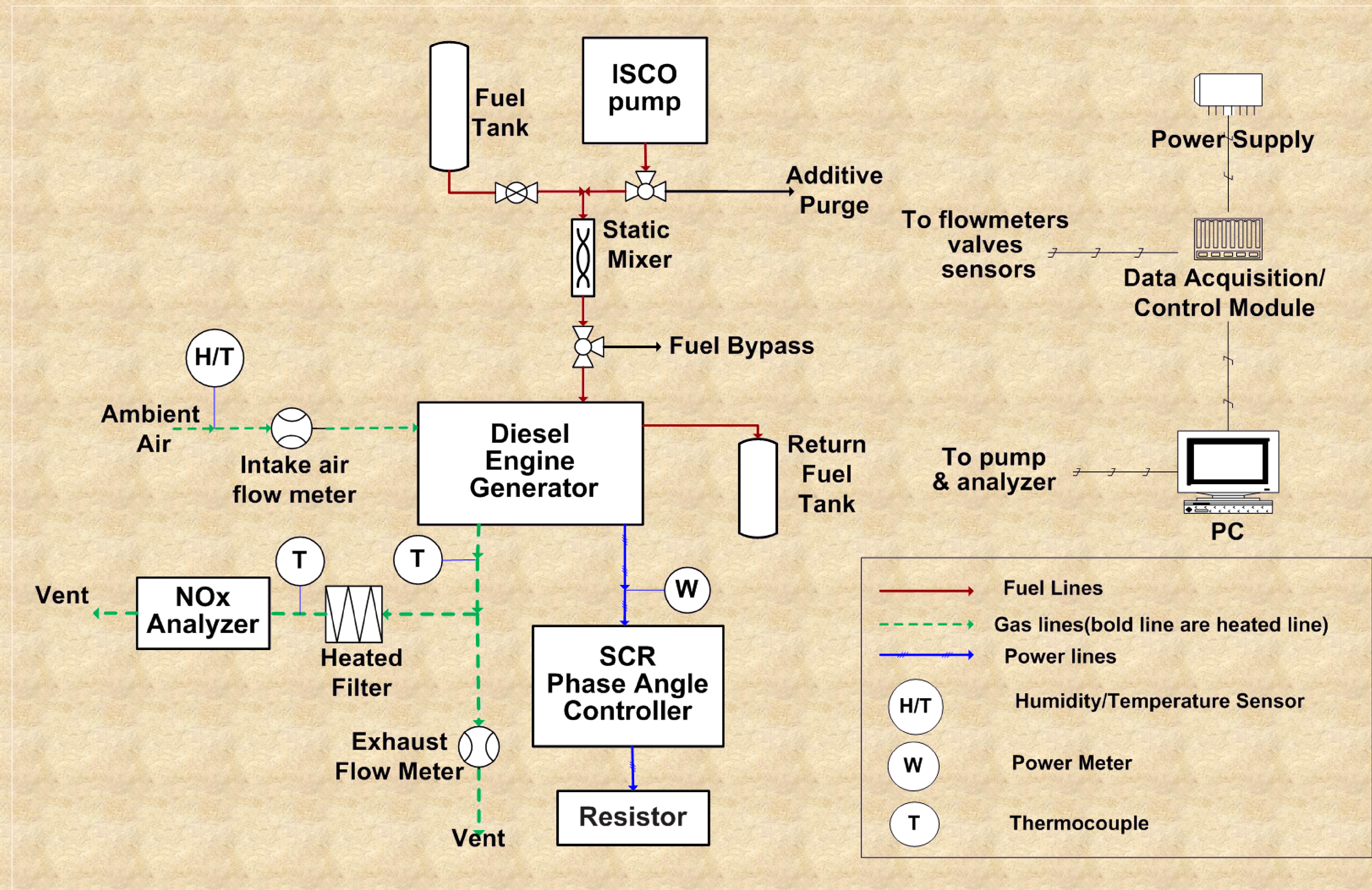


Bench-Top Engine System for Fast Screening of Alternative Fuels and Fuel Additives

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Bench-Top Engine Generator Testing System



Data Validation

Six fuels were tested in both **500HP AC chassis dynamometer testing system** and **small engine generator testing system**; their NO_x reduction (compared with the baseline diesel fuel) are listed below:

