Evaluation of CRT-DPF filters with low and medium sulfur diesel fuels in Iranian market

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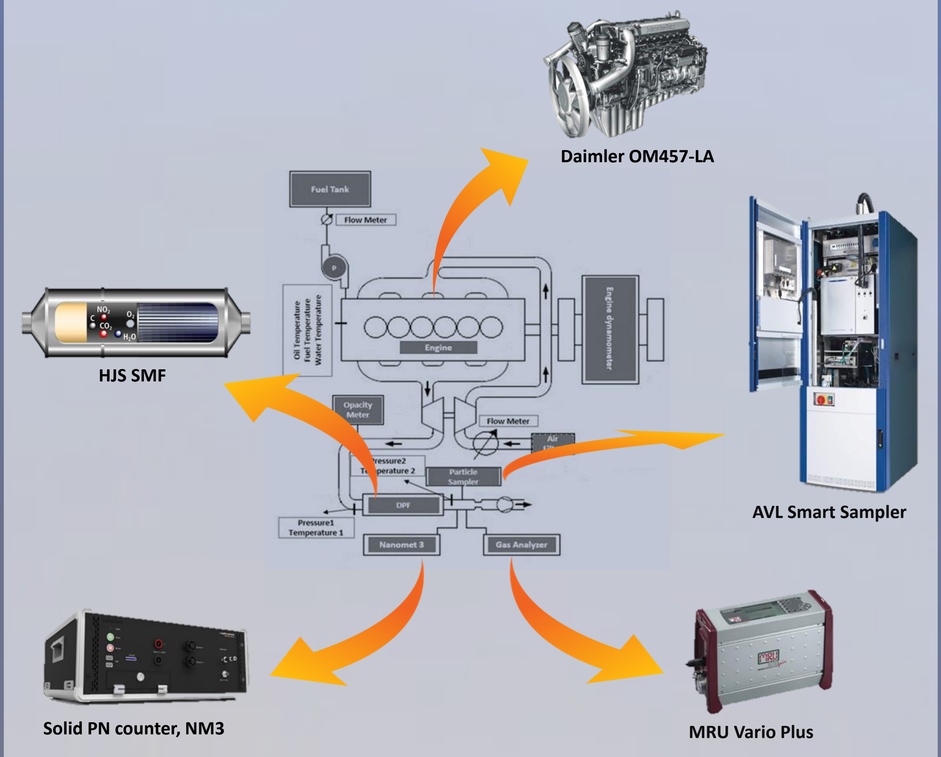
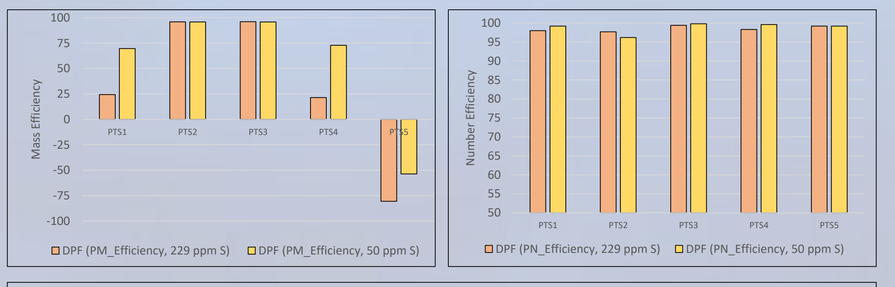
1:Background

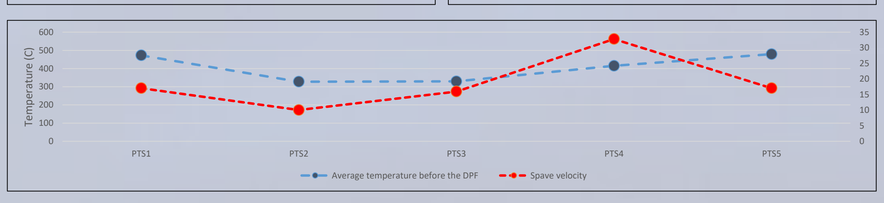
- The current Iranian national emission standard level for all new diesel vehicles is Euro IV + DPF or Euro V EEV.
- DPF was first introduced into Iranian market in 2014.
- CRTs are the most favorable DPFs for both retrofit and OEM markets in the developed countries due to its simplicity.
- The old and low-level standard engines, besides the high-sulfur diesel fuels, are big challenges to the use of CRTs in Iran.
- Approximately 50% of distributed Iranian diesel fuel contains high level of sulfur content (up to 7000 ppm).
- Fortunately, diesel fuel prepared for the city buses in eight mega-cities of Iran, including Tehran, is usually of EU 4 standards.
- lack of careful monitoring of fuel quality is partly responsible for the medium-sulfur diesel distribution, up to 229 ppm, in EU 4 diesel stations.
- Complexity of the active DPF systems, besides their high price, make DPF-retrofit-projects slow, despite the extreme necessity of DPF-retrofitting of city buses for air quality improvement.
- The objective of the current study was to analyze the function of a commercial CRT with low- and medium-sulfur-content diesel fuel (50 and 229 ppm) and to evaluate the possibility of using CRTs in city buses of Tehran.

