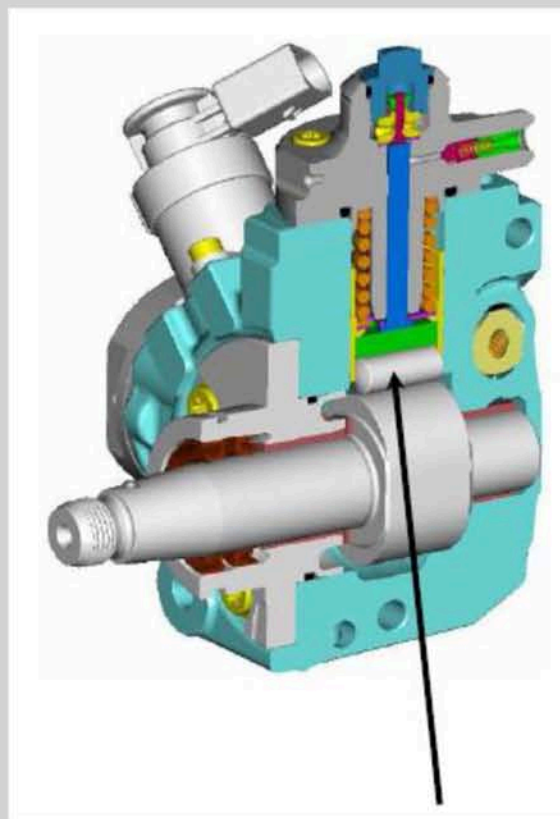


# Audi - Bosch reliability program

INFORMATION Redacted PURSUANT TO THE FREEDOM OF INFORMATION ACT (FOIA), 5 U.S.C. 552(B)(6)

## CP4 diesel high-pressure fuel pump in CR injection systems from 1800 bar (EU5)



The “sensitive heart” of the pump is the drivetrain with:

- roller
- roller support
- twin camshaft

For the entire life span and under all operating conditions, the roller must:

- slide easily within the roller support (C coating)
- roll over a very slippery cam without slippage

If these conditions are not met, **drivetrain damage** will occur with:

- **sluggishness** of the roller in the roller support due to manufacturing variances (largely eliminated).
- **critical fuel qualities** in various markets worldwide, although the fuel properties that result in damage have not been analytically proven to date:

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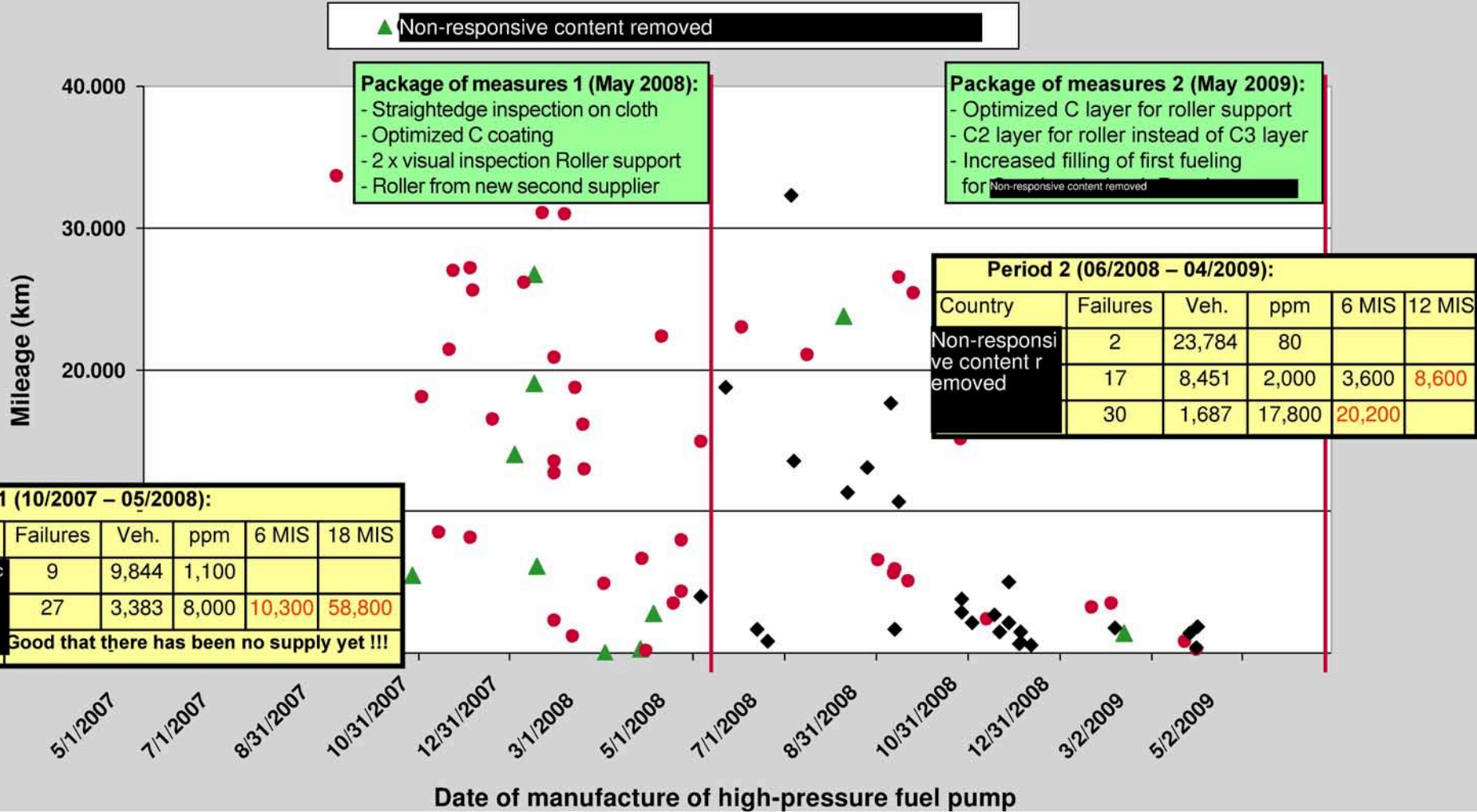
-

left roller tappet



# Audi - Bosch reliability program

Field failures V6 diesel high-pressure fuel pump CP4.2 - Non-responsive content removed



TOP meeting on 9/24/2009



# Audi - Bosch reliability program

## CP4 diesel high-pressure fuel pump in CR injection systems from 1800 bar (EU5)

### Summary:

Global settlements Audi MY2008 – MY2010 (Date: 09/09/2009):

V6-TDI: 394 cases

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7.0 DC / 1,000 veh.(22 MIS)

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R4-TDI: 193 cases

3.0 DC / 1,000 veh.(xx MIS)

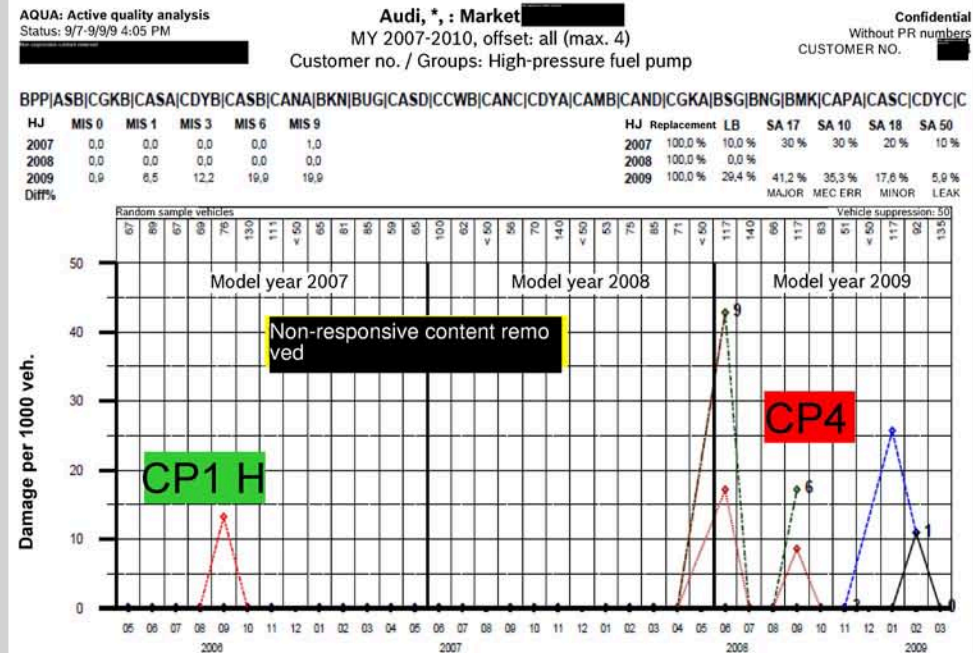
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### Pump robustness:

In comparison with the previous pump types CP1H and CP3 with eccentric drive / polygonal drive, the CP4 with roller / cam drive is not sufficiently robust for the worldwide fuels.

### Recommended decision:

The CP4 is to be developed for a “defined poor quality fuel” so that all release tests currently passed with normal fuel EN590 will also be passed with this special fuel. **Define anti-wear measures and immediately start a corresponding test program.**



**Status V6-TDI Bin5 – MY09 / MY10**  
**Failure of HPP in EC ER**

**WK 37/09**

**V6-TDI – Bin5 MY09/10****WK 37/09****HPP failures****▶ New vehicles**

1 Q7 MY09      USA market – California      Mileage: 1,750 mls

1 Touareg MY09      Non-responsive content removed      Mileage: 4,932 mls

**Analysis:** A visual inspection reveals chips in the high-pressure fuel pump and MU  
Detailed analysis at Bosch

GQ

**Special meeting to discuss the results of dismantling audit CP4.X on 09.11.09 in Győr.  
Board meeting between Bosch / Audi, 09.24.09.**

**▶ EC ER**

1 Q7 AU716 90229 MY10      Mileage: 89,543 mls (144,075 km)

The vehicle comes from batch 1 Bin5 MY09 and was converted to MY10.

Drive profile: [REDACTED]:      mixed drive operations  
USA:      Cold test in [REDACTED], hot test APG until failure

**Analysis:** A visual inspection reveals chips in the high-pressure fuel pump and MU  
HPP to be sent to Bosch for detailed in analysis in WK 38/09  
Fuel filter and fuel sample, tanks sent for analysis to NSU laboratory

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**V6-TDI – Bin5 MY09/10****WK 37/09****Vehicle:** Q7 AU716 90229 MY10

Mileage: 89,543 mls (144,075 km)

The vehicle comes from batch 1 Bin5 MY09 and was converted to MY10.

