

**TESTING OF FITCH  
FUEL CATALYST  
ON CUMMINS  
NTA855R3  
DIESEL ENGINE**

**REPORT NO. : ITLR-T18076-001**

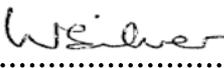
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## 1 EXECUTIVE SUMMARY

Advanced Combustion Technologies (ACT) UK Ltd, representing Advanced Power Systems International (APSI), USA, approached First Great Western and ATOC with a view to evaluating the Fitch Fuel Catalyst on rail traction diesel engines. Following agreement with all relevant parties, a test was arranged on a Cummins NTA855R3 engine already available on a test bed at mi Technology, Preston for other work.

The Fitch fuel catalyst is a polymetallic alloy, which is fitted into the engine fuel supply line. It is claimed to reverse the effects of auto-oxidation, which results in reduced energy and poorer combustion, by producing chemical reactions at molecular level. Improvements in the cetane rating of the fuel are also claimed, increasing the ability of the fuel to burn.

Testing consisted of a full suite of performance and emissions tests, followed by a 44-hour conditioning run on a defined load cycle, with a final set of performance/emissions tests to conclude. The emissions test followed the ISO 8178 Test Cycle F for rail traction engines.

Results showed an increase in power over the test of between 2% and 5%, which developed after approximately 25 hours operation. Mass fuel flow also increased in similar proportions, but since this diesel injection system operated at constant volume, it was interpreted that the catalyst had affected the fuel density in some way. Effectively, a fuel saving of up to 4% could be realised, dependent upon load. At the conclusion of the load run, the power increase had not yet stabilised.

Gaseous emissions (nitrogen oxide, carbon monoxide and hydrocarbons) all increased by between 2.7% and 6.2%, indicating a generally neutral effect from the catalyst, given the actual power increase observed. Particulate matter remained constant, while exhaust smoke reduced by 16.3%.

Further testing could be considered to establish the necessary time to achieve the full benefits of the fuel catalyst, whilst measuring mass and volumetric fuel flow. This would provide the opportunity to further assess the effect on emissions, in particular the contrast between particulate matter and exhaust smoke. Additionally, this evaluation could facilitate optimisation of engine fuel control settings to achieve maximum fuel economy and emissions benefits from the Fitch Fuel Catalyst.

A full copy of this 28 page report is available on request.

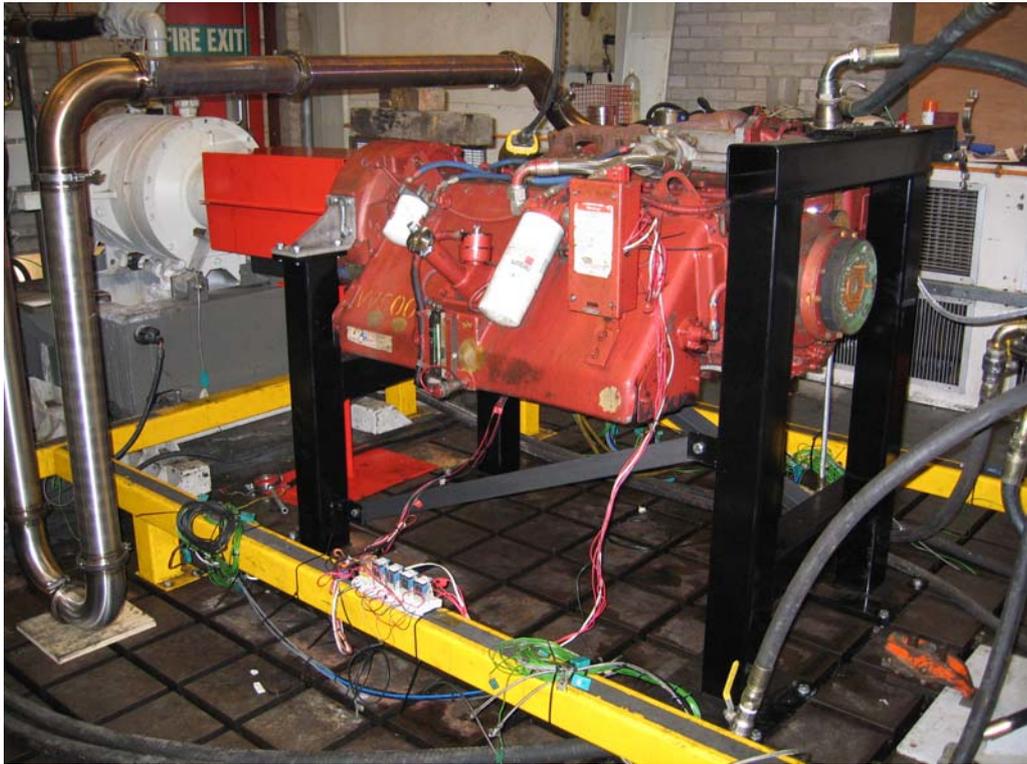


Figure 1 – NTA855R3 Engine Installation (1)