Fuels	Chassis Dynamometer (Transient)	Engine Generator			
		90% Load	60% load	30% Load	0% load
Valero (low aromatic)	7.5	13.1	7.1	-3.9	-27.31
City of Houston (TxLED)	2.5	5.5	0.9	-13.9	-33.0
Additive 1	1.3	1.9	-1.4	-12.3	-35.9
Additive 2	1.0	-3.0	2.3	14.2	23.6
Additive 3	-1.9	-5.2	2.3	14.5	30.0

Two testing systems gave same rank of NO_x reduction:
Valero > TxLED > Additive 1 > Additive 2 > Additive 3

- This system is used to screen the NO_x reduction efficiency of diesel fuel additives and other alternative diesel fuels.
- It has the capability to generate fuel/additive blends with different ratios and feed them into the engine; the blend ratio or additive concentration can be changed in situ.
- The engine can be operated at different loads using the programmable load control.

Two Testing Protocols

Premix Protocol

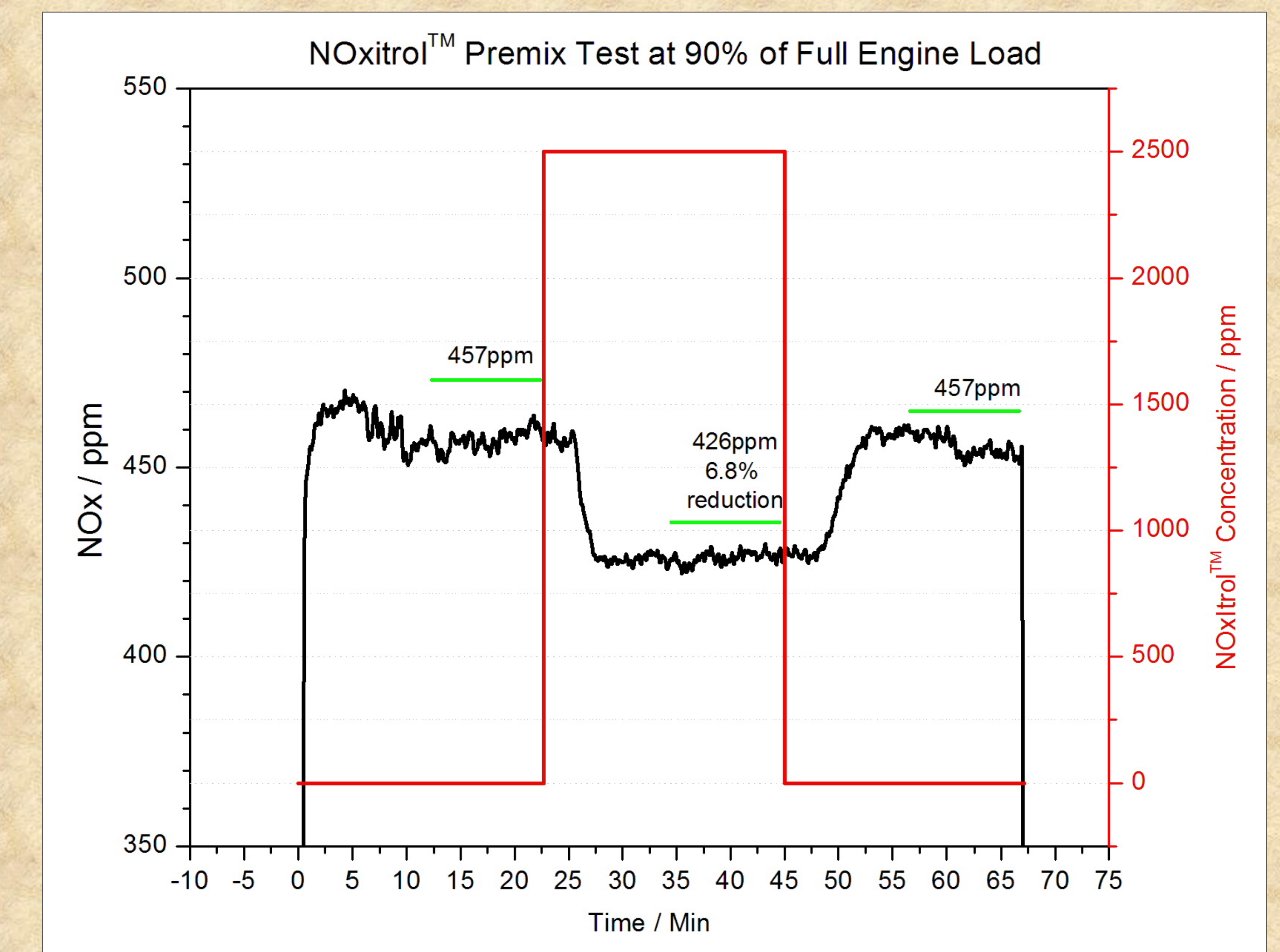


Figure 1: Premix testing to screen NO_x reduction efficiency of NOxirtol™ additive at 90% of full engine load. (Baseline fuel, fuel with 2500ppm of NOxirtol™, and baseline fuel were feed into the engine for 22.5min each in succession.)