Drive profile: ■■■■

Mixed drive operations

USA:

Cold test in ■■■■ hot test APG until failure

**Problem:** Loss of power while driving on the highway  
 Engine will not start after ignition replaced.

**Analysis:** A visual inspection reveals chips in the high-pressure fuel pump and MU (metering unit)

HPP date of manufacture: Feb 09 from **prototyping**

The fuel filter has been maintained according to the maintenance interval:

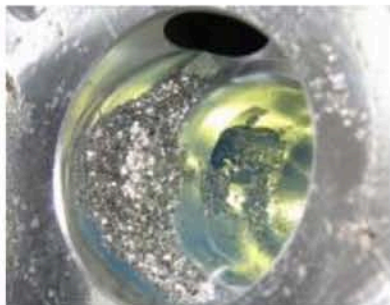
- Fuel filter replaced at 116,842 km, filter drained at 131,631 km

**Further action:**

HPP to be sent to Bosch for detailed in analysis in WK 38/09

Fuel filter and fuel sample, tanks sent for analysis to NSU laboratory

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# V6-TDI – Bin5 MY09/10

## Backup

WK 37/09

**V6-TDI – Bin5 MY09/10****WK 37/09****HPP failure in EC ER MY09 (Nov. 08)****Vehicle:** Q7 AU716 E218 MY09 Mileage: 101,000 mls (162,000 km)

Drive profile: ■ Mixed drive operations

USA: Cold test in ■ hot test APG

**Problem:** FSP entries due to variation in rail pressure

When the engine was analyzed, chips were found in the MU

0445B20169\_07 782-4254 (process 2008-CP4\_0897) DNA no. 2826

**Result of the HPP analysis at Bosch:**

- Drivetrain damage
- Particles in the high-pressure fuel pump and MU
- “Old” version of HPP
- Heavy chipping on cam track
- both roller supports feature damage to the middle of the C coating and are turned 90°
- Deposits(probable corrosion on cam track(also exposed areas and in IV holes / on IV
- > Assumption: Failure due to water in diesel

**Measures:**

Robustness checks at Bosch using non-standard diesel fuels

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Date: 9/25/2009 12:57:50 PM  
Subject: Fuel samples for HPP failures EC ER USA

Hello [Redacted]

Attached please find the photos for the fuel sample from the fuel filters, as well as the associated data

1 veh. Q7 MY10 AU71 [Redacted]

HPP failure after 141,925 km

0 445 010 613  
CR/CP4S2/R75/40  
059 130 755 AG  
01 080428 BPT 0876

0001

Drive profile: NK6 48,907 km    KL1 20,202 km

KL4 28,623 km  
WL1 44,988 km

2 veh. Q7 MY10 AU716 90229

HPP failure after 144,075 km

0 445 B20 169-20  
CP4.2HS-747-2x5 525-REC  
059 130 755 AL  
00 000982 BPT 4185

0000

[Redacted] please send on the detailed drive profile. Thank you  
The samples will be sent to our laboratory for analysis.

One sample is prepared for Bosch and can be brought along on Monday to the CP4 meeting.

Please let me have some feedback about the results of the findings in relation to the failed pumps and similar pumps because we have to report to the damage group next Monday week 40.

Thank you.

With best wishes

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AUDI AG

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Sitz/Domicile: Ingolstadt  
Registergericht/Court of Registry: Local District Court Ingolstadt  
HRB Nr./Commercial Register No.: 1  
Vorsitzender des Aufsichtsrats/Chairman of the Supervisory Board: Martin Winterkorn Vorstand/Board of Management: Rupert Stadler (Vorsitzender/Chairman), Ulf Berkenhagen, Michael Dick, Frank Dreves, Peter Schwarzenbauer, Axel Strotbek, Werner Widuckel  
Wichtiger Hinweis: Die vorgenannten Angaben werden jeder E-Mail automatisch hinzugefügt und lassen keine Rückschlüsse auf den Rechtscharakter der E-Mail zu.  
Important Notice: The above information is automatically added to this e-mail. This addition does not constitute a representation that the content of this e-mail is legally relevant and/or is intended to be legally binding upon AUDI AG.

> >From: [Redacted] Non-responsive content removed

>Sent: Friday, September 25, 2009 1:32 PM  
>To: [Redacted]  
>Subject: >

>  
>  
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>AUDI AG  
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>  
>Sitz/Domicile: Ingolstadt  
>Registergericht/Court of Registry: Local istrict Court Ingolstadt >HRB Nr./Commercial Register No.: 1

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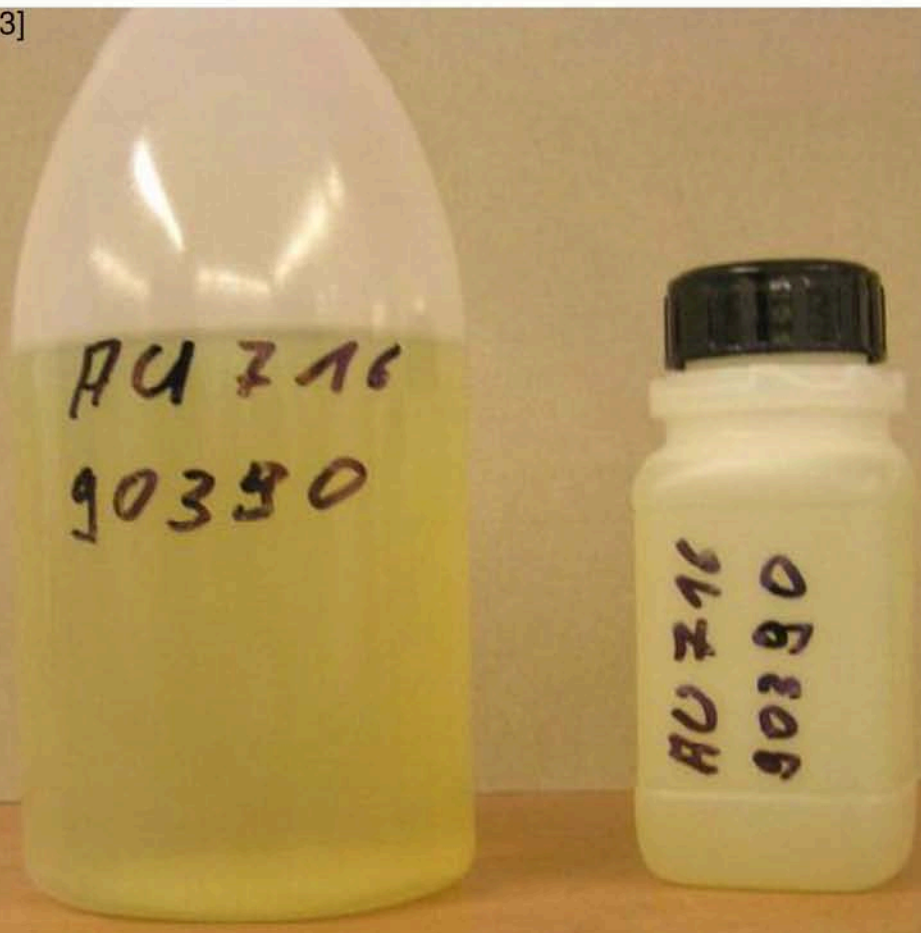
> Aufsichtsratsvorsitzender/Chairman of the Supervisory Board: Martin Winterkorn  
> Vorstand/Board of Management: Rupert Stadler (Vorsitzender/Chairman), Ulf Berkenhagen, Michael Dick, Frank Dreves, Peter Schwarzenbauer, Axel Strotbek, Werner Widuckel  
> >Wichtiger Hinweis: Die vorgenannten Angaben werden jeder E-Mail automatisch hinzugefügt und lassen keine Rückschlüsse auf den Rechtscharakter der E-Mail zu.

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AUDI AG.





EA11003EN-01080[3]



**V6-TDI Bin5 – MY09 / MY10**

**WK 42/09**

**Trouble ticket – Failure of high-pressure fuel pump in EC ER**

**V6-TDI – Bin5 MY09/10****WK 42/09****Trouble ticket - High-pressure fuel pump EC ER Q7 3.0l TDI Bin5****Vehicle 1:** Q7 AU716 90390 MY10 (Engine CAT 582) Mileage: 88,427 mls (141,925 km)

Drive profile: NK6 48.907 km, KL1 20.202 km, KL4 28.623 km, WL1 44.988 km

**Problem:** The high-pressure fuel pump does not build up pressure.**Analysis:** Visual check reveals chips in high-pressure fuel pump HPP and metering unit MU. The maintenance intervals of the fuel filter has been observed.

Visual check of fuel in fuel filter indicates no water deposits

Fuel sample: Lubricity HFRR=549 OK (Anti Wear Package)

Water content OK (35 mg/kg), no FAME

**Analysis by Bosch:** Date of manufacture 04/2008 (prior to introduction of the “straightedge test”)

Failure of the high-pressure with drivetrain damage (see 3-4):

- Circumferential abrasive wear on cam track and roller
- Large areas of C coating in roller support worn
- Slight signs of corrosion

“Cause no longer apparent, indicators of periods of use with water in fuel”

**Further action:**

Diagnostic meeting Audi / Bosch

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**WK 43**

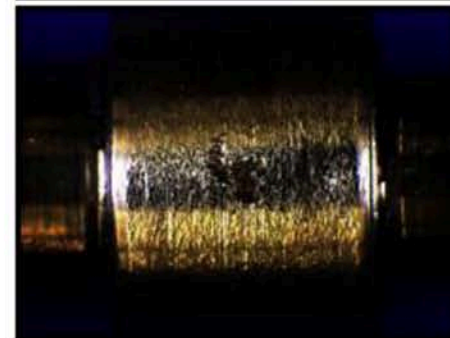
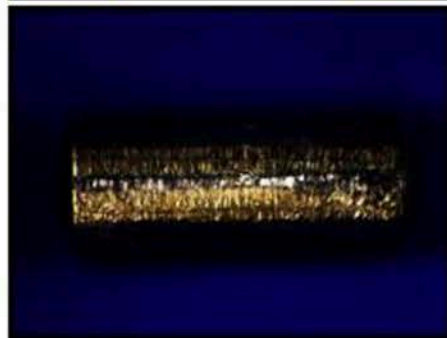
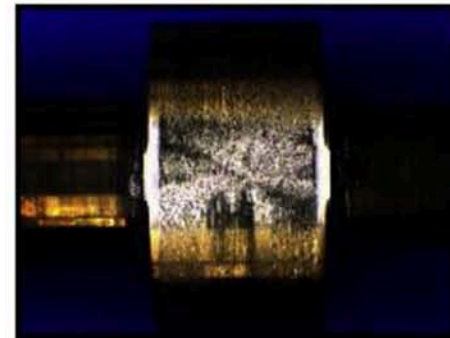
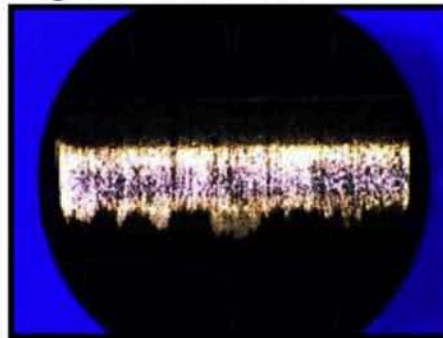
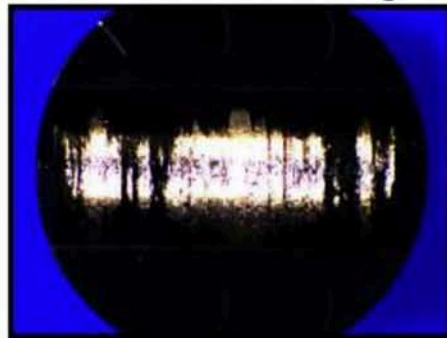
## V6-TDI – Bin5 MY09/10

