BILKONSULT Cars & Tech Support

Fuel Consumption Test

Comparative test with Triboron™

performed on behalf of Triboron International AB

February 2014

1 Introduction

Triboron™ is a natural product derived from the chemical element boron (symbol B and atomic number 5). It is similar to carbon in its capability to form stable covalently bonded molecular networks. It has extremely good lubricant qualities and boric acid bonds with metal. Also, crystalline boron is chemically inert and resistant to attack by boiling hydrofluoric or hydrofluoric acid. However, elemental boron is rare and poorly studied because the material is extremely difficult to prepare. Most studies so far therefore involve samples that contain small amounts of carbon. It is only recently that the problem has been solved and Triboron International AB has discovered through extensive research how the properties of boron can be used.

Triboron is unique since one has succeeded to dissolve boron into a clear liquid with a very high concentration of boron. The fluid is stable and does not drop out and it can easily be added to fats, oils and fuels in order to receive economical, mechanical and environmental savings. Both the boric acid and the substances used to form Triboron are completely environmentally harmless and biodegradable.

When Triboron has been added in, for instance a fuel, the heat created by friction results in the creation of boric acid that starts to interact with the metal surfaces, forming a solid-lubricant boundary layer that only requires small amounts of refills to maintain its permanent perfection.

In order to establish a more comprehensive image of Triboron's effect on fuel consumption a comparative fuel consumption test has been performed in a real life driving environment by Bilkonsult Cars & Tech Support AB. This Swedish firm is a test support and vehicle analysis company with extensive experience in the vehicle testing area. The test was performed on behalf of Triboron International AB, but without any involvement during the test and data collection process.

1.1 Purpose

The purpose of the comparative fuel consumption test was to establish and measure the effect of the additive Triboron.

1.2 Method

The test has been performed in two steps. In the first step, a group of selected vehicles drive a predetermined route with their original fuel. Several factors such as fuel consumption, speed, weather conditions etc., are measured during the test. In the second step, the same vehicles drive the same route but with Triboron added to their fuel. The same factors are measured and the results in fuel consumption are then compared.

The test procedure is defined according to the best available know-how, on how to perform road based comparison tests. The test rounds are designed to represent general European driving conditions. An experienced test leader controls and manages all test rounds, vehicle checks as well as refueling and adding of Triboron. The test is managed in such a way that the average speed and driving time is the same throughout all rounds.

2 Fuel Consumption Test

2.1 Test Vehicles

The test vehicles have been selected to represent a cross-section of the vehicle population. The average fuel consumption for the test vehicles before the test was between 0,44 liters / 10 kilometers and 0,80 liters / 10 kilometers and the mileage ranged between 10,000 and 30,000 kilometers.

Car 1	Car 2	Car 3	Car 4	Car 5
MY12	MY13	MY14	MY13	MY14
Small hatchback	Small hatchback	Small hatchback	Medium station wagon	Large SUV
RWD	RWD	AWD	FWD	AWD
Diesel, 184 hp	Diesel, 109 hp	Gasoline, 254 hp	Gasoline, 135 hp	Diesel, I4 204 hp
8-speed automatic gearbox	7-speed double clutch automatic gearbox	6-speed automatic gearbox	6-speed manual gearbox	8-speed automatic transmission

All vehicles were garaged in a heated location (in order to avoid cold starts) and had the same starting temperature for all test rounds. Coolers and brakes were cleaned before each test drive. Tire pressure, oil and fluids etc. were controlled before and during the test drives.

2.2 Test Drivers

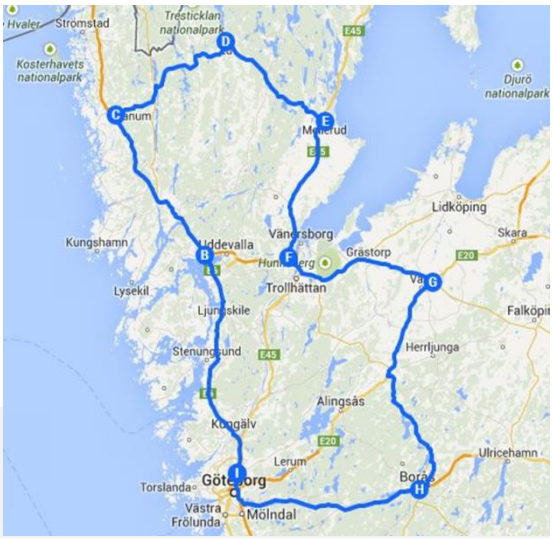
The test drivers consisted of a mix of very experienced drivers and drivers with less driving experience.