Injection Protocol

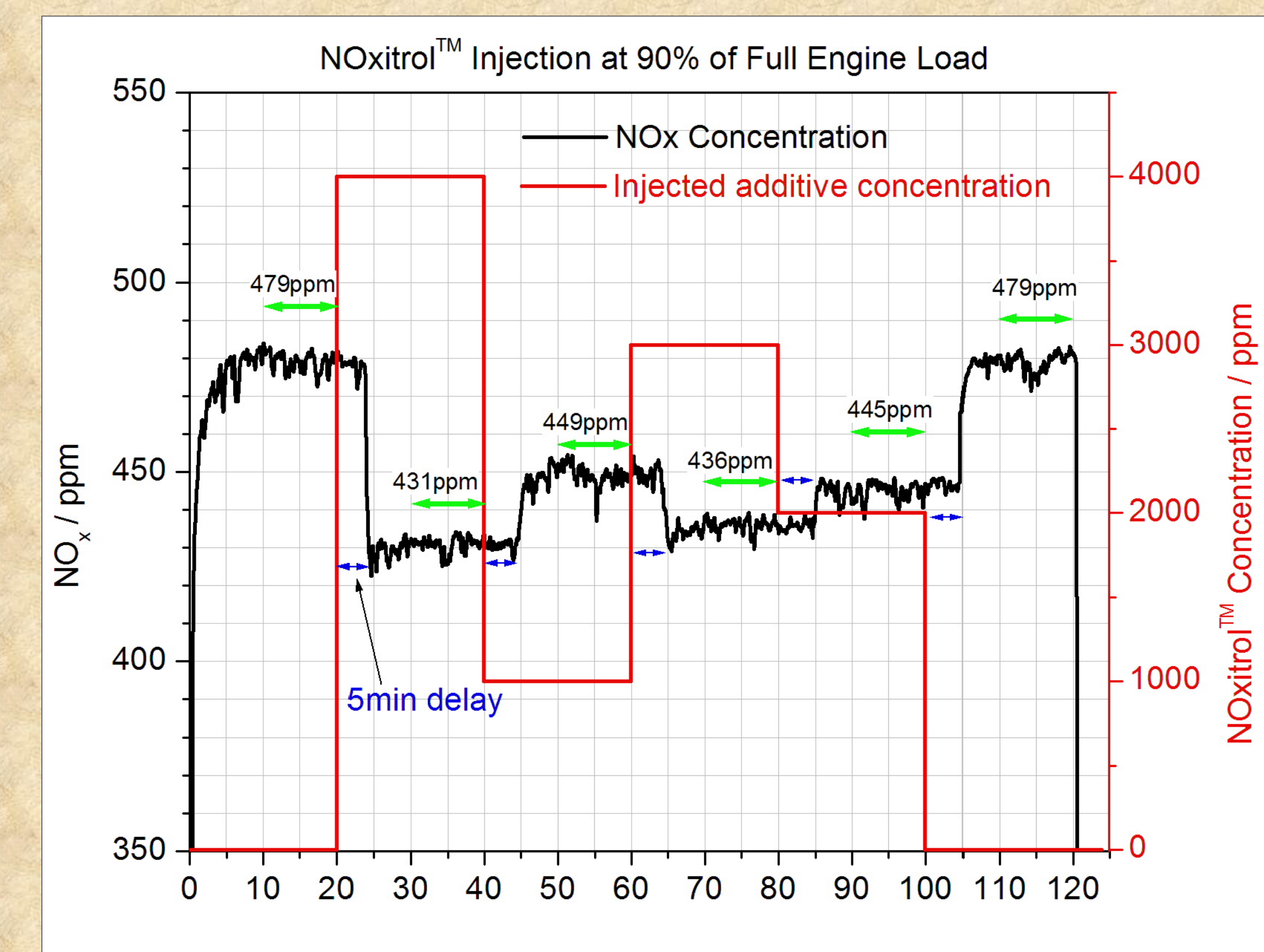


Figure 2: Injection testing to screen the influence of different doses of NOxirtol™ additive on NO_x reduction at 90% of full engine load.