WK 42/09

### Trouble ticket - High-pressure fuel pump EC ER Q7 3.0l TDI Bin5

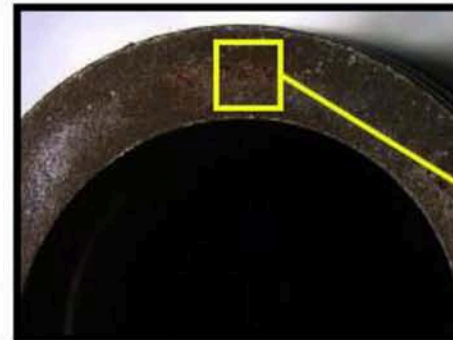
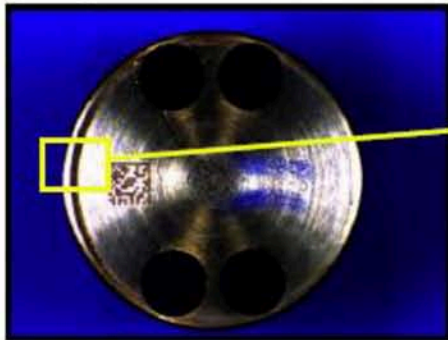
**Analysis by Bosch:** Q7 AU716 90390 MY10 (Engine CAT 582)

- Standard pump 0445010613
- Date of manufacture 04/2008 (i.e. before the introduction of the straightedge test and further quality improvement measures with respect to metal splashes / fusing on the roller or roller support)
- Drivetrain damage category I
- Circumferential abrasive wear and fatigue on cam track and roller
- Large areas of C coating in roller support worn

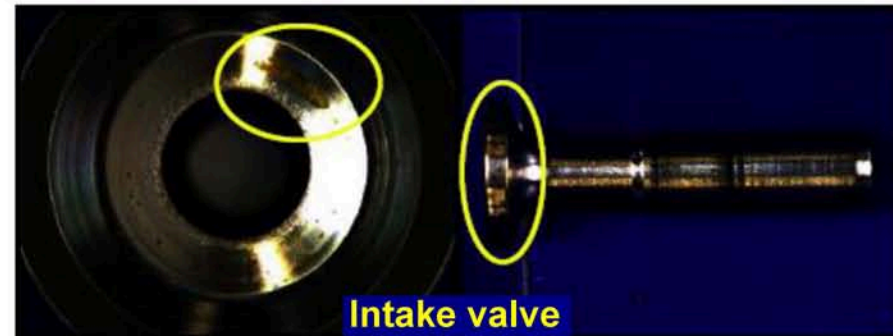


**V6-TDI – Bin5 MY09/10****WK 42/09****Trouble ticket - High-pressure fuel pump EC ER Q7 3.0l TDI Bin5****Analysis by Bosch:** Q7 AU716 90390 MY10 (Engine CAT 582)

- Little evidence of periods of use with water in fuel (corrosion)
- The advanced state of the damage means that there is no longer any possibility of identifying anything unusual about the manufacture of the roller support or roller

**Summary:**

- The cause of the damage is no longer ascertainable
- Indications of periods of use with water in fuel. Evidence is too weak to enable definite conclusions to be drawn in relation to the cause of the damage.





**V6-TDI – Bin5 MY09/10****WK 42/09****Trouble ticket - High-pressure fuel pump EC ER Q7 3.0l TDI Bin5****Vehicle 2:** Q7 AU716 90229 MY10 (Engine CAT 587)

Mileage Veh.: 89,766 mls (144,075 km)

Mileage HPP: 42,140 mls (67,635km): KL4: 29.979 km, WL1: 37,656 km

**Problem:** Loss of power while driving on the highway Engine will not start.

**Analysis:** Visual check: Chips in high-pressure fuel pump HPP and metering unit MU  
 At mileage 76,440 km, a prototype with additional robustness measures was installed (see p.6).  
 Maintenance intervals for fuel filter observed.  
 Visual check of fuel in fuel filter indicates no water deposits  
 Fuel sample: Lubricity HFRR=533 OK (Anti Wear Package)  
 Water content OK (40mg/kg), no FAME

**Analysis by Bosch:** Date of manufacture 02/2009 (**prototype with additional anti-wear measures**)

Failure of the high-pressure with drivetrain damage (see 6-7):

- Circumferential abrasive wear on cam track and roller
- Large areas of C coating in roller support worn

“Cause no longer apparent, indicators of periods of use with water in fuel”

**Further procedure:**

Blocking of additional anti-wear measures until the precise reason for the failure has been identified. Diagnostic meeting Audi / Bosch

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**WK 43****Audi**

Vorsprung durch Technik

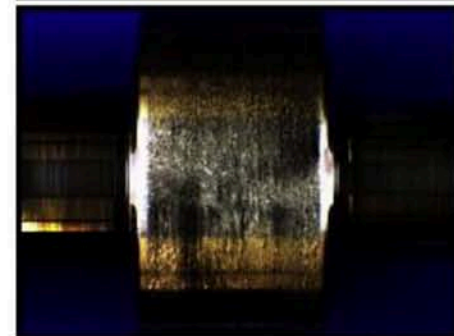
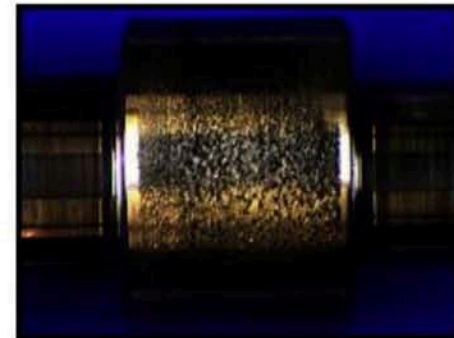
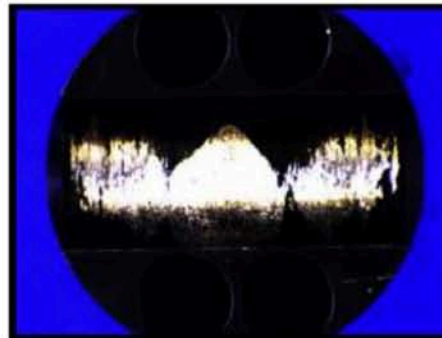
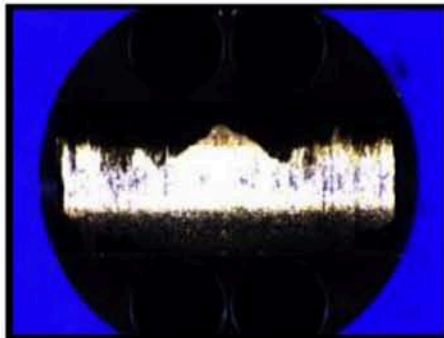


**V6-TDI – Bin5 MY09/10****WK 42/09****Trouble ticket - High-pressure fuel pump EC ER Q7 3.0l TDI Bin5****Analysis by Bosch:** Q7 AU716 90229 MY10 (Engine CAT 587)

- Sample pump 0445B20169\_20
- Date of manufacture 02/2009
- Drivetrain damage category I
- Circumferential abrasive wear on cam track and roller
- Large areas of C coating in roller support worn

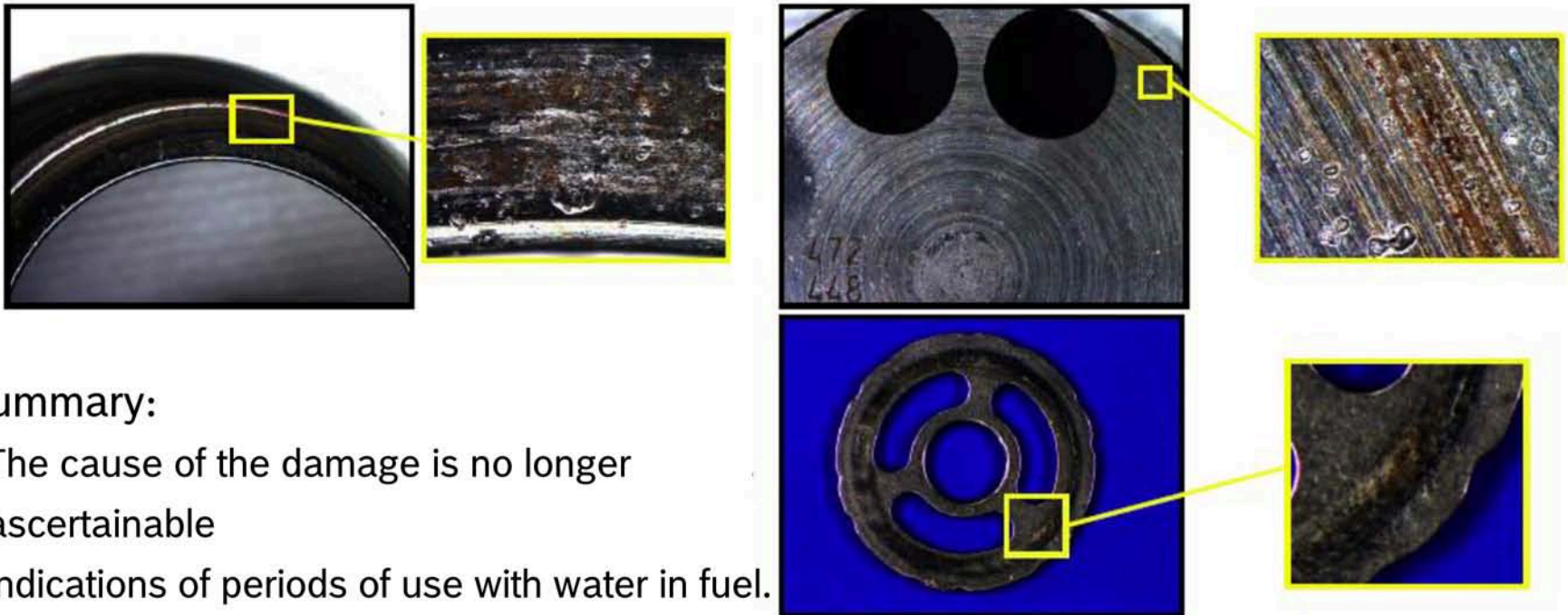
**Additional anti-wear measures:**

- Roller support with C3 layer
- Roller crests with C3 layer
- Omission of ball peening of camshaft
- Omission of anti-friction coating on spring plate
- Roller support round (instead of partly round)
- Omission of MnPh on tappet body



**V6-TDI – Bin5 MY09/10****WK 42/09****Trouble ticket - High-pressure fuel pump EC ER Q7 3.0l TDI Bin5****Analysis by Bosch:** Q7 AU716 90229 MY10 (Engine CAT 587)

- Little evidence of periods of use with water in fuel (corrosion)
- The advanced state of the damage means that there is no longer any possibility of identifying anything unusual about the manufacture of the roller support or roller

**Summary:**

- The cause of the damage is no longer ascertainable
- Indications of periods of use with water in fuel.

