

# **Test Report**

**CLS Bond™ Diesel Fuel Additive**

**VOLVO-PENTA MD-1 Engine**

**January-March-2002**

## 1) Introduction

Tests with LubriSilk™ diesel additive during the spring of 2002 at an engine research laboratory

## 2) The test setup

Volvo-Penta MD1 engine in a test bench according to the laboratory's research standard setup.

## 3) The test

The engine was fully overhauled and restored and the tests were run through February and March. The initial run was performed with Volvo standard diesel fuel. After 4 hours, the real tests were performed, including measurement of torque as a function of fuel consumption, HC concentration in the emission.

## 4) The result

Initial tests are indicating a 5% reduced fuel consumption. Long term benefits will be reduced wear due to reduced friction.

## 5) Conclusion

Conclusions and tendencies:

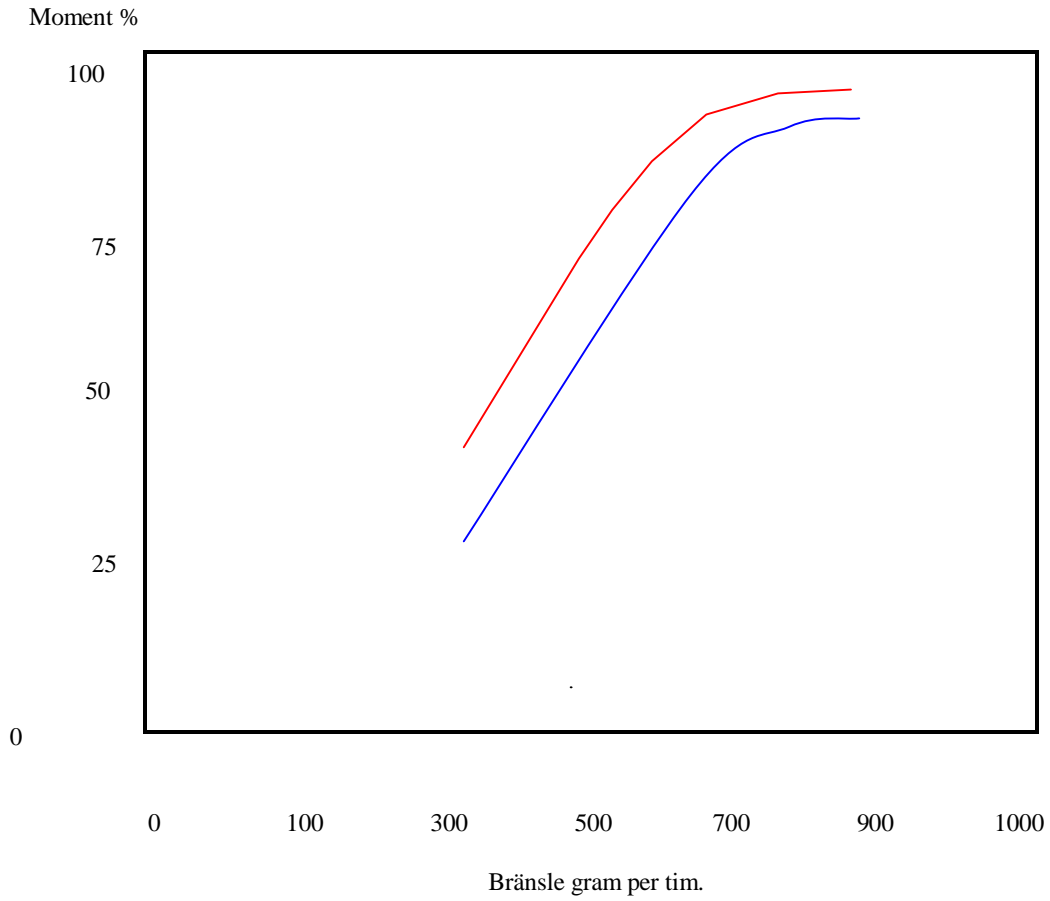
- Decreased fuel consumption, >5% for Boron CLS Bond™ diesel additive
- No Acid in used fuel
- Significant reduction of metal residues in the engine oil (When testing the CLS oil additive)
- Significant tendencies of corrosion
- Significantly reduced wear
- Decreased HC emission
- Density 1.5 g/ml. Particle size < 0.2-0.5 u, therefore no risk for clogged fuel and oil filters
- Patent, patent no. 5,431,830
- All Boron CLS Bond™ products are certified at American Bureau of Shipment
- All Boron CLS Bond™ products have or have pending MIL specification. All indices points to all products will qualify
- Boron CLS Bond™ are not aggressive vs. other materials such as metals (Al) or rubber. (Common for other lubricants)
- Boron (CLS Bond™ does not use PTFE (e.g. Teflon) or ZDDP (Zn) which combine with H<sub>2</sub>O (e.g. condensation) and are transformed into a corrosive acid (HCl) which leads to a higher degree of toxicity for those other lubricants