2: Experimental Apparatus



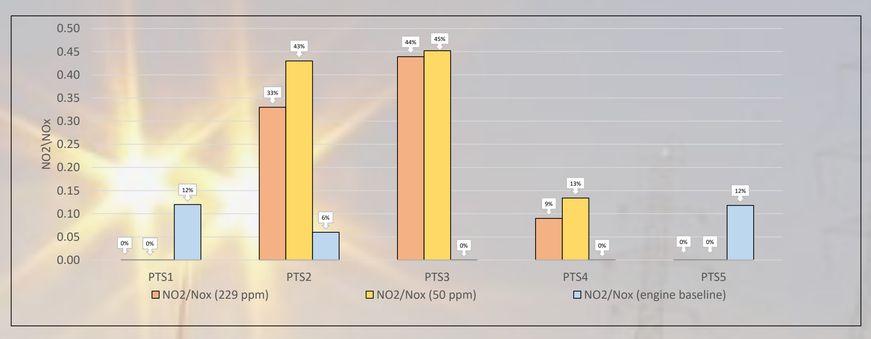
3:PM & PN efficiency (Store and release effect)



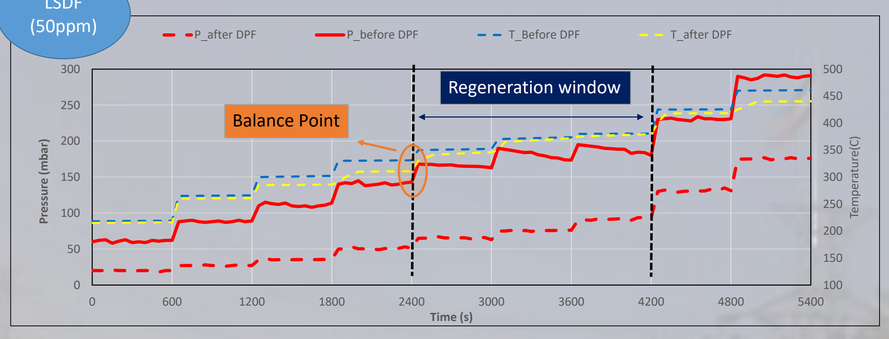


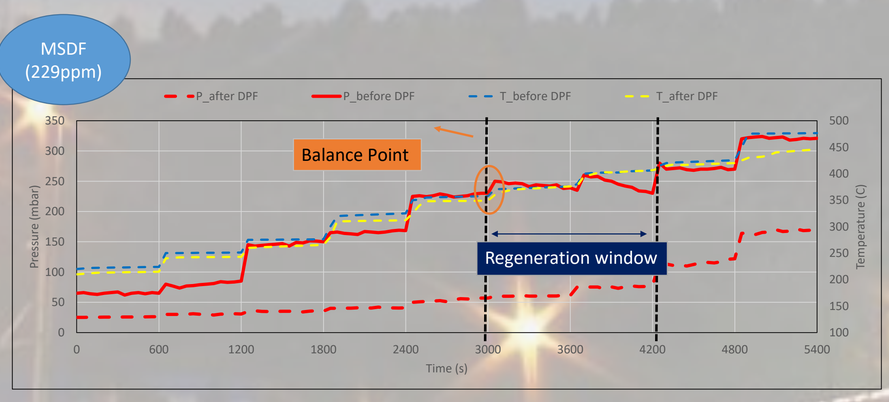
Test stages	Calculated weight			Measured weight	Store (+) or release (-)
	$m_{solid\_particles}$	$m_{sulfate}$	$TPM_{calculated}$	$TPM_{measured}$	
PTS 1.	0.005	0.210	0.215	0.179	**+0.036**
PTS 2.	0.002	0.024	0.026	0.005	**+0.021**
PTS 3.	0.000	0.021	0.021	0.003	**+0.018**
PTS 4.	0.002	0.088	0.090	0.096	**-0.006**
PTS 5.	0.002	0.210	0.258	0.429	**-0.171**

4: NO_x emission–NO_2 slip phenomena



5: Regeneration quality





6: Conclusion

- The average PN efficiency for LSD and MSD was 98.8% and 98.5%, respectively.
- No considerable difference was observed in the effect of fuel sulfur on the CRT's PN-efficiency.
- the PM efficiency was low for both the tested fuels, with an average of 83.5% and 59.5% for LSD and MSD, respectively.
- Comparing the results for MSD and LSD shows that the effect of the fuel sulfur level on PM efficiency was significant.
- Low PM efficacy, despite very high PN efficiency, was attributed to sulfate species production.
- NOx values did not change remarkably during any of the operation points by the implementation of CRT.
- NO_2/NOx ratio changed significantly by the use of CRT.
- NO_2 slip increased with using LSD in comparison with MSD.
- Comparing the results for MSD and LSD shows that favorable regeneration area decreased for MSD to two-thirds in comparison with that for LSD and balance point temperature increased to about 50 °C.

Considering the situation in Tehran where LSD is commonly used with occasional fueling with MSD, field-testing of CRT is necessary to evaluate the possibility of using CRTs in Tehran's public bus fleet.

Acknowledgement

The Iran Khodro Diesel company and the Iranian Diesel Engine Manufacturing Co. provided the test facility, and their contributions are greatly appreciated. The scientific and technical guidance of Andreas Mayer and Volker Hensel of VERT is also acknowledged.

Funding

This work was supported by the Iran National Science Foundation (grant number 92026442) and the Tehran Air Quality Control Company (grant number 92054333).