Evidence is too weak to enable definite conclusions to be drawn in relation to the cause of the damage.

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EA11003EN-01095[0]

**Serious problem in verification run**

**Complaint to team: A**

**from station: US**

**Vehicle class:**

**VW351**

**Breakdown**

**X**

Complaint	Note	Analysis(A), Measure (M), Deadline (T)	Status	Responsibility	Vehicle	VIN NO:	Mileage / Date
Major loss of power during shift run and flashing preheat light. Impossible to continue running, vehicle was towed back to station.	1	<p><b>A:</b>                      Analysis: Two static error memory entries in ECU regarding "status fuel rail / system pressure too low". Particles visible inside HPP, see photos. HPP data: 03L 130 755 A - BPT 1053 - CR/CP4S1/R35/20 - Bosch 0 445 010 508                      Following telephone call with [redacted] damaged part will be sent to WOB and all the spare parts required for the repair will be ordered.</p> <p><b>M:</b></p> <p><b>T:</b></p>			1K2AM006  2.0l 103 kW TDI CR BIN5  Engine no. CJA 000003  Gearbox no.:  Gearbox type: DQ250-6F	3VWJL7A13 AM0 [redacted]	132968 km 10.20.2009

**Contact person:**

[redacted]

**Tel.:**

[redacted]

Legend (Status):  
 0-Problem recorded, 1-Analysis complete, 2-Measure defined,  
 3-Measure in use, 4-Measure effective, 5-Measure ineffective, 6-Measure rejected

c.c.:

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

EA11003EN-01095[1]

**Serious problem in verification run**

Non-responsive c  
ontent removed

**Complaint to team: A**

**from station: US**

**Vehicle class:**

**VW351**

**Breakdown**

**X**

**Photos**

1K2AM006 HPP\_1

1K2AM006, 82,640 km, 10.20.2009



1K2AM006 HPP\_2

1K2AM006, 82,640 km, 10.20.2009



EA11003EN-01095[2]

**Serious problem in verification run**

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**Complaint to team: A**

**from station: US**

**Vehicle class:**

**VW351**

**Breakdown**

X

1K2AM006 HPP\_3

1K2AM006, 82,640 km, 10.20.2009



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EA11003EN-01095[3]

**Serious problem in verification run**

**Complaint to team: A**

**from station: US**

**Vehicle class:**

**VW351**

**Breakdown**

**X**

**Controllers**

Import no.	Controller no.	Controller name	Number of errors, SW status		SW status add-on	Coding
47	000001	Engine electronics	2	5146	R4 2,0L EDC G001A 50078	
	00135 000	Fuel rail / system pressure too low. Status:			static	P0087 <input type="checkbox"/> Sporadic
	00135 000	Fuel rail / system pressure too low. Status:			static	P0087 <input type="checkbox"/> Sporadic
47	000002	Transmission electronics	0	1920	GSG DSG AG6 43 20	
47	000003	Brake electronics	0	0107	ESP MK60EC1	Long
47	000008	Air-conditioning/ heating electronics	0	0203	Climatic	Long
47	000009	Central electronics	1	2019	BCM PQ35 B++	Long
	00185 012	Control relay for power supply, terminal 15, electric				<input checked="" type="checkbox"/> Sporadic
47	000015	Airbag	0	8900	04 AIRBAG VW8R 0 12340	
47	000016	Steering wheel electronics	0	0111	J0527 052	1033
47	000017	Instrument panel insert	0	0021	COMBI	27 0B 00
47	000019	Diagnostic interface for	0	0081	J533 Gateway H07	Long
47	000025	Immobilizer	0	0021	IMMO	NULL
47	00002E	Mediaplayer Position 3	0	X088	SG EXT.PLAYER	Long
47	000037	Navigation	0	0980	RNS-MID	Long
47	000042	Door electronics, driver's door	0	1519	J386 DOOR-CU DD	1205
47	000044	Power steering	0	2901	EPS_ZFLS Tmn 70	
47	000052	Door electronics, passenger side	0	1519	J387 DOOR-CU PD	1204
47	000056	Radio	0	0980	RNS-MID	Long
47	000062	Door electronics, back left	1	1401	J388 DOOR-CU BL	1168
	00934 005	Window lifter rear door left -V26 Basic setting missing/incorrect				<input checked="" type="checkbox"/> Sporadic
47	000065	Tire pressure monitoring	0	0817	RDK	Long
47	000072	Door electronics, back right	0	1401	J389 DOOR-CU BR	1168

**V6-TDI – Bin5 MY09/10****WK 42/09****1. HPP failure in EC ER Q7 3.0l TDI Bin5****Vehicle:** Q7 AU716 90229 MY10 (Engine CAT 587)

Mileage Veh.: 89,766 mls (144,075 km)

Mileage HPP: 42,140 mls (67,635km): KL4: 29.979 km, WL1: 37,656 km

**Problem:** Loss of power while driving on the highway Engine will not start.**Analysis:** Visual check: Particles in high-pressure fuel pump HPP and metering unit MU

At mileage 76,440 km, a prototype with additional robustness measures was installed (see p.6).

Maintenance intervals for fuel filter observed.

Visual check of fuel in fuel filter indicates no water deposits

Fuel sample: Lubricity HFRR=533 (EN590max=460), water OK (40mg/kg), no FAME

**Analysis by Bosch:** Production date 02/2009 (**prototype**)

Failure of the high-pressure with drivetrain damage (see 6-7):

- Circumferential abrasive wear on cam track and roller
- Large areas of C coating in roller support worn away

"Cause no longer apparent, indicators of periods of use with water in fuel"

**Further action:**

Blocking of additional robustness measures until their impact on HPP

failures has been clarified

Diagnostic meeting between Audi/Bosch

WK 43



# V6-TDI – Bin5 MY09/10 HPP failure in EC ER

WK 42/09

Vehicle: Q7 AU716 90229 MY10

Mileage: 89,543 mls (144,075 km)



## Fuel samples:

- Fuel filter
- Tank

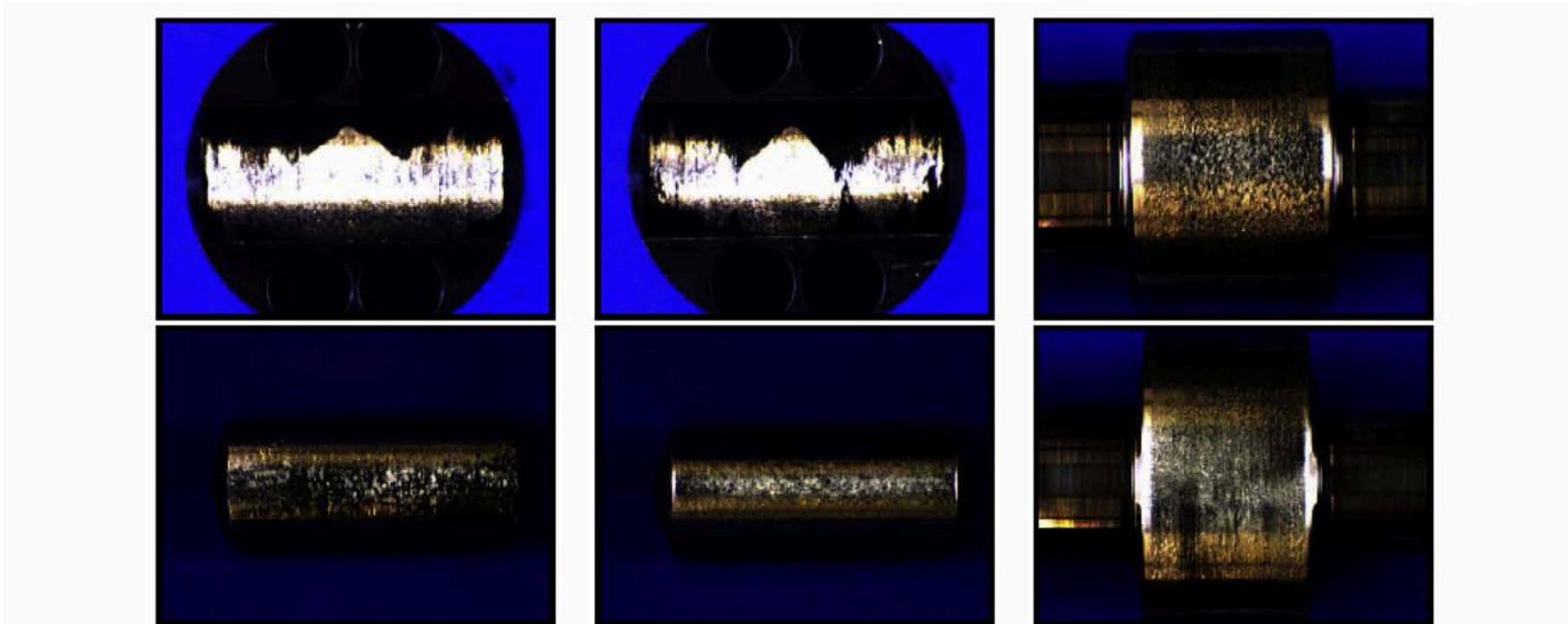


**V6-TDI – Bin5 MY09/10****HPP failure in EC ER****Analysis by Bosch:**

- Sample pump 0445B20169\_20
- Date of manufacture 02/2009
- Drivetrain damage category I
- Circumferential abrasive wear on cam track and roller
- Large areas of C coating in roller support worn

