybrid buses

Technical Considerations

- CCBC



- Developed on the base of real world data collection in several major cities

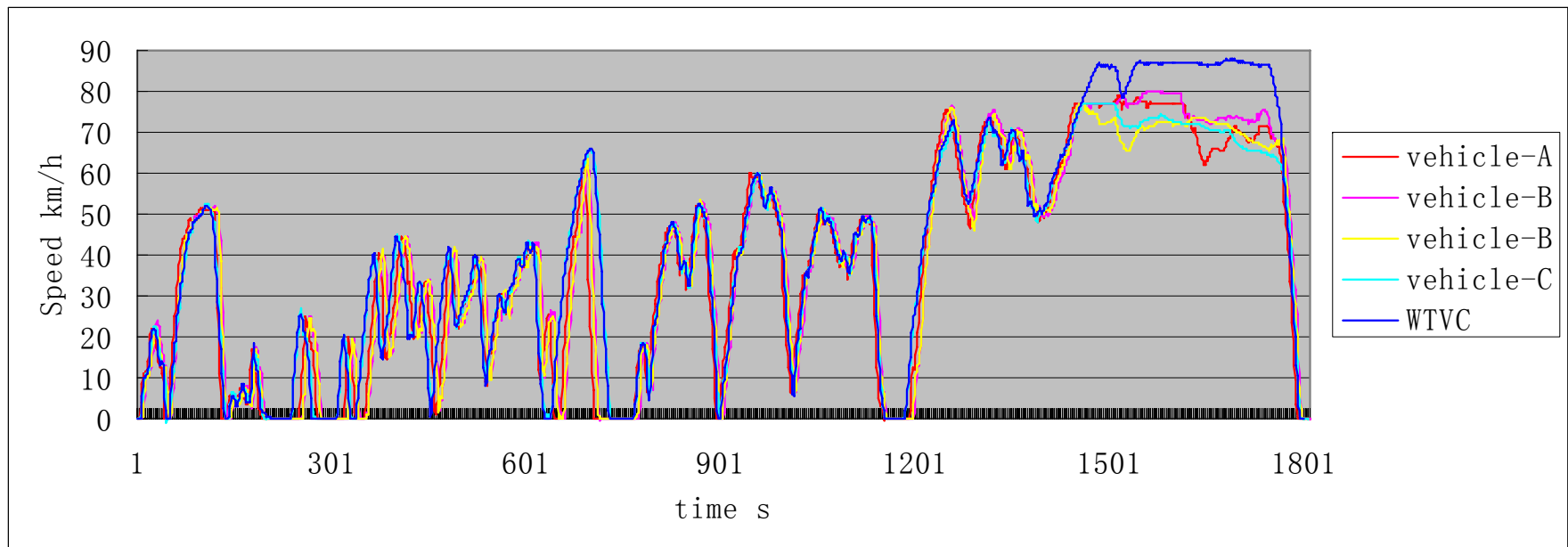
Technical Considerations

- Comparison with other cycles

	Duration s	Average speed km/h	Max speed km/h	Max acceleration m/s ²	Max deceleration m/s ²	Idle time s	Idle occupancy %
CCBC	1314	15.9	60	0.914	1.543	381	29.0
Manhattan	1090	10.92	40.48	2.04	2.49	393	36.09
UDDS	1061	30.32	93.34	1.96	2.07	354	33.36
CBD×3	1722	20.13	32	1.02	2.09	345	20.03
JE05	1830	27.33	87.6	1.59	1.83	460	25.14
WTVC	1800	40.14	87.8	1.6	1.7	233	12.9

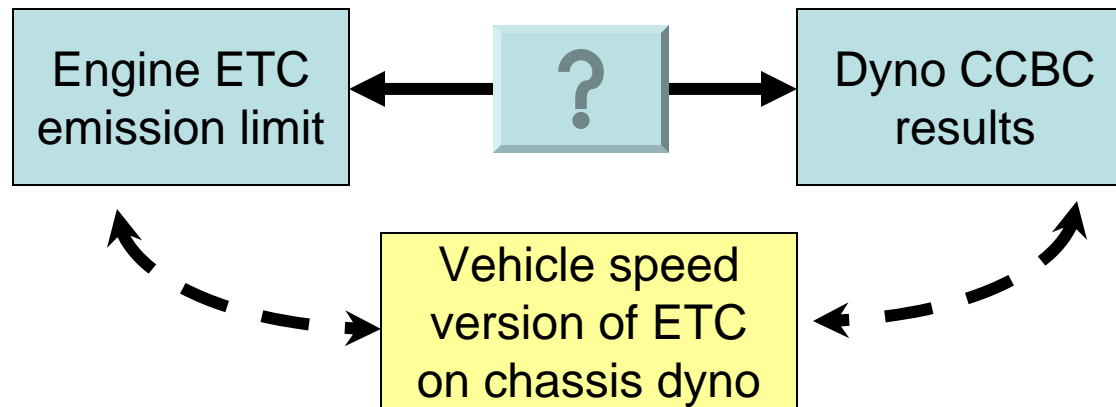
Technical Considerations

- Test results, following WHVC



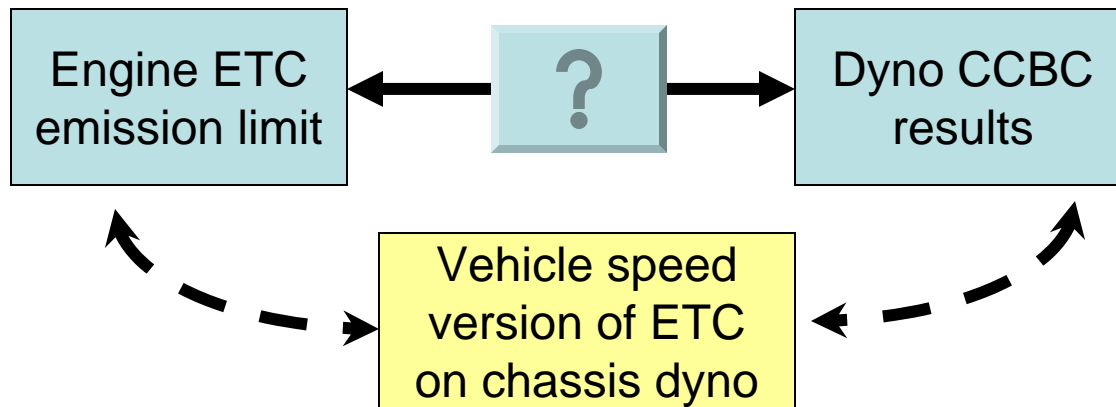
Further Work

- Feasibility and rationality to set chassis dyno emission limits equivalent to that of current HDV emission regulation are needed.



- Comparative tests between engine bench and chassis dyno will be done for conventional HDVs and their engines.

Further Work



**Thank you for your
attention!**

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