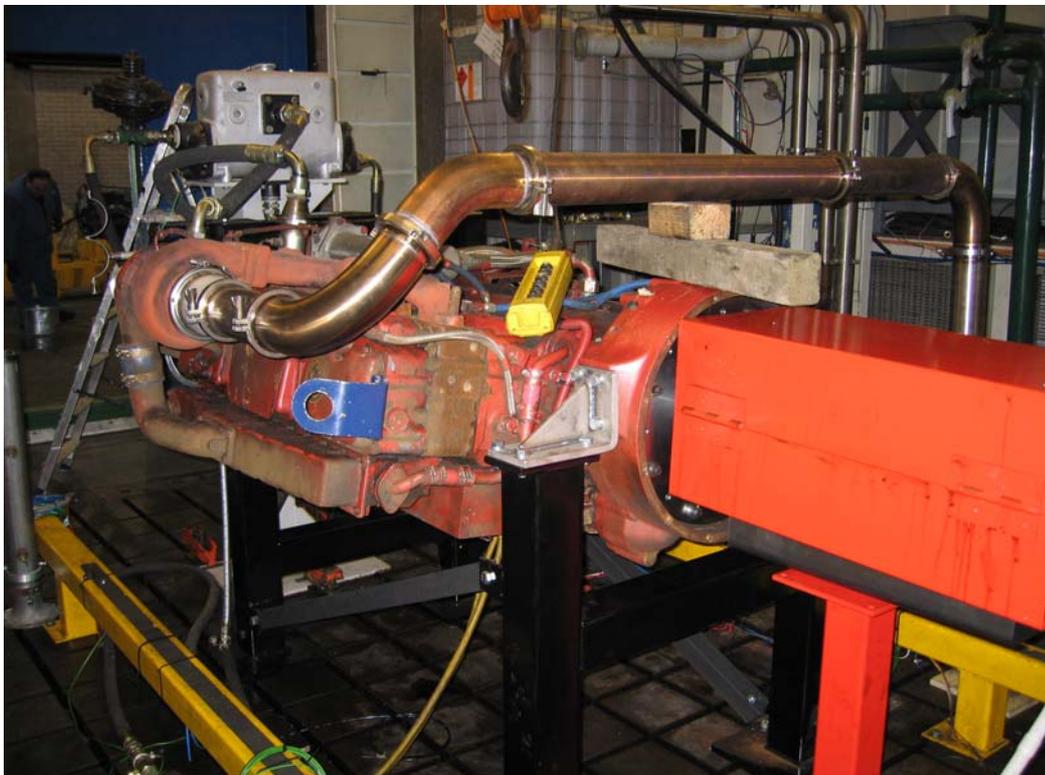
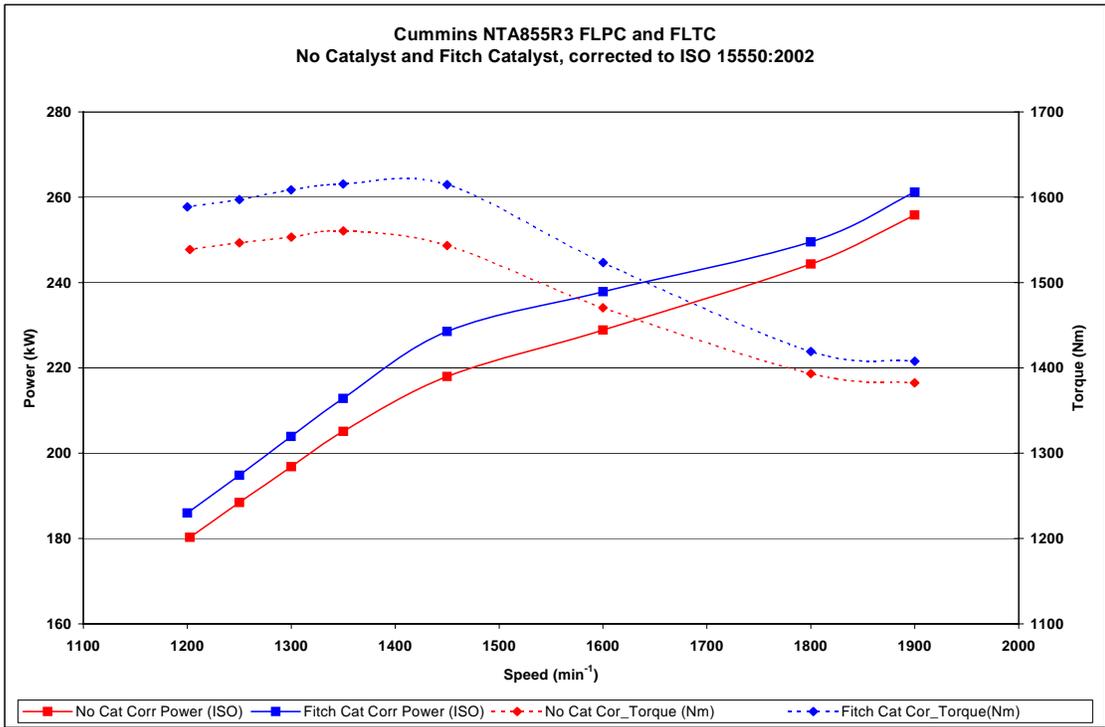