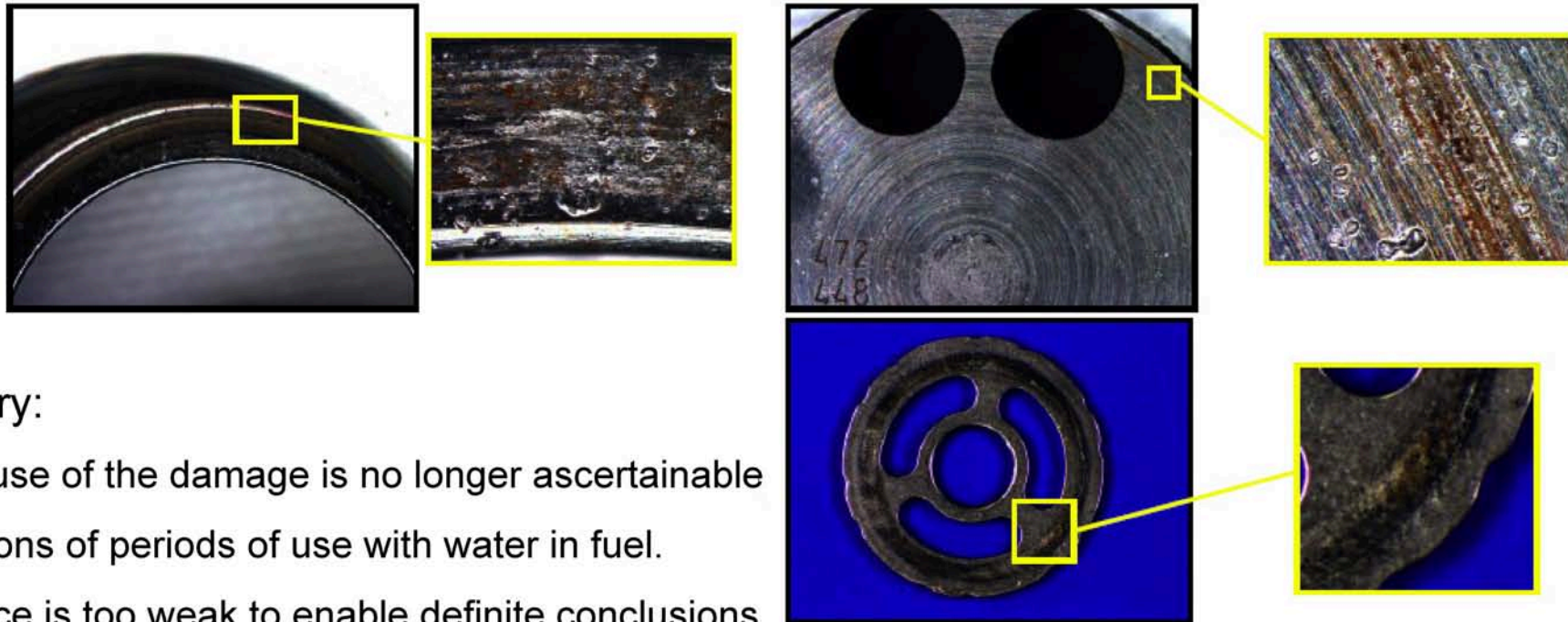
**WK 42/09****Changes to the drivetrain in comparison with series:**

- Roller support with C3 layer
- Roller crests with C3 layer
- Omission of ball peening of camshaft
- Omission of anti-friction coating on spring plate
- Roller support round (instead of partly round)
- Omission of MnPh on tappet body



**V6-TDI – Bin5 MY09/10****HPP failure in EC ER****WK 42/09****Analysis by Bosch:**

- Little evidence of periods of use with water in fuel (corrosion)
- The advanced state of the damage means that there is no longer any possibility of identifying anything unusual about the manufacture of the roller support or roller

**Summary:**

- The cause of the damage is no longer ascertainable
- Indications of periods of use with water in fuel.

Evidence is too weak to enable definite conclusions to be drawn in relation to the cause of the damage.

**V6-TDI – Bin5 MY09/10****WK 42/09****2. HPP failure in EC ER Q7 3.0l TDI Bin5**

**Vehicle:** Q7 AU716 90390 MY10 (Engine CAT 582) Mileage: 88,427 mls (141,925 km)

HPP: Date of manufacture April 08 (without straightedge test)

Drive profile: NK6 48.907 km, KL1 20.202 km, KL4 28.623 km, WL1 44.988 km

**Problem:** The high-pressure fuel pump does not build up pressure.

**Analysis:** Visual check: Particles in high-pressure fuel pump HPP and metering unit MU

Maintenance intervals for fuel filter observed.

Visual check of fuel in fuel filter indicates no water deposits.

Fuel sample: Lubricity HFRR=549 (EN590max=460), water OK (35mg/kg), no FAME

**Analysis by Bosch:** Date of manufacture 04/2008 (**before the introduction of the straightedge test**)

Failure of the high-pressure fuel pump with drivetrain damage (see pp.10-11):

- Circumferential abrasive wear on cam track and roller
- Large areas of C coating in roller support worn away

"Cause no longer apparent, indicators of periods of use with water in fuel"

**Further action:**

Diagnostic meeting between Audi/Bosch

WK 43

**V6-TDI – Bin5 MY09/10**

**WK 42/09**

**HPP failure in EC ER**

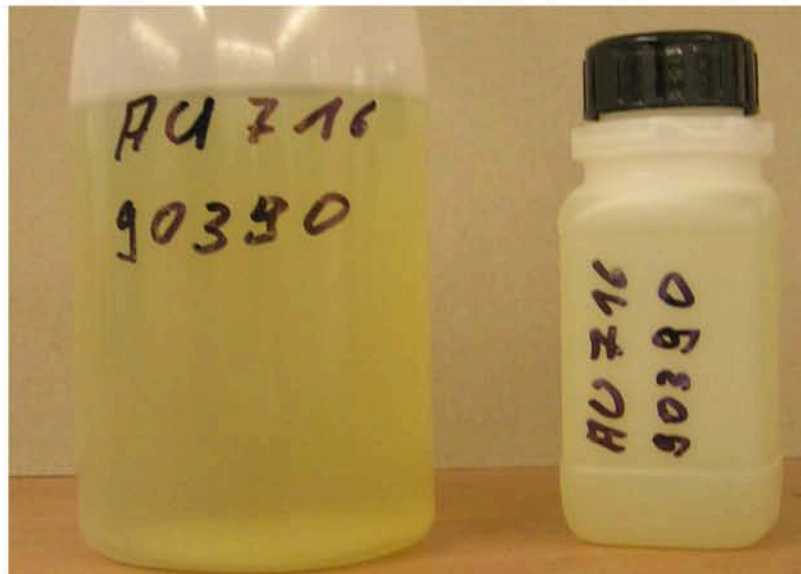
**Vehicle:** Q7 AU716 90390 MY10

**Mileage:** 88,426 mls (141,925 km)



**Fuel samples:**

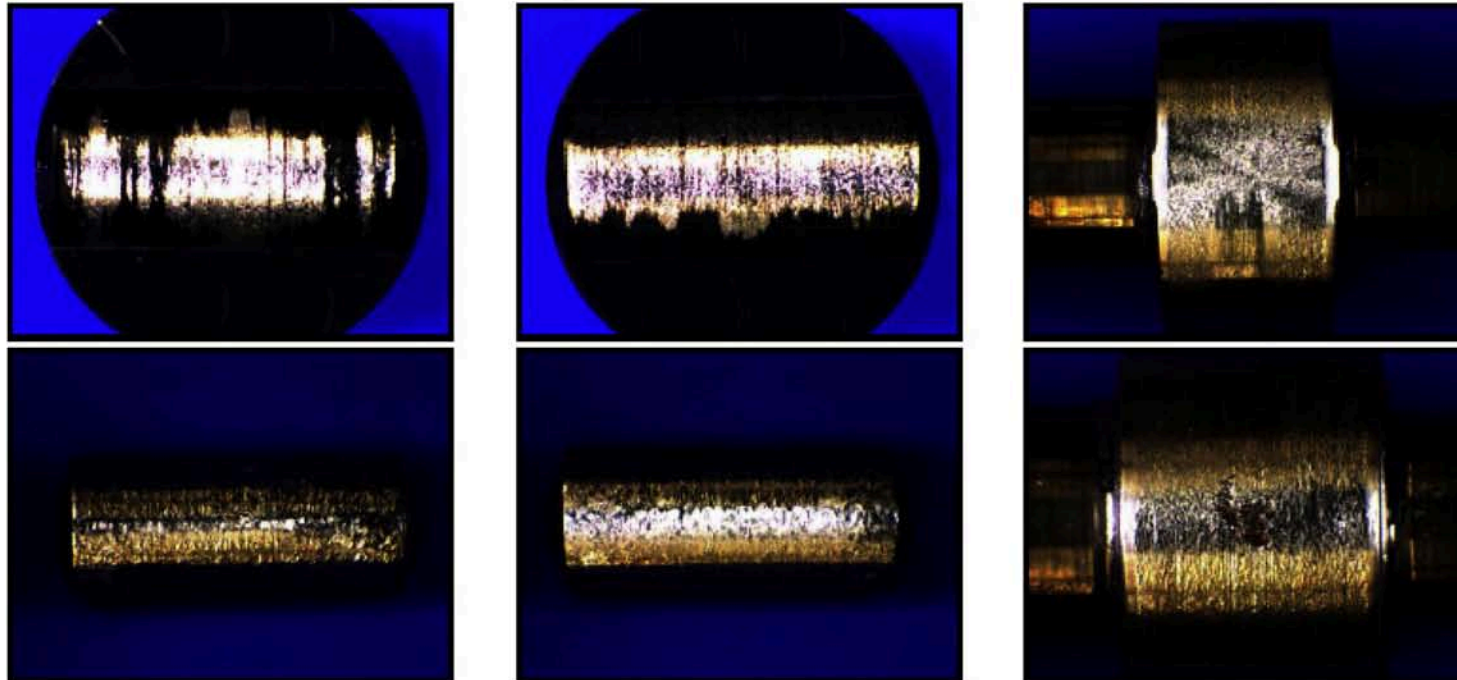
- Fuel filter



## V6-TDI – Bin5 MY09/10 Backup

WK 42/09

- Standard pump 0445010613
- Date of manufacture 04/2008 (i.e. before the introduction of the straightedge test and further quality improvement measures with regard to metal splashes / fusing on roller or roller support)
- Drivetrain damage category I
- Circumferential abrasive wear and fatigue on cam track and roller
- Large areas of C coating in roller support worn



## V6-TDI – Bin5 MY09/10 Backup

WK 42/09

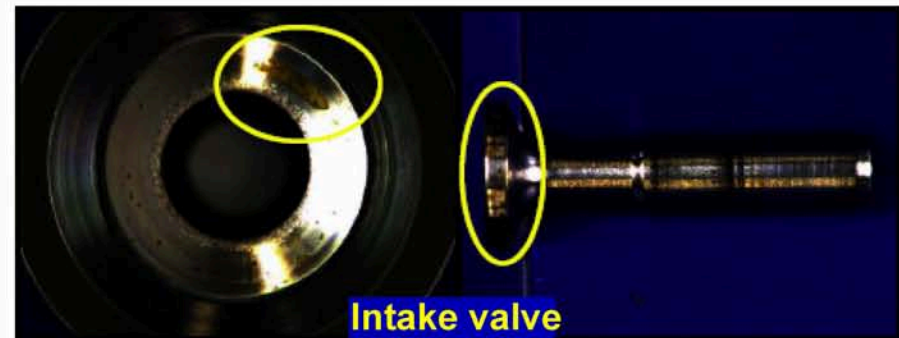
- Little evidence of periods of use with water in fuel (corrosion)
- The advanced state of the damage means that there is no longer any possibility of identifying anything unusual about the manufacture of the roller support or roller



### Summary:

- The cause of the damage is no longer ascertainable
- Indications of periods of use with water in fuel.