The content of metal particles are decreasing by around 70% already within 10 hours of testing. These tests have been performed on the same engine in a controlled environment. Further testing points to a further reduction of metal particles > 85%. The highest measured value is 92%. This gives lower fuel consumption and reduced wear and a more efficient engine.

Water in lubricant could exist, although not visible to the eye, and could reduce the life of vital parts (e.g. bearings by 75%). Water in lubricants causes oxidation, acid, ferric, pollution, and viscosity problems. Water makes the lubricant initially thicker and then thinner than the original viscosity. Water dramatically increases the corrosion, especially in engines and machinery that are not running constantly (ex. Marine engines etc.). Boron CLS Bond™ combines with H<sub>2</sub>O (Water), creating a self repairing film due to the bonding of the Boron. The bonding isolates the metal surface against corrosion.

## CLS Dieseladditiv

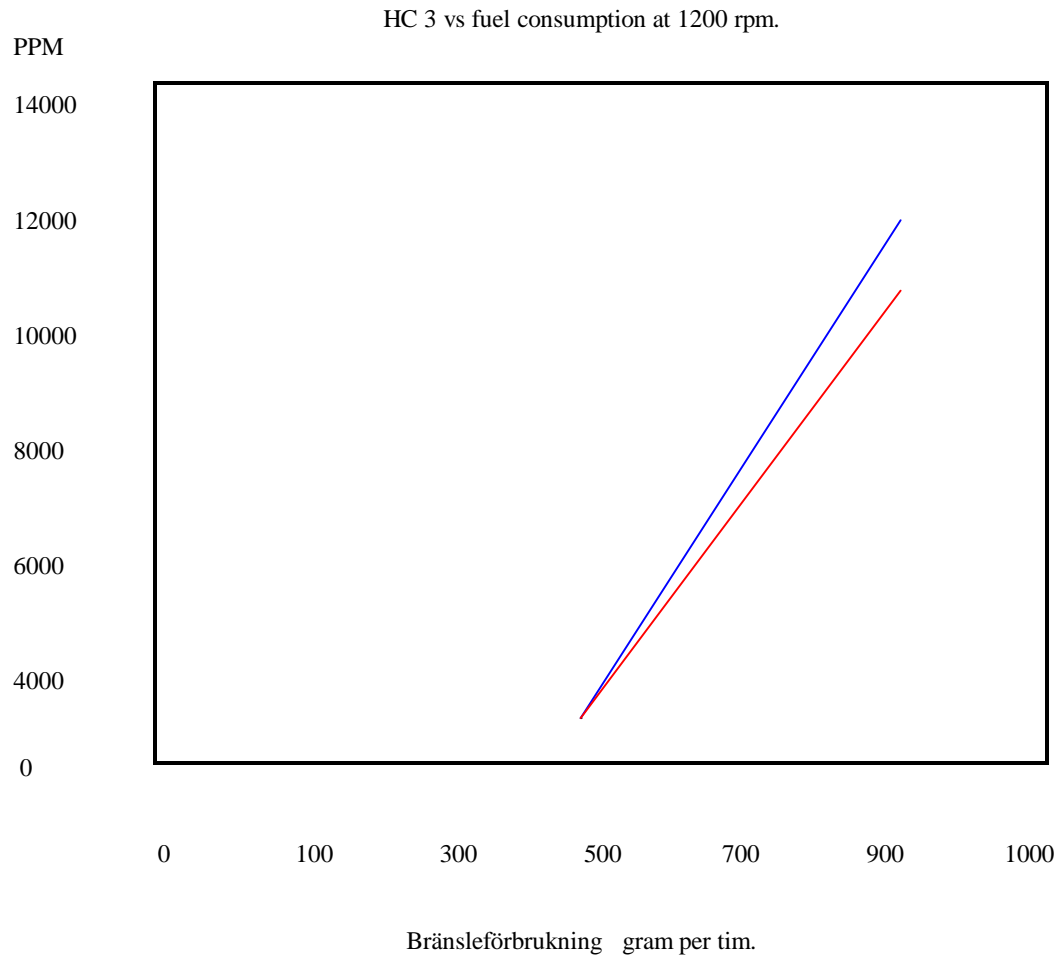
Effekt i förhållande till bränsleförbrukning vid max belastning.