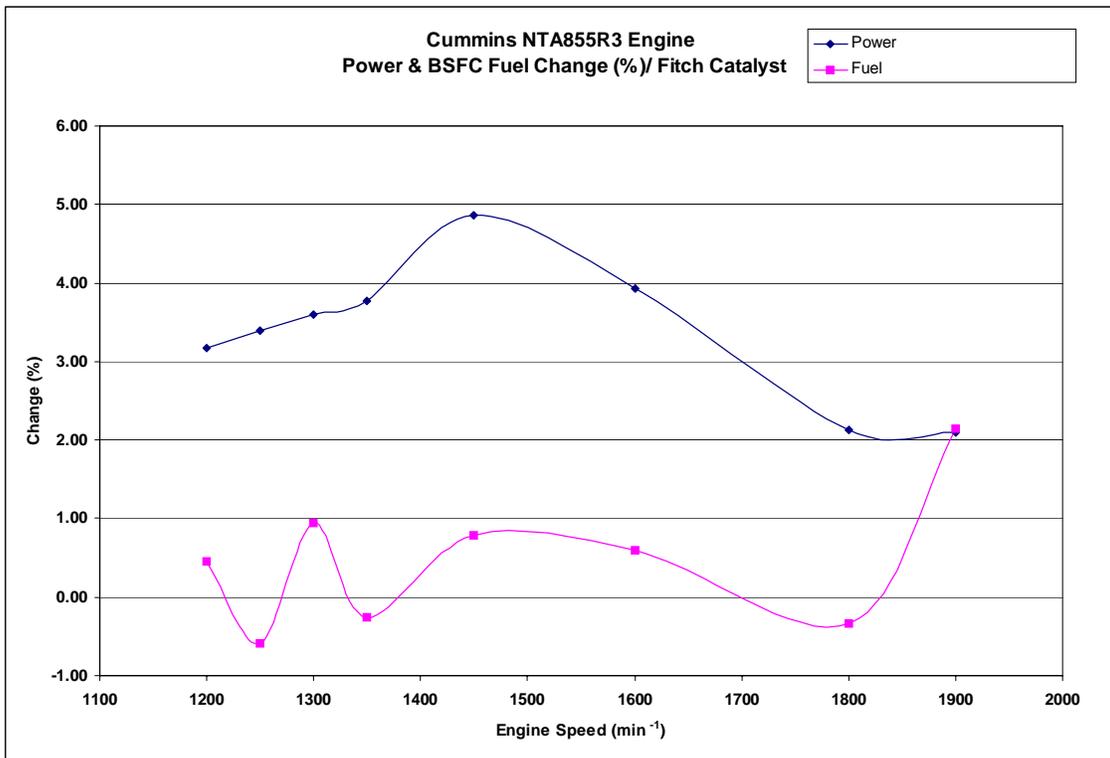