- *Driver A:* Advanced automotive test driver, male, 52 years (test leader)
- *Driver B:* Advanced automotive test driver, male, 51 years
- *Driver C:* Normal experienced driver, male, 34 years
- *Driver D:* Normal driver, female, 28 years
- *Driver E :* Normal driver, female, 26 years

2.3 Test Route

The test route was designed to reflect a normal European driving environment and consisted of highway driving, country road driving, and mountain road driving as well as driving in city areas.

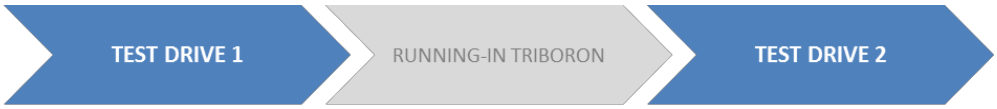
Road type	Share of route
Highway	53%
Country roads	23%
Mountain roads	19%
Urban driving	5%



- *Total driving distance:* 469 kilometers
- *Total driving time:* 6 hours (plus / minus 4 minutes)
- *Average speed:* 78,2 km/h

2.4 Test Procedure

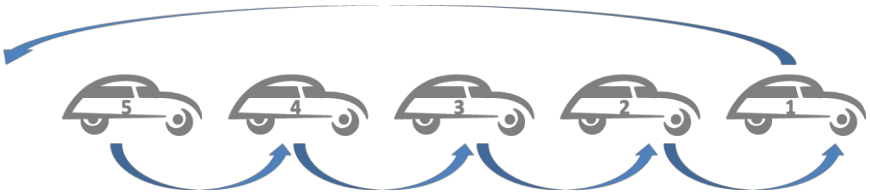
The test was conducted in two steps. Each step consisted of a driving distance of approximately 10,000 km with a running-in period for Triboron of approximately 15,000 km in between.



Average temperature: 5,3˚ C
Road conditions: Wet/Dry

Average temperature: 1,5˚ C
Road conditions: Wet

All five test vehicles were driven in a trailing row and changed places on a regular basis, i.e. all vehicles have been in all places.



All drivers have driven all vehicles during all rounds in order to eliminate the effect of driving habits.

All tests were performed under similar road and weather conditions (between +1˚C and +6˚C). However, the average temperature for the second step (with Triboron) was 3,8 ˚C lower than in the first step.

A total of 40 test drives were performed (20 in the first step without Triboron and 20 in the second step with Triboron).

2.5 Fuel and Triboron Additive

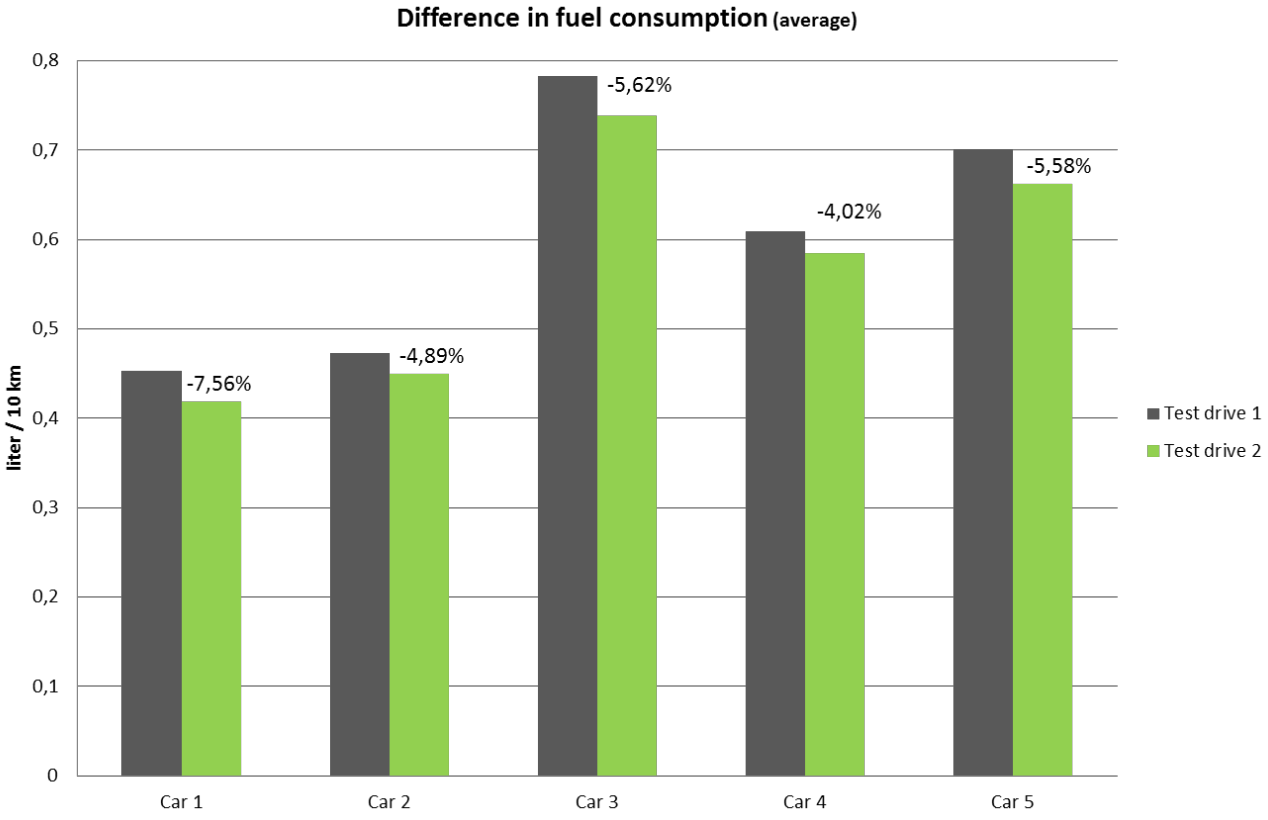
All vehicles have used the fuel specified for each model. All fueling have been done at the same gas station (Preem), using the same diesel and gasoline pumps. For more information regarding fuel specifications, see appendix.