Evidence is too weak to enable definite conclusions to be drawn in relation to the cause of the damage.



**V6-TDI – Bin5 MY09/10****WK 42/09****HPP failure in EC ER MY09 (Nov. 08)****Vehicle:** Q7 AU716 E218 MY09 Mileage: 101,000 mls (162,000 km)

Drive profile: D: Mixed driving mode

USA: Cold test in Alaska, hot test APG

**Problem:** Error memory entries due to variation in rail pressure

When the engine was analyzed, chips were found in the MU

0445B20169\_07 782-4254 (process 2008-CP4\_0897) DNA no. 2826

**Result of the HPP analysis at Bosch:**

- Drivetrain damage confirmed
  - Particles in the high-pressure fuel pump and MU (metering unit)
  - “Old” version of HPP
  - Heavy chipping on cam track
  - both roller supports feature damage to the middle of the C coating and are turned 90°
  - Deposits (probably corrosion on cam track (also exposed areas and in IV holes / on IV
- > Assumption: Failure due to water in diesel

**Measures:**

Robustness checks at Bosch using using non-standard diesel fuels

Bosch, GQ, EA

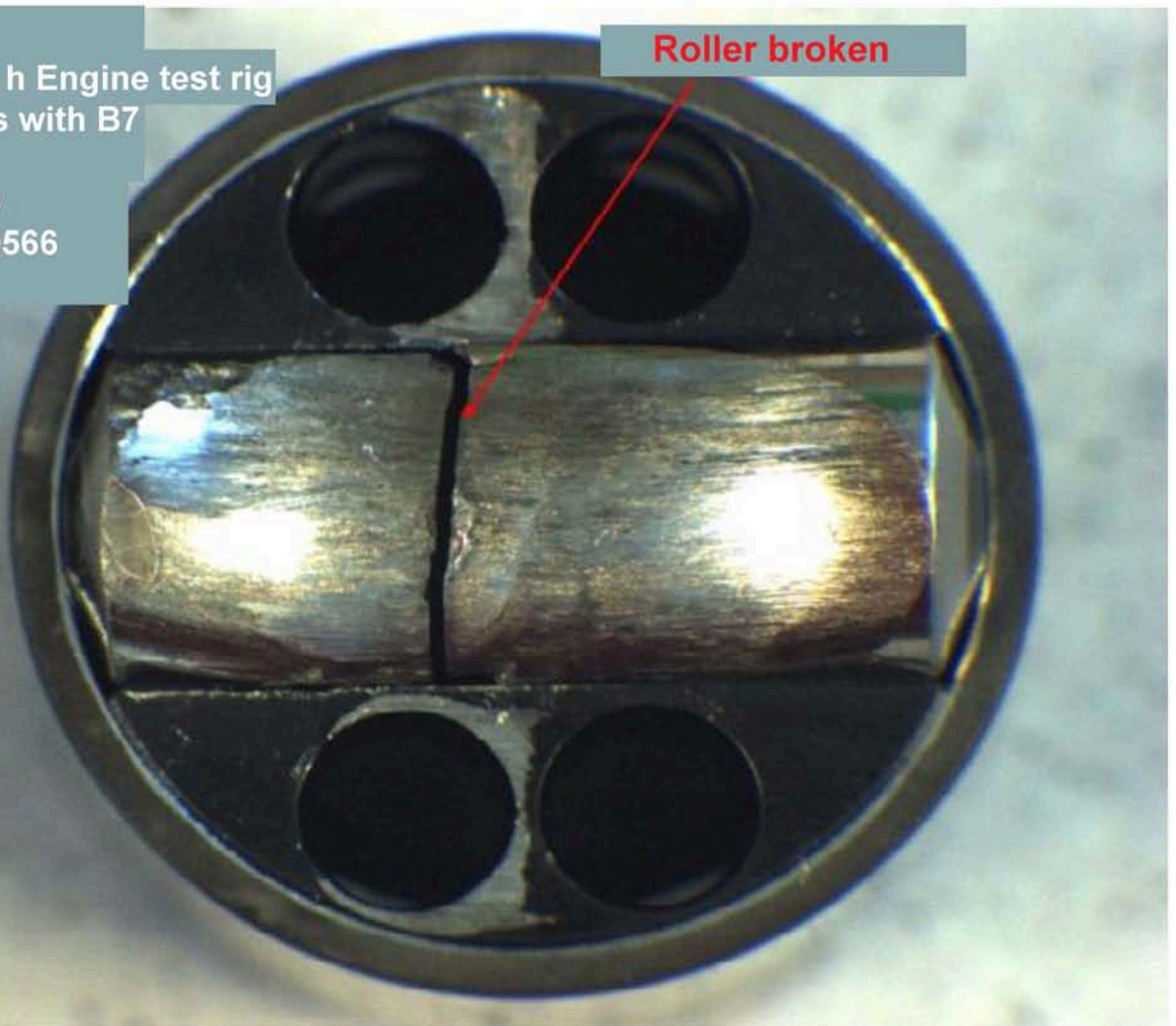


Hello [Redacted]  
I have received a CP 4.1 US07 HPP from [Redacted]  
The engine failed during testing - no building up of pressure and particles in the MU. When dismantled, there were signs of serious drivetrain damage with a broken roller.

With best wishes

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CJA0000598  
Running time: 567 h Engine test rig  
of which 230 hours with B7  
Bosch HPP CP4.1  
03L130755A ...508  
DM:220409 No.:0566

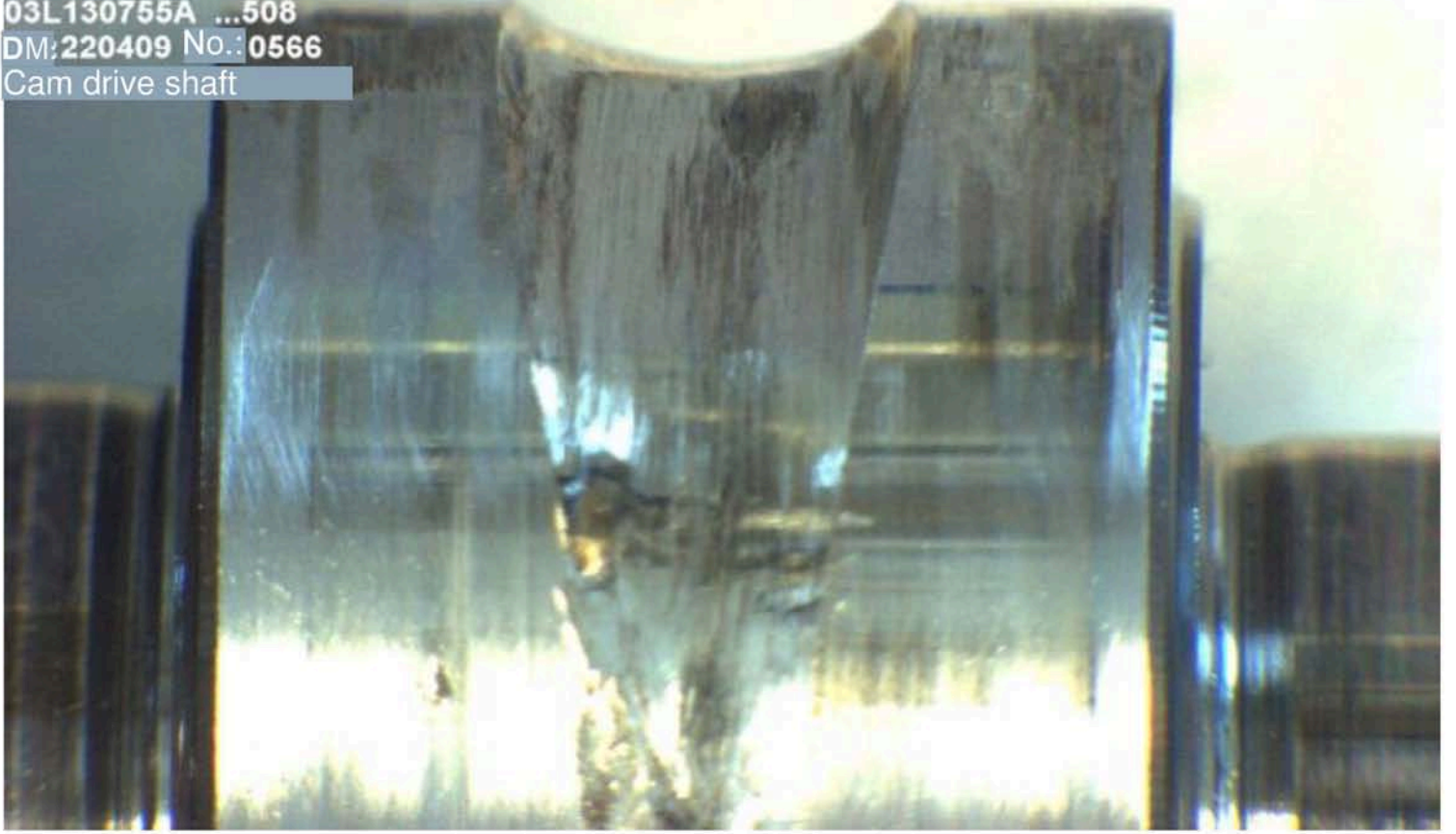


EA10005N-01098[1]  
CJA0000598

Running time: 567 h Engine test rig  
of which 230 hours with B7  
Bosch HPP CP4.1  
03L130755A ...508  
DM:220409 No.: 0566



CJA0000598  
Running time: 567 h Engine test rig  
of which 230 hours with B7  
Bosch HPP CP4.1  
03L130755A ...508  
DM:220409 No.: 0566  
Cam drive shaft



EA11003EN-01098[2]