Figure 2 – NTA855R3 Engine Installation (2)

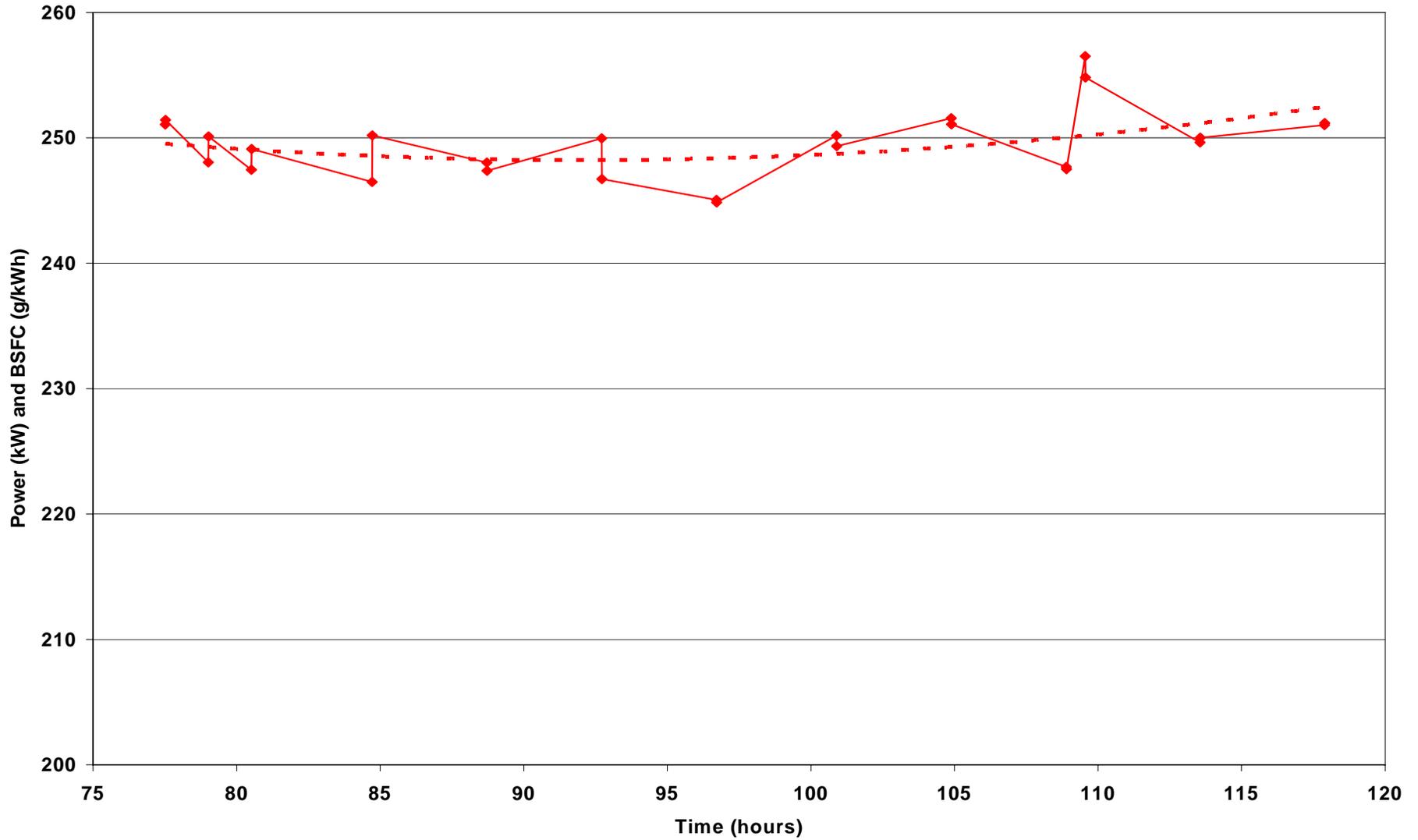


Power /Torque Change



Percentage Power & BSFC Change