The Triboron additive was delivered directly from the manufacturer and added according to instructions, by the same person using a dropper.

3 Test Results

All test drives showed reduced fuel consumption with the additive Triboron for all cars. The average reduction in test drive 2 was -5,53% (-0,0330 liter / 10 kilometer).

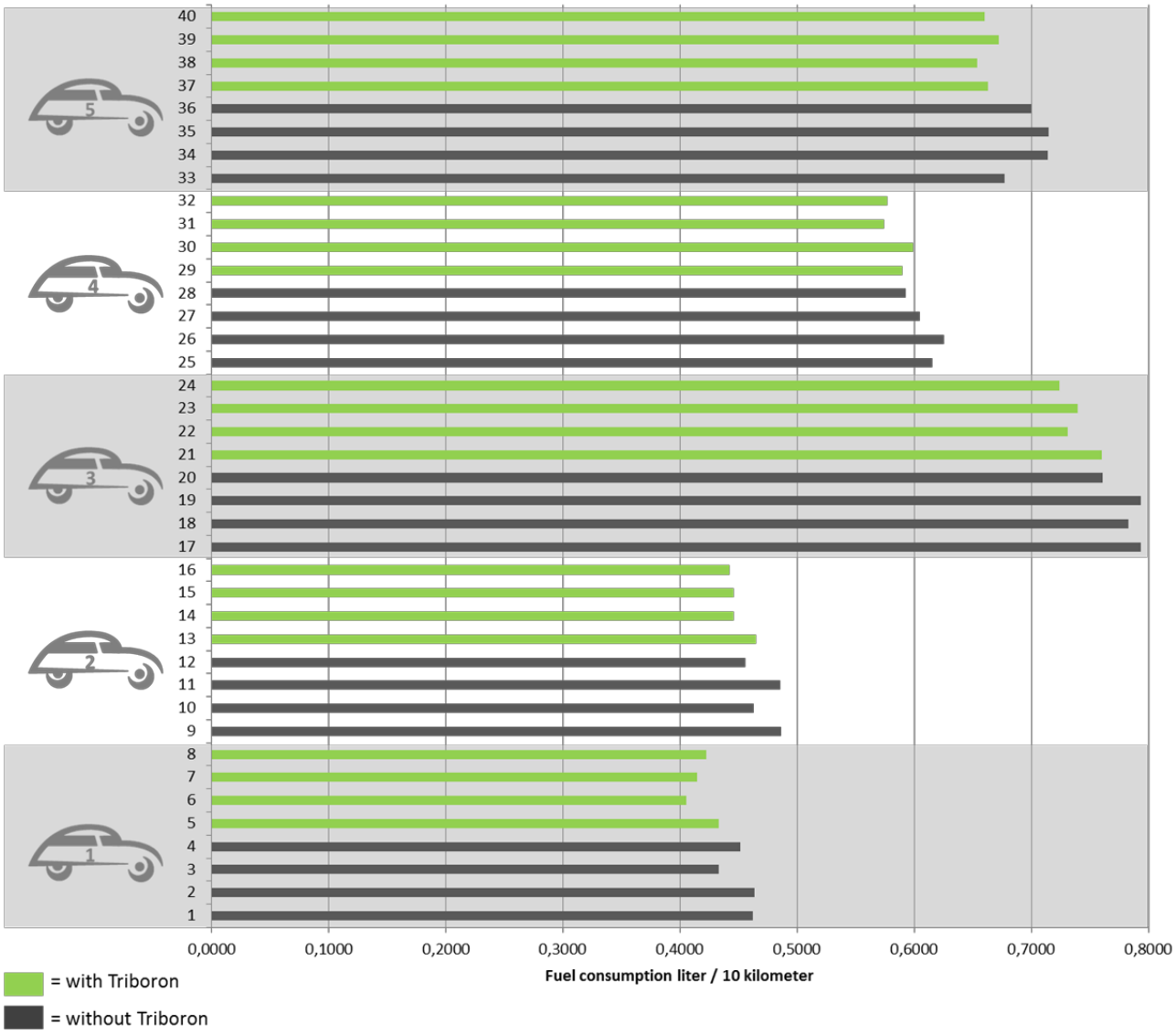
	Average consumption (liter/ 10 km)					
	Car 1	**Car 2**	**Car 3**	**Car 4**	**Car 5**	**Average**
Test drive 1	0,4526	0,4725	0,7824	0,6092	0,7011	0,6036
Test drive 2	0,4184	0,4494	0,7384	0,5847	0,6620	0,5706
Difference in fuel consumption (l/10 km)	*-0,0342*	*-0,0231*	*-0,0440*	*-0,0245*	*-0,0391*	-0,0330
Difference in fuel consumption (%)	*-7,56%*	*-4,89%*	*-5,62%*	*-4,02%*	*-5,58%*	-5,53%



