

Ford Position on CK-4 and FA-4

New Ford Diesel Motor Specification

Heavy Duty Engine Oil Classification Panel

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Concerns about CK-4 and FA-4

- Some formulations may not be as robust on wear protection as existing CJ-4 formulations with >1000 ppm phosphorus.
- Ford has seen accelerated 6.7L valve train wear with some CK-4 and FA-4 formulations that we haven't seen with existing CJ-4 formulations.
- We have wear concerns about CK-4 and FA-4 formulations with less than 1000 ppm phosphorus in new and older Ford engines.
- Some examples of observed wear attached. Attached photographs does not include all tests conduct. See January 28, 2015 presentation for more data.

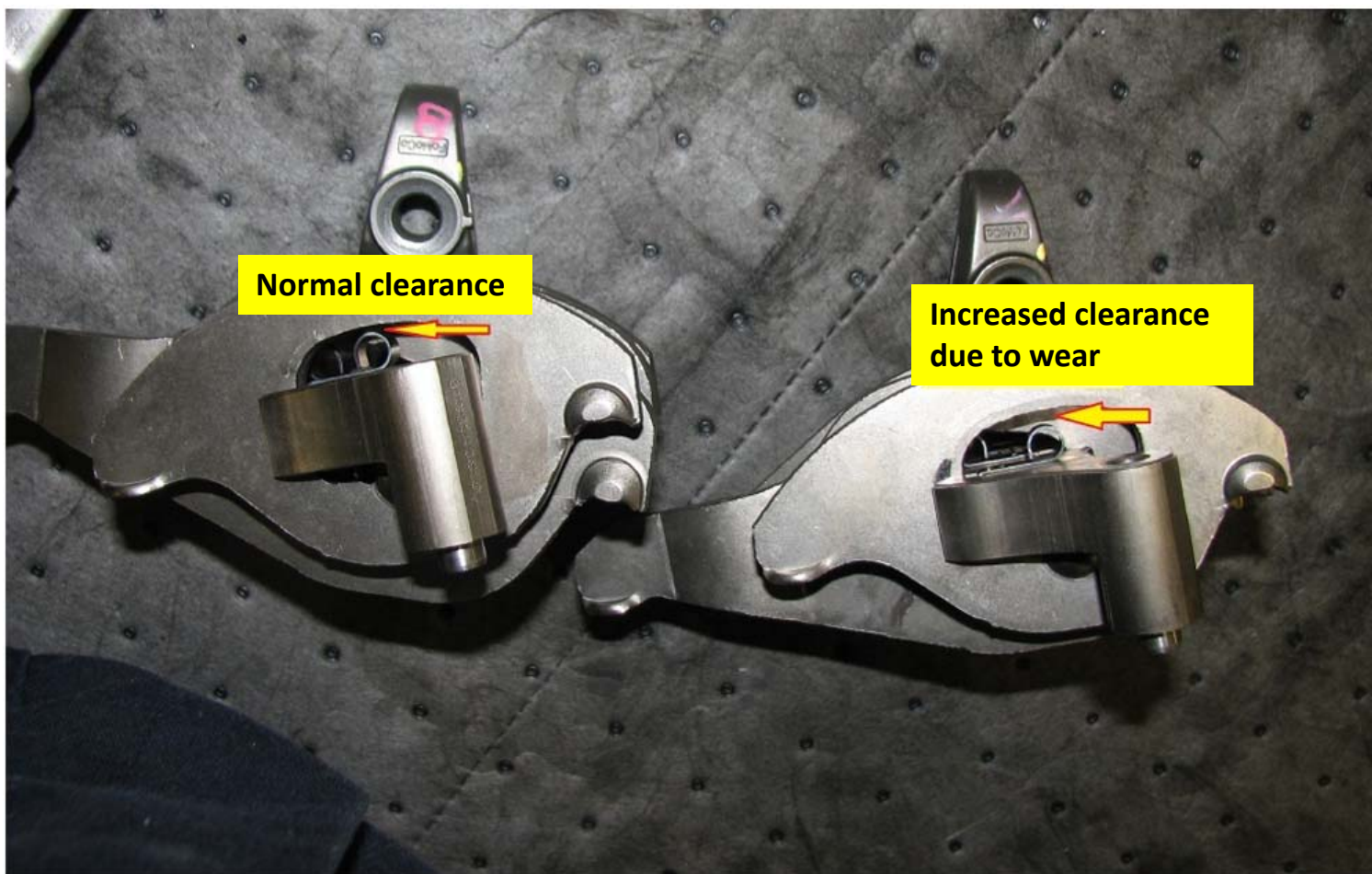
Durability Tests in 6.7L with 5W-30 PC-11B