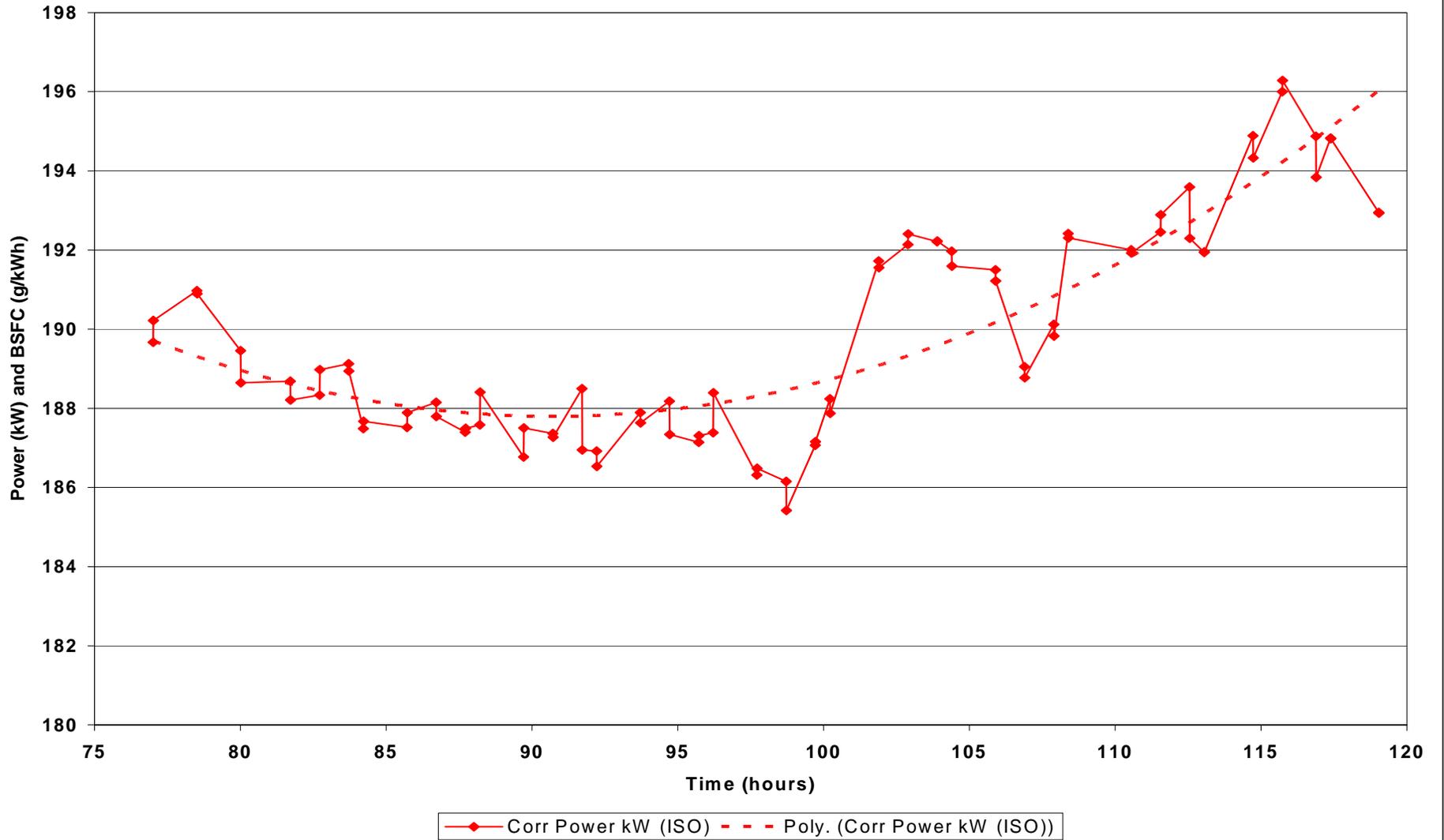
Cummins NTA855R3 Fitch Catalyst Tests  
48-hour Durability Phase - 100% Load



◆ Corr Power kW (ISO) - - Poly. (Corr Power kW (ISO))