Red line is torque after 3 hours with CLS diesel additive in fuel.  
Blue line shows torque without Boron CLS Bond added.  
Test bench setup according to the laboratory's engine test methods.

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## CLS Diesel additive.



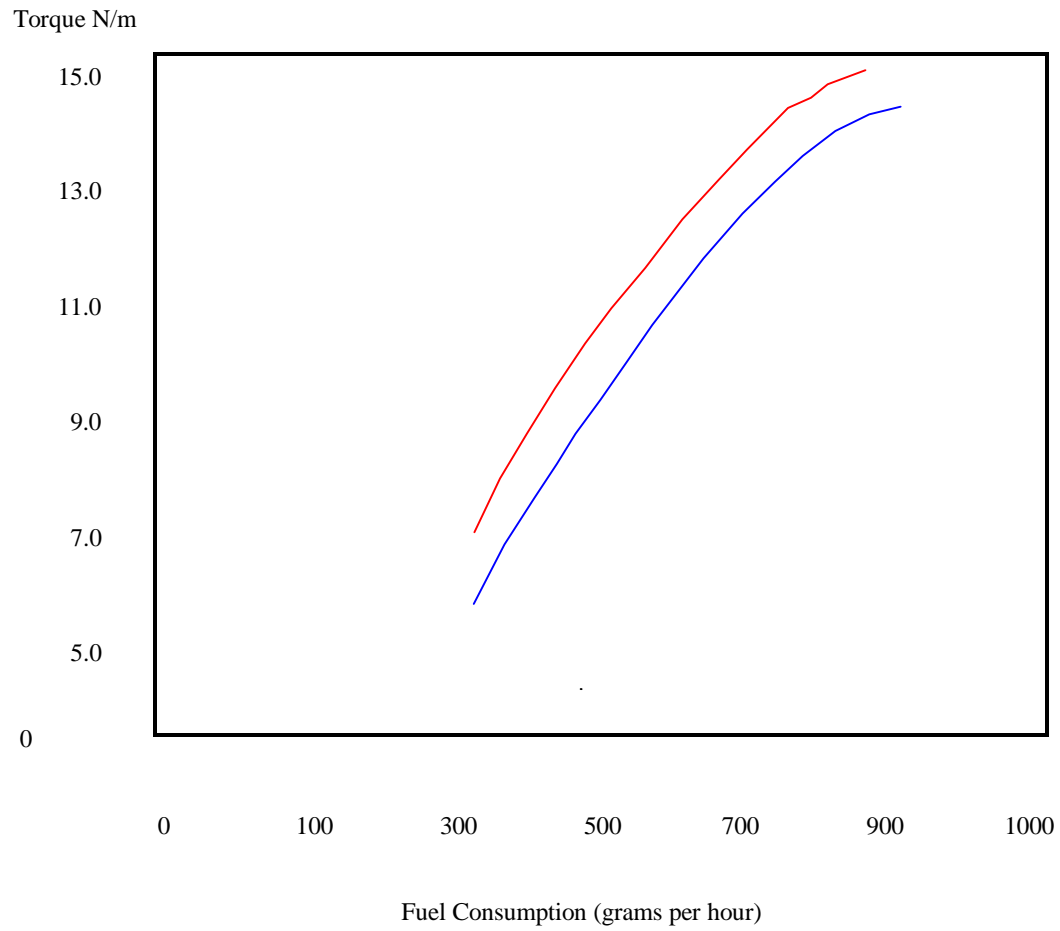
Blue line shows HC 3 without CLS at 1200rpm.

Red line showing reduction of HC after 3 hours with CLS added.

Test bench setup according to the laboratory's engine test methods.

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*CLS Diesel Additive*



Blue line: before CLS added  
Red line: 3 hours after CLS added to fuel

Test bench setup according to the laboratory's engine test methods.