Running time: 567 h engine test rig

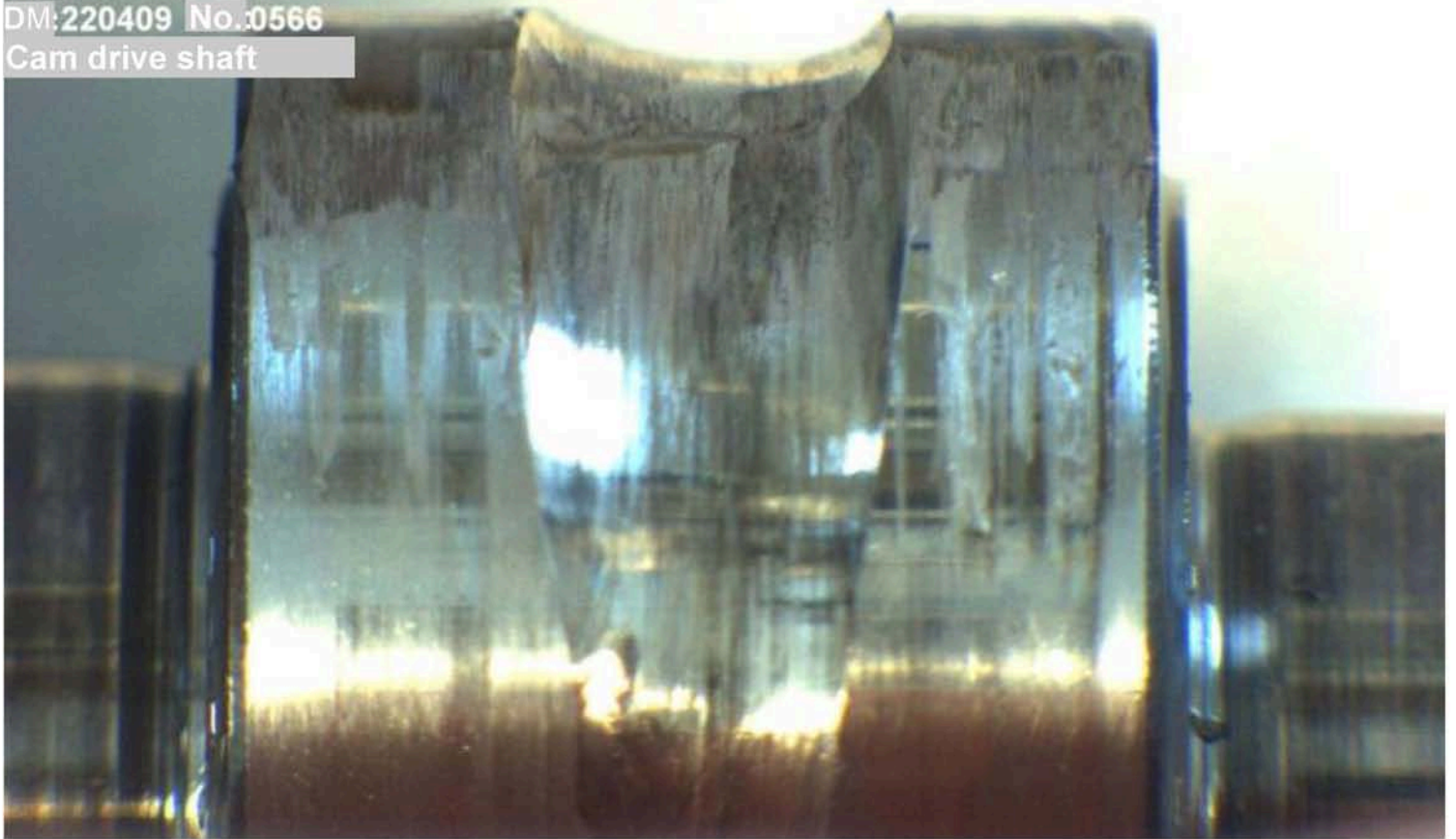
of which 230 hours with B7

Bosch HPP CP4.1

03L130755A ...508

DM:220409 No.0566

Cam drive shaft



VOLKSWAGEN



## HPP - Assessment

Manufacturer	Bosch	Date,	2/24/2010
Series	CP4.1	Handled by	
VW - Part number	03L130755A	Project	
Manufacturer - Part no. Serial no. / DM	0445010508 BPT 0566 /220409	Engine no.	CJA0000598
Drawing no./prototype.		Output:	
Change index,	0006	Fuel	
Plant	011	Fuel vehicle / test rig	Engine test rig H72a
		Running time / Operating mode	567 h VCT
Complaints / comments	Run for 230 hours with B7 - Remaining time with gas stations diesel drivetrain damage - turned tappet		

Component	Assessment		Remark
	OK	Not OK	
<b>Housing</b>			
Drive shaft		X	
Roller support		X	
Roller		X	Roller broken
Tappet hole			
HP piston			
Spring washer / anti-friction coating			
Shaft seal / seal-tightness			
Corrosion			
Bearing			
LP ports			
HP ports			
MU / MU hole			
<b>Hydraulic function</b>			
Delivery rate			
Injection pressure			
Drive power			
Seal-tightness under load			
Pressure valves			
Overflow valve			
Dirt / chips			
<b>Electrical function</b>			
Plug contacts			
MU			
<b>Remarks:</b>			

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(Fuel) Injection lab / diesel component test rig H72 A

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EA11003EN-01108[0]

**Serious problem in verification run**

**Complaint to team:** Engine from station: US

**Vehicle class:** VW526 Breakdown

Complaint	Note	Analysis(A), Measure (M), Deadline (T)	Status	Responsibility	Vehicle	VIN NO:	Mileage / Date
Vehicle's engine stopped whilst driving	1	<p><b>A:</b> Vehicle will not start. Check engine light and filament active. Vehicle will not start. Error memory entry in CU01: Fuel rail / system pressure too low. See controllers. Chips visible in the opening of the HPP sensor. See photos. 00 readout with environmental conditions see PDF.</p> <p><b>M:</b></p> <p><b>T:</b></p>			<p>VW526_B D174-0S</p> <p>3,0l 165 kW V6 TDI SCR BIN5</p> <p>Engine no. CAT 000711</p> <p>Gearbox No: MHC 130210 Gearbox type: AL1000-8A</p>	WVGFK9BP 1BD [REDACTED]	45066 km 09.15.2010

**Contact person:**

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**Tel.:**

[REDACTED]

Legend (Status):  
0-Problem recorded, 1-Analysis complete, 2-Measure defined,  
3-Measure in use, 4-Measure effective, 5-Measure ineffective, 6-Measure rejected

c.c.:

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EA11003EN-01108[2]

**Serious problem in verification run**

**GQG**

**Complaint to team:**

**Engine**

**from station: US**

**Vehicle class:**

**VW526**

**Breakdown**

**X**

**Photos**

**IMG\_0116\_60KB**

VW526\_\_BD174-0S, 28.009 km, 09.15.2010



**IMG\_0117\_60KB**

VW526\_\_BD174-0S, 28.009 km, 09.15.2010







**Serious problem in verification run**

**Complaint to team:** Engine from station: US

**Vehicle class:** VW526 Breakdown X

**Controllers**

Import no.	Controller no.	Controller name	Number of errors, SW status		SW status add-on	Coding
14	000001	Engine electronics	3	0004	3.0TDI EDC17 long	
		00145B Fuel rail / system pressure too low.				<input type="checkbox"/> Sporadic
		00146F Fuel rail / system pressure too low.				<input type="checkbox"/> Sporadic
		00145C Fuel rail / system pressure too low.				<input type="checkbox"/> Sporadic
14	000002	Transmission electronics	0	1812	AL1000 AISIN	00 13 68
14	000003	Brake electronics	0	0417	MK25A	Long
14	000005	Access and start	0	0208	BCM2 2.0	Long
14	000008	Air-conditioning/ heating electronics	1	0612	Climate 2 zones	Long
		000145 Controller for additional air heating, voltage too low				<input checked="" type="checkbox"/> Sporadic
14	000009	Central electronics	0	0083	BCM1 2.0	Long
14	000010	Park assist	0	0016	PARK ASSIST 8K	31 85 01
14	000015	Airbag	3	0020	VW10AirbagVV0	Long
		100D05 Databus received error value				<input checked="" type="checkbox"/> Sporadic
		900211 Detonator for airbag on passenger side, short circuit to ground				<input type="checkbox"/> Sporadic
		90031B Detonator 2 for airbag on passenger side, resistance too great				<input type="checkbox"/> Sporadic
14	000016	Steering wheel electronics	0	0007	Steering control module	Long
14	000017	Instrument panel insert	0	0231	COMBI	Long
14	000019	Diagnostic interface for	1	5202	GW-CAN-L-MOST	Long
		003003 Energy management active				<input checked="" type="checkbox"/> Sporadic
14	000036	Seat adjustment, drive side	1	0114	MEM-FS	Long
		01880 003 Buttons for lumbar adjustment E335, mechanical errors				<input checked="" type="checkbox"/> Sporadic
14	000042	Door electronics, driver's door	0	0158	TSG FA	Long
14	000046	Comfort central module	0	0208	BCM2 2.0	Long
14	000047	Sound system	0	0090	DSP Prem	not available



**Serious problem in verification run**

**GQG**

**Complaint to team:**

**Engine**

**from station: US**

**Vehicle class:**

**VW526**

**Breakdown**

**X**

14	000052	Door electronics, passenger side	0	0158	TSG BF	Long
14	000053	Electronic parking	1	1100	EPB	Long
	000021	Dynamic drive assist unavailable				<input checked="" type="checkbox"/> Sporadic
14	000055	Light beam regulation	0	0100	AFS-ECU	Long
14	000056	Radio	0	0052	Radio U SIRIU	Long
14	00005F	Information electronics	1	0170	H-BN-NA	Long
	03276 000	Check software version management Status: static				<input type="checkbox"/> Sporadic
14	000062	Door electronics, rear left	0	0158	DCU BL	Long
14	000065	Tire pressure monitoring	0	0008	RDKBERU25	00 00 00
14	000069	Trailer function	0	0072	Trailer	Long
14	00006C	Tailgate camera	0	0020	Reversing camera CU 130001	
14	00006D	Electric tailgate	0	0612	TGCU module	Long
14	000072	Door electronics, rear right	0	0158	DCU BR	Long



# Status of Touareg failure with Bosch CP 4.2

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## Description of problem:

Failure of the Touareg support car at MAF USA

## Vehicle data:

- Vehicle type: Touareg (VW 526-BD105-PPS)
- Engine: 3.0l V6 TDI BIN5 165 kW (Gen1)
- High-pressure fuel pump: Bosch CP 4.2 (059.130.755.AL)
- Mileage: 90,000 km
- The HPP as yet contains no measures from anti-wear packages.
- Vehicle operated with a 6 bar tank system and for up to 79,000 km with SW master 03, i.e. flushing volume without tolerance provision (additive 351/h)  
Only in verification **prior to customer (already built market launch volume) flushing volume OK**

## Analysis results:

- High-pressure fuel pump wear in Bosch CP 4.2 (see photos)
- Wear on camshaft, rollers and roller supports
- Flattening and abrasive wear on camshaft
- Material chips and braking flats on both rollers
  
- Forwarding of the HPP to Bosch arranged for further analysis

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# Status of Touareg failure with Bosch CP 4.2