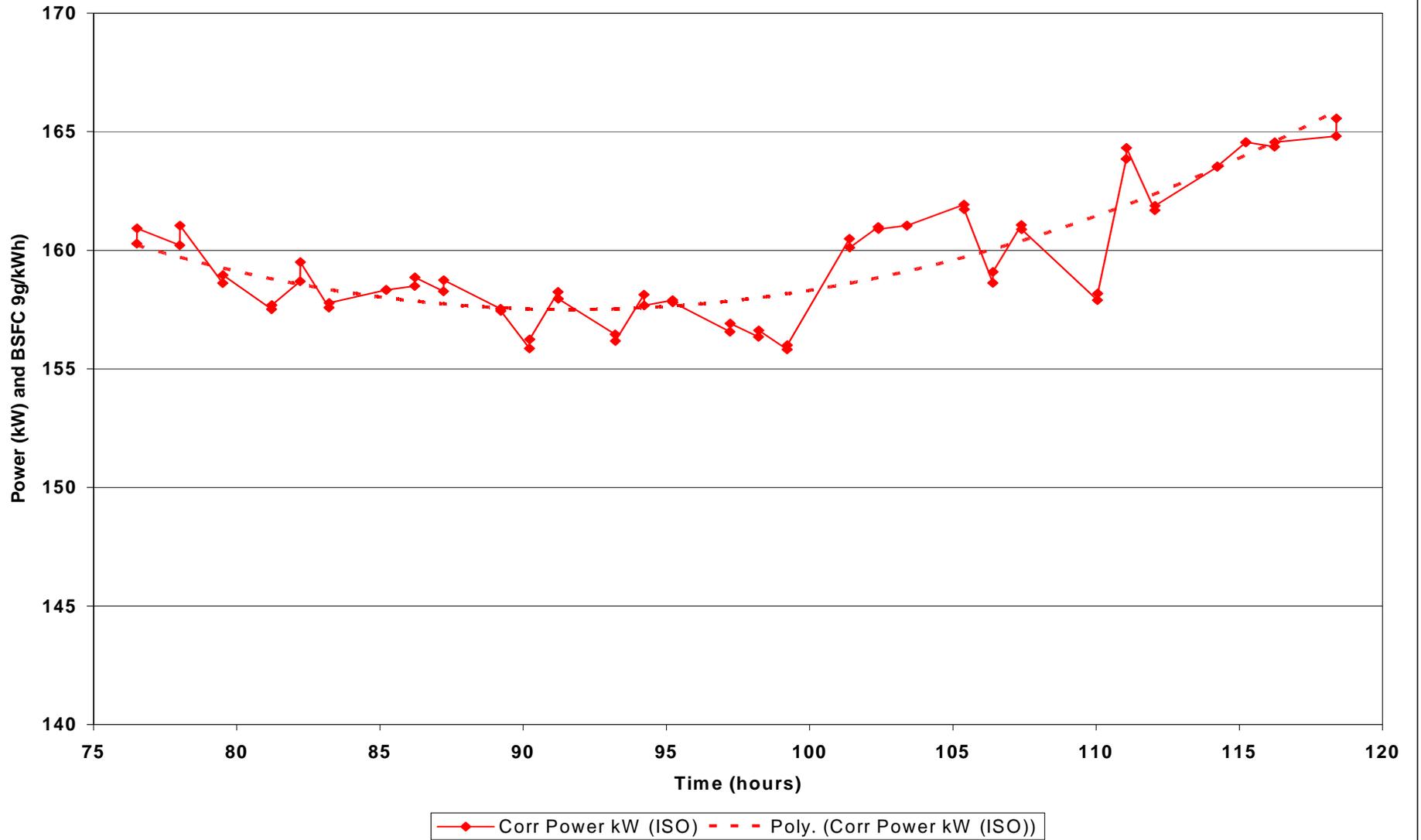
Conditioning Run , 100% Load Data

Cummins NTA855R3 Fitch Catalyst Tests  
48-hour Durability Phase - 75.5% Load

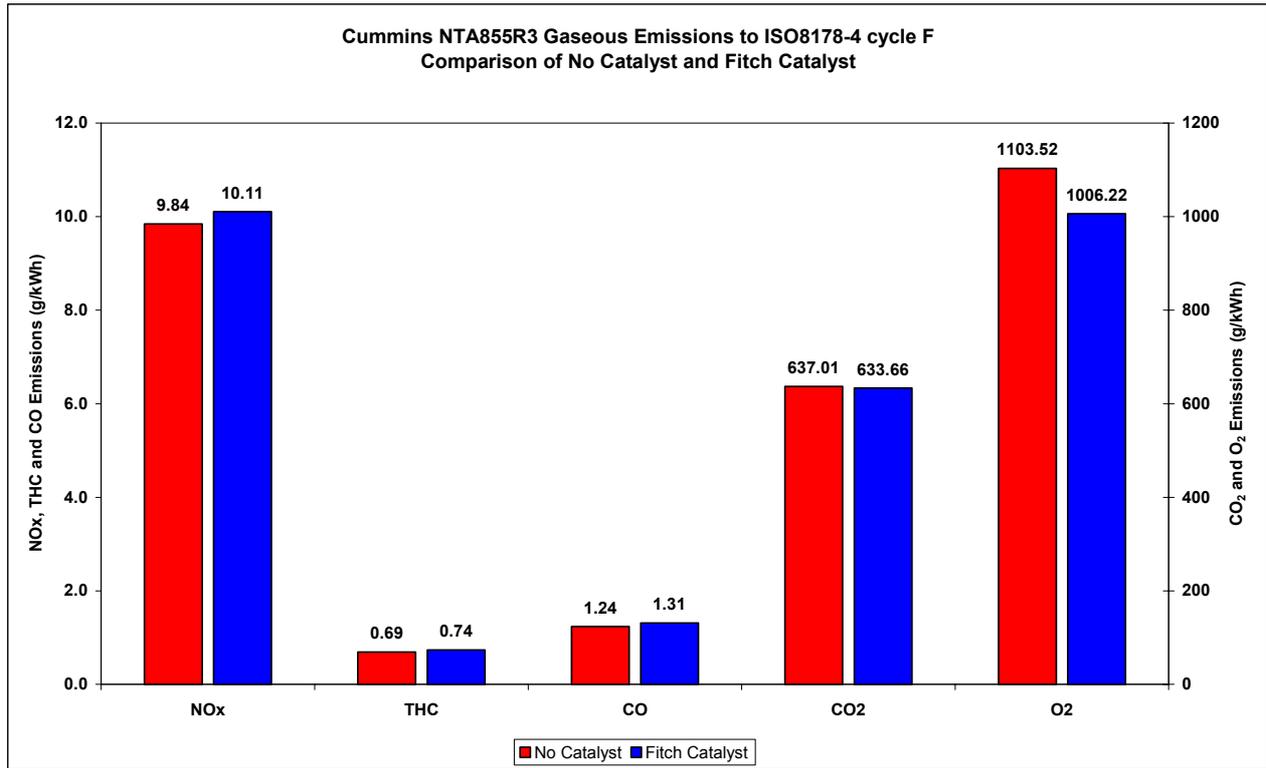