Example of accelerated wear on pushrod ends



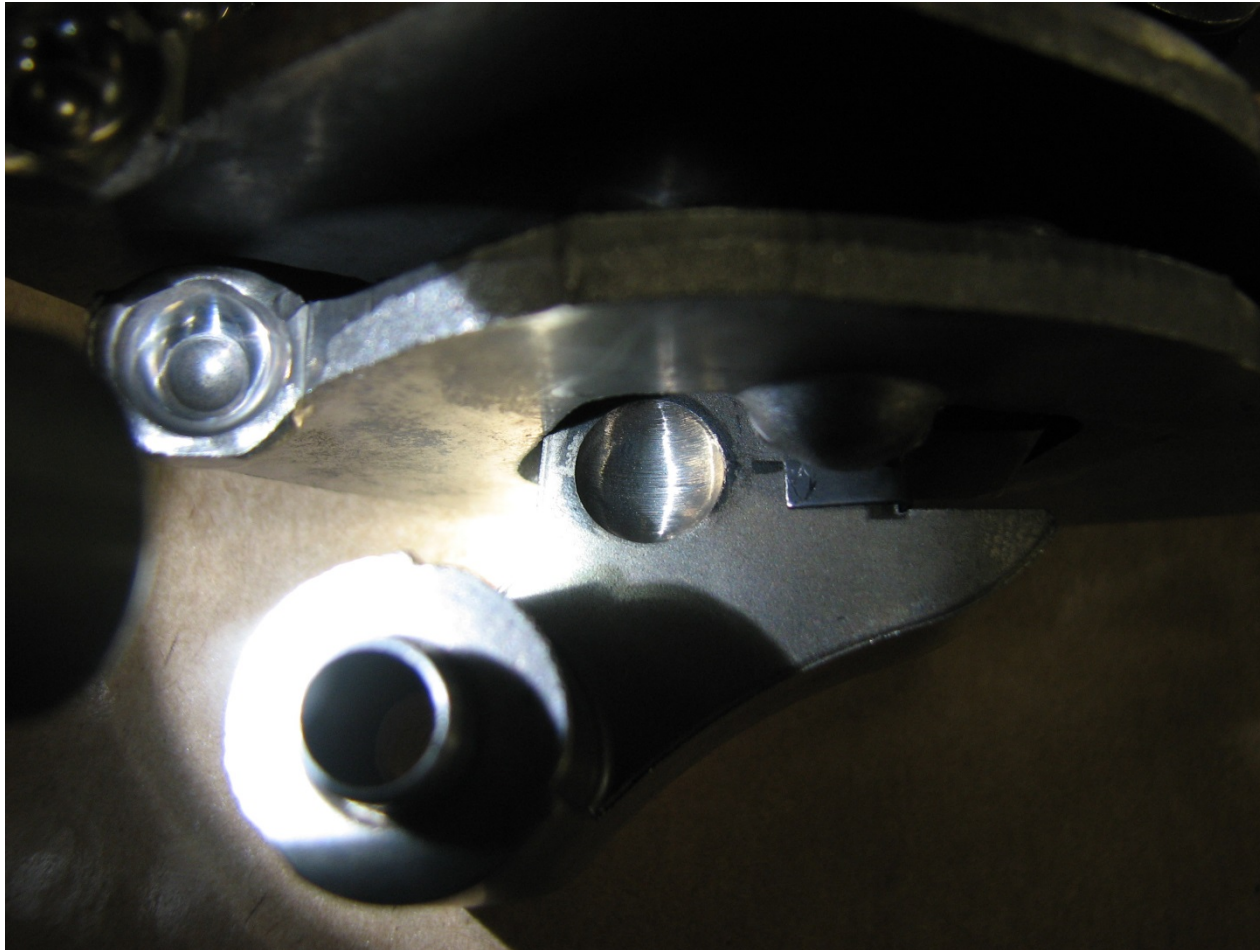
Durability Tests in 6.7L with 10W-30 PC-11A