Roller cylinder 1

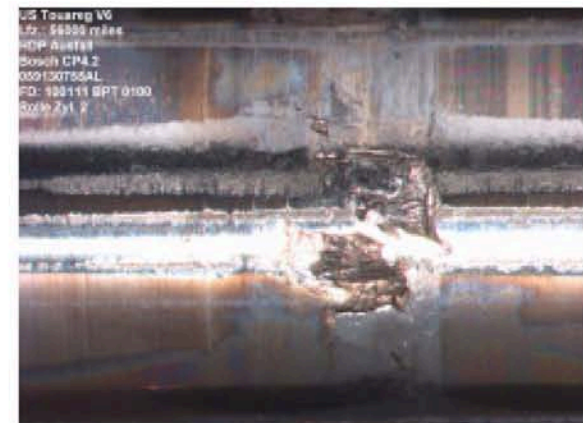
Roller cylinder 1



Camshaft



Roller cylinder 2



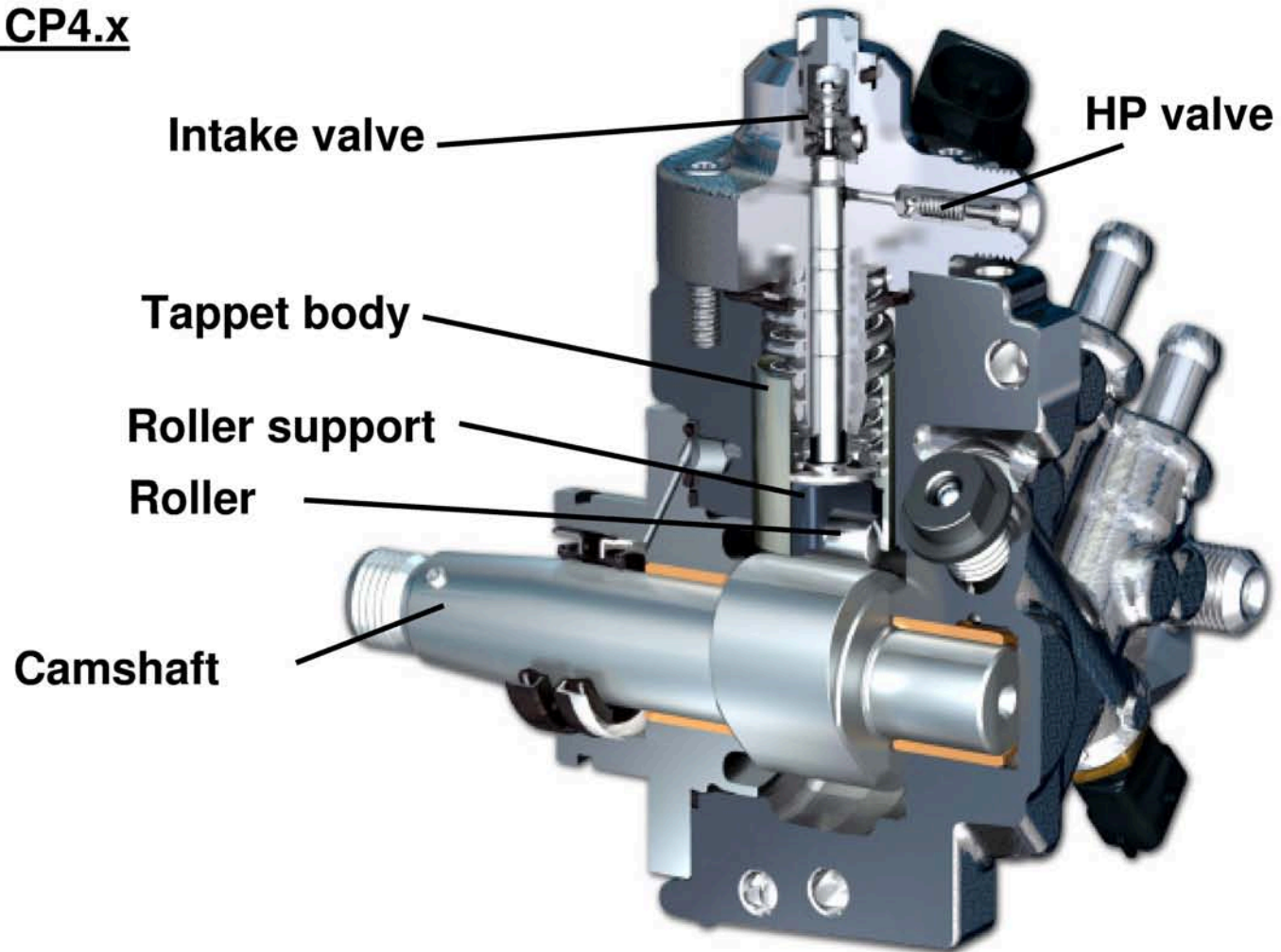
Roller cylinder 2

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# Status of Touareg failure with Bosch CP 4.2

## Bosch CP4.x



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# HPP failure in V6 TDI 3.0l 165 kW BIN5

SOP



WK 34/10

## Description of problem :

Failure of HPP with error memory entries "rail pressure to low" and check engine light.

## Scope:

Case 1: VW526\_\_BD174 at 45,066km HPP with anti-wear package 1 Failure on 15.09

- Breakdowns, HPP seizure. Chips in pump and tank.
- Analysis of HPP at BOSCH with N/EA-6 on 9/27/2010

Case 2: VW526\_\_BD105 with approx. 90,000km HPP without anti-wear package Failure on 25.09

- Breakdowns, HPP seizure. Particles in pump and tank.
- Analysis of HPP at EADE on 09.27.2010

Case 3: VW526\_\_BD105 at 71,740km HPP without anti-wear package Failure on 14.09

- Sporadic Error memory entry, Mil on, Veh. ready to drive No HPP damage.
- Analysis of HPP at BOSCH with N/EA-6 on 9/27/2010





HPP distances with the various software levels SW001 to SW004

GQG – Vehicle:		Start AL	25,000km / 50,000km	75,000km	100 tkm			
NAR: VW526__BD105-PPS	HPP: 059 130 755 AL <b>Without anti-wear package</b>	SW-Master 001 0-35 Tkm		SW 002 35-53 Tkm	SW 003 53-79 Tkm	SW4 starting from 79 Tkm	Situation in U1	HPP failure at 90,000 km
VW526__BD108-PPS HPP:	059 130 755 AL <b>Without anti-wear package</b>	001 0-15 Tkm	002 15-42 Tkm	003 42-64 Tkm	04 64 Tkm		Situation U1 - Fuelling 30xFL	Error memory entry at 71,700 km
VW526__BD172-0S HPP:	059 130 755 BC <b>Anti-wear package 1</b>		002 0-14 Tkm	003 14-20 Tkm	004 starting from 20 Tkm		Situation in U1	Current mileage 20,000km
VW526__BD174-0S	HPP: 059 130 755 BC <b>Anti-wear package 1</b>	002 0-14 Tkm	003 14-35 Tkm	004 starting from 35 Tkm			Situation U1 - Fuelling in 35xFL / 1xTX / 2xGA	HPP failure at 45,000km
VW526__BD172-0S HPP:	059 130 755 BC <b>Anti-wear package 1</b>	002 0-15 Tkm	003 15-37 Tkm	004 starting from 37 Tkm			Situation in U1	Current mileage 45,000km
China: VW526__BD123-PPS	HPP: 059 130 755 AH <b>Without anti-wear package</b>	001 0-24 Tkm		003 starting from 24 Tkm			Station C1 + summer traveling South China	Current mileage 34,000km
VW526__BD175-0S HPP:	059 130 755 BB <b>Anti-wear package 1</b>	003 starting from 0 km					Situation C1	Current mileage 15,000km
Russia: VW526__BD143-0S	HPP: 059 130 755 AH <b>Without anti-wear package</b>	001 0-25 Tkm		003 25-40 Tkm			Situation in Russia	Current mileage 40,000km



Quality assurance,  
entire vehicle  
GQG B/3

Legend: HPP failure

Unusual behavior in HPP  
(cause under analysis)

Fuelling in TX and GA on  
09.10.10 and 09.15.10





**V6TDI Gen1 – status of HPP failures in the Toureg Bin5 MY11**

## V6-TDI Gen1 – TouNF Bin5 MY11 HPP failures WK 39/10

### ▶ Problem

- ▶ 2 failures of the Touareg NF Bin5 in Q-AL, 1 vehicle with previously damaged HPP

### ▶ Analysis

- ▶ Vehicles have been running with Master 04 since 09.01.2010, previously Master 03
- ▶ Both failures after 10,000 km with Master 04
- ▶ Fuel temperature in the inlet approx. 50°C on average with exterior temperature 35°C (situation at U1 Measurement of datalogger)
- ▶ Max Temperature peaks up to approx. 120°C in the resultant heat (under worst case conditions)
- ▶ Preliminary pumping volume of the tank EFP when engine started from the resultant heat:
  - Master 03: 200l/h, full pumping from start until uncritical inlet temperatures are reached
  - Master 04: 130l/h, needs-based pumping at start
- ▶ Hypothesis: At hot start from the resultant heat with poor quality fuel (**low boiling point, poor viscosity**), high-pressure fuel pump is not sufficiently flushed with fresh fuel.

### ▶ Recommendation

- ▶ Master 05 (same as Q7 Bin5, previously no unusual features) with full pumping in engine start (including increase in tolerance to 30l/h)
- ▶ Flashing the already assembled Touareg NF Bin5 vehicles to Master 05
- ▶ Immediate conversion of all GQ verification vehicles to RP2
- ▶ Measures for Touareg NF EU5 should also be continuously implemented

### ▶ Deadline

- ▶ Data record creation EA on 10.01.2010, Master creation by 10.08.2010, remaining timeline to be discussed



**V6TDI Gen1 – status of HPP failures in the Toureg Bin5 MY11**

# V6-TDI Gen1 – TouNF Bin5 MY11 HPP failures WK 39/10

## ▶ Problem

- ▶ 2 failures of the Touareg NF Bin5 in Q-AL, 1 vehicle with previously damaged HPP

## ▶ Analysis

- ▶ Vehicles have been running with Master 04 since 09.01.2010, previously Master 03
- ▶ Both failures after 10,000 km with Master 04
- ▶ Fuel temperature in the inlet approx. 50°C on average with exterior temperature 35°C (situation at U1 Measurement of datalogger)
- ▶ Max Temperature peaks up to approx. 120°C in the resultant heat (under worst case conditions)
- ▶ Preliminary pumping volume of the tank EFP when engine started from the resultant heat:
  - Master 03: 200l/h, full pumping from start until uncritical inlet temperatures are reached
  - Master 04: 130l/h, needs-based pumping at start
- ▶ Hypothesis: At hot start from the resultant heat with poor quality fuel (**low boiling point, poor viscosity**), high-pressure fuel pump is not sufficiently flushed with fresh fuel.

## ▶ Recommendation

- ▶ Master 05 (same as Q7 Bin5, previously no unusual features) with full pumping in engine start (including increase in tolerance to 30l/h)
- ▶ Flashing the already assembled Touareg NF Bin5 vehicles to Master 05
- ▶ Immediate conversion of all GQ verification vehicles to RP2
- ▶ Measures for Touareg NF EU5 should also be continuously implemented

## ▶ Deadline

- ▶ Data record creation EA on 10.01.2010, Master creation by 10.08.2010, remaining timeline to be discussed