Conditioning Run, 75.5% Load Data

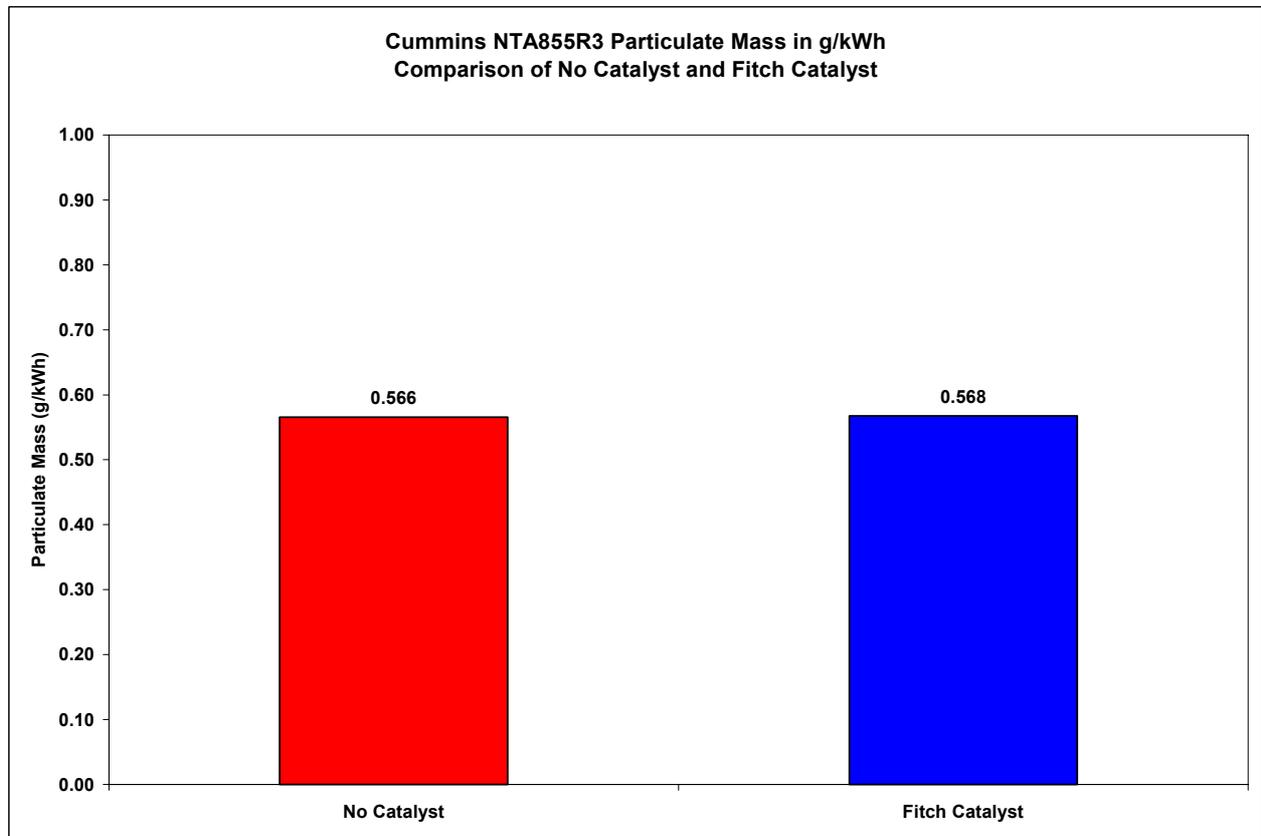
Cummins NTA855R3 Fitch Catalyst Tests  
48-hour Durability Phase - 63.3% Load