The reduction in fuel consumption was on average a bit larger for the diesel cars:

Average reduction in fuel consumption (%)	
Diesel	-6,01%
Gasoline	-4,82%

Result test by test:



Conclusions

The additive Triboron had a reducing impact on the fuel consumption for all vehicles, regardless of brand, model and fuel type. This was despite the fact that the average temperature was lower in the test where Triboron was added. These tests also indicate a larger effect of Triboron on diesel cars than gasoline cars.

Appendix

Fuel Specifications

Produktinformation
Bensin

Bensin 95 E5, Bensin 98

Användningsområde
Miljöklass 1 Bensin som ger optimal effekt i motorn och ger rätt prestanda och livslängd samt möjliggör effektiv avgasreningsteknik.

Bensin 95 och Bensin 98 är avsedda för motorfordon försedda med katalysator för avgasrening samt motorer utan katalysatorer som behöver blyersättningsmedel. För motorer som behöver blyersättning finns det att tillgå på Preems stationer. Bensin 95 och Bensin 98 är ej avsedda för flygmotorer.

Vid val av bensinkvalitet, följ alltid motortillverkarens rekommendation av kvalitet och oktantal.

Egenskaper
Bensin 95 MK1 och Bensin 98 MK1 är bensinkvaliteter för 2- och 4-takts bensinmotorer och har egenskaper som vid förbränning ger minimala sotbeläggningar i förbränningsrummet.
Låg svavelhalt i produkterna har positiv påverkan på katalysatorns funktion och livslängd. Bensin 95 E5 innehåller max 5% etanol som minskar utsläpp av fossilt koldioxid samt ger lägre utsläpp av miljö- och hälsoskadliga ämnen.

Bensin 98 oktan kan innehålla upp till 5 % etanol.

Lagring
Lagring skall ske i, för lagring godkända cisterner. Ljusgenomsläppliga cisterner skall ej användas för att säkerställa att produktkvaliteten ej försämras.