Example of accelerated wear on rocker arm fulcrums



Durability Tests in 6.7L with 10W-30 PC-11A

Example of accelerated wear on rocker arm fulcrums



Ford Diesel Motor Oil Recommendations Going Forward

- Ford will not be recommending CK-4 or FA-4 to service any Ford diesel engines at this time.
- Ford will continue to recommend CJ-4 oils with more than 1000 ppm phosphorus. These should be oils that are license to CJ-4 only without CK-4 in the donut.
- Historically Ford has always recommended API diesel categories but will depart from this for CK-4 since some products will contain <1000 ppm phosphorus.
- Ford recommends that API change CK-4 and CJ-4 to include a minimum phosphorus limit of 1000 ppm.
- Ford recommends that if no phosphorus limit is put in CK-4/CJ-4 then, API require as part of licensing, oils with <1000 ppm phosphorus be labeled “Low Phosphorus”.
- Ford released an OEM specification that will contain addition wear requirements compared to CK-4.
 - WSS-M2C171-F1
- Ford has an official approval program for this spec and will publish an approved products list. Recommend working through your additive company for approval.
- Contact Ron Romano or Chuck Richardson to begin the approval process or for more information.

WSS-M2C171-F1

- Contains all CK-4 requirements and limits
- 6.7L valve train wear test
 - Development in progress
 - Estimated completion 1Q17
 - Upon completion turn over to ASTM to be published as an ASTM test procedure.
- **Need approved formulations until test development is complete.**
- Optional/additional requirements to approve formulations without the 6.7L engine test
 - 1000-1200 ppm phosphorus
 - CJ-4 formulations licensed prior to January 2016 with an antioxidant boost for T-13.
- Other engine testing conducted on the 6.7L engine may be used if approved by Ford Motor Company prior to testing.

Summery and Next Steps

- WSS-M2C171-F1 published
- Ford position statement published
- 200+ products approved to WSS-M2C171-F1
- Publish an approved products list. Shown in Motor Oil Tab on <https://www.fcsdchemicalsandlubricants.com/main/>.
- Complete 6.7L wear test development.

Ford Motor Company CK-4/FA-4 Ford Position Statement

Starting on December 1, 2016 the American Petroleum Institute (API) will begin licensing two new diesel motor categories CK-4 and FA-4. API CK-4 is being released to replace CJ-4. FA-4 is a low viscosity diesel oil released for diesel engines designed for a lower viscosity oil.

API FA-4

Due to its low viscosity FA-4 should not be used in any Ford diesel vehicles at this time.

API CK-4

Ford will not be recommending the use of CK-4 motor oils in any Ford diesel engines, new or old. Testing Ford has done on some CK-4 formulations have shown inadequate wear protection compared to CJ-4 formulations developed and licensed before 2016.

Like many other diesel engine manufacturers, with their own internal OEM specification, Ford will now be recommending oils that meet an OEM specification, Ford Material Engineering Specification WSS-M2C171-F1. The customer should use an oil showing that it meets this specification.

An oil showing CJ-4 in the API donut without showing CK-4 would be acceptable for service even if not showing WSS-M2C171-F1. This oil would most likely be an older CJ-4 formulation, developed and licensed prior to 2016. These oils could be around for about a year after CK-4 licensing begins, December 1, 2016. Field experience and Ford testing has shown that these older CJ-4 formulations provide acceptable 6.7L engine protection.

To insure you protect your Ford diesel engine use an oil meeting Ford specification WSS-M2C171-F1 like Motorcraft Super Duty Motor oil.

Questions