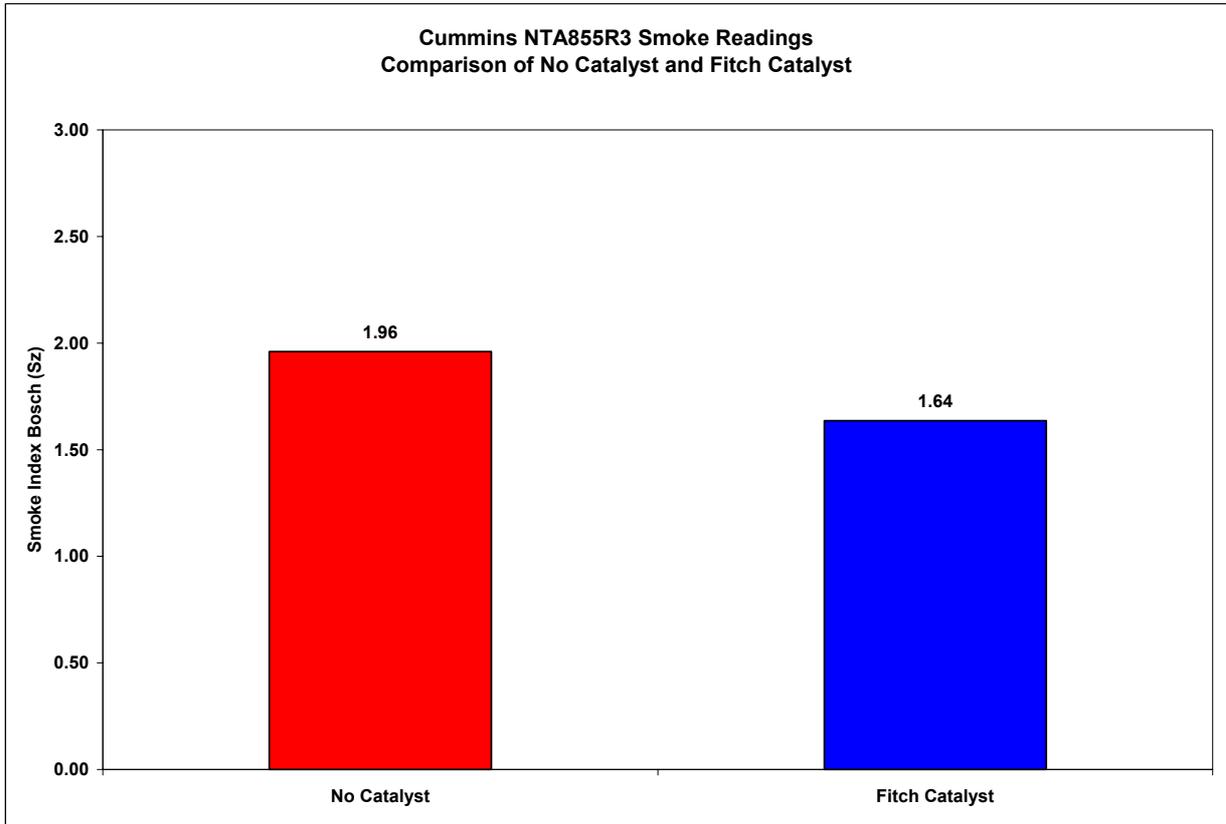
Conditioning Run, 63.3% Load Data



Gaseous Emissions Change



Particulate Matter Change



Exhaust Smoke Change