Egenskaper	Enhet	Svensk standard SS-EN 228:2013	Typiska analysdata *
		95 / 98 oktan	95 / 98 oktan
Oktantal, Research		min 95,0 / 98,0	95,2 / 98,2
Oktantal, Motor		min 85,0 / 87,5	85,1 / 88,0
Densitet vid 15 °C	kg/m^3	720,0-775,0	745 / 750
Etanol	vol-%	max 5.0	ca 4,95 / 0
Svavelhalt	mg/kg	max 10,0	< 1
Manganhalt	mg/l	max 6,0	< 2
Bensenhalt	vol-%	max 1,00	ca 0,8
Aromathalt	vol-%	max 35,0	ca 34
Olefinhalt	vol-%	max 18,0	2,5-8
Destillation:			
Förångat vid 100 °C			
- Sommar	vol-%	47-71	52-63
- Vinter	vol-%	50-71	54-65
Slutkokpunkt	°C	max 205	175-195
Ångtryck vid 37,8°C			
- Sommar	kPa	45-70	69
- Vinter	kPa	65-95	94
Värmevärde, effektivt	MJ/kg	-	43,2 / 43,7
Energiinehåll	kWh/liter	-	8,94 / 9,10

* Med typiska analysdata menas vilka normala analyserade värden produkten har under en längre tidsperiod. Variationer förekommer, men produkten uppfyller alltid gällande bränslestandard.

Artikelkod: 01230 (bensin 95 E5), 02814 (bensin 98) **Utgåvedatum:** 2012-03-08 **Upplysningar telefonnr:** 020-450 450

preem

Produktinformation
Diesel

ACP Evolution Diesel MK1 max 7% RME
sommar/vinter

Egenskaper
ACP Evolution Diesel är en miljöklass 1 diesel som ger minskade utsläpp av fossil koldioxid genom att den delvis är tillverkad av förnybar råvara.

ACP Evolution Diesel tillverkas genom hydrering. Den förnybara råvaran omformas i hydrerings- processen till kolväten vars egenskaper är lika med kolväten i fossil diesel. Den förnybara råvaran samprocessas med fossil råvara till den färdiga produkten.

I ACP Evolution Diesel låginblandas därtill RME (rapsmetylester) som också ger minskat utsläpp av fossil koldioxid.

ACP Evolution Diesel håller bränsleinsprutnings-systemet (injektorerna) rena från beläggningar så att optimal bränsleinsprutning uppnås. God tändvillighet och goda förbränningsegenskaper ger låga nivåer av miljö- och hälsoskadliga avgasemissioner, samt minimala avlagringar i förbränningsrummet.

Produkten har bra smörjande egenskaper som skyddar bränsleinsprutningssystemet mot slitage.

Produkten uppfyller Svensk standard för dieselbränsle, SS 15 54 35, miljöklass 1 samt europastandarden för dieselbränsle, EN590. Räknas till brandfarliga vätskor Klass 3. Ingående RME uppfyller kraven enligt Svensk standard SS-EN 14214 för FAME[1)].

Användningsområde
ACP Evolution Diesel är avsedd för lätta och tunga dieselmotorer, såväl gamla som nya. Det behövs inga justeringar av motorn för att köra på ACP Evolution Diesel och den kan blandas med andra produktkvaliteter på samma sätt som helt fossil miljöklass 1-diesel.

Lagring
Lagring av all diesel skall ske i, för lagring godkända cisterner. Ljusgenomsläppliga cisterner skall ej användas för att säkerställa att produktkvaliteten ej försämras. Vid lagring av dieselbränsle är det viktigt att utföra regelbunden vattenkontroll i cistern för att minska risk för eventuell tillväxt av mikroorganismer. Lagringstiden för dieselbränsle med inblandning av RME bör inte vara längre än 1 år.

[1)]FAME är samlingsnamn för fettsyrametylestrar varav RME är den vanligaste som används på den svenska marknaden.

Egenskaper	Enhet	Svensk Standard SS 15 54 35	Typiska analysdata *
Cetanindex		min 50,0	57
Viskositet vid 40°C	mm^2/s (cSt)	1,40-4,00	2,3
Densitet vid 15°C	kg/m^3	800,0-830,0	ca 825
Svavelhalt	mg/kg	max 10,0	< 2
Filtrerbarhet, CFPP			
sommar	°C	-5** / -10***	-12
vinter	°C	-26	-27
Grumlingstemperatur			
sommar	°C	0	-9
vinter	°C	-16	-25
Begynnelsekokpunkt		min 180	188
95% överdestillerat vid	°C	max 340	323
Flampunkt	°C	min 56,0	61-71
Aromathalt	vol-%	max 5,0	< 4,8
PAH (polycykliska aromater)	vol-%	max 0,02	< 0,02
Total förnybar andel	%	-	ca 35 (s); ca 10 (v10); ca