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Title: Fan Shaft Failure Diagnostics

Applies To: 11/13L ProStar, PayStar, and TransStar with feature code 12THX (Viscous Fan Drive)

CHANGE LOG

11/20/2015 - Adjusting Article to reflect previous author change.
11/4/2015 - Revised Step 3 to include info on block scoring behind oil pump and gear end play
11/2/2015 - Added tolerance info under "symptoms", re ordered steps in "diagnostics" section
08/17/2015 - Initial Article Release

DESCRIPTION

This document is intended to supplement the fan drive conversion iKNow IK0900105: Horton fan drive. In the event of a fan shaft failure, the preliminary inspection steps below **MUST** be completed to eliminate customer downtime & dissatisfaction.

SYMPTOMS

Customer Observations or Concerns:

Oil loss
Abnormal Engine Noise
Loss of engine oil pressure
Coolant loss

Tech Observations or Concerns:

Oil leak coming from front of engine
Broken fan blade(s), shroud, shaft
Damaged radiator
Coolant leak

Additionally, there is a tolerance for end play on the fan shaft (going in and out of the front of the engine). Expected end play can be anywhere from 0.2mm to 1.25mm. 1.25mm is the upper limit for service.

SPECIAL TOOLS / SOFTWARE

Note: Some of these tools might not be used depending on the necessary repairs. This is just a list of all possible tools needed. See Diagnostic Steps for more details on which repairs must be performed.

Step	Tool Description	Tool Number
4, 7	Air and Fuel Cap and Plug Kit	ZTSE4891

4	Seal Installer (Crossover Tube Seal)	ZTSE6046
4	Extension Tube Small Installer	ZTSE6047
4	Front Crankshaft Seal Installer	ZTSE4873
4	Fan Hub Wrench	ZTSE4913
4	55MM Fan Clutch Impact Wrench	KL 5013 NAV
4, 7	Coolant Management Tool	KL 5007 NAV
7	Extension Tube Installer	ZTSE6043
7	Extension Tube Installer Large	ZTSE6051-1
7	Extension Tube Installer Small	ZTSE6051-2

SERVICE PARTS INFORMATION

Only replace these parts AS NEEDED. See Diagnostic Steps for more information.

Kit Description	Part Number	Qty	Notes	Engine
KIT, FAN DRIVE, RETROFIT 2 SPEED	2514165C94	1		MaxxForce 11/13 and N13
BEARING SET ASM MAIN STANDARD	7092910C92	1		MaxxForce 11/13 and N13
BEARING KIT, CONNECTING ROD NORMAL	3004714C91	6		MaxxForce 11/13 and N13
BOLT, HEX COLLAR	3003213C1	14	Main cap bolts	MaxxForce 11/13 and N13
SCREW	62904900079	12	Rod Cap Bolts	MaxxForce 11/13 and N13
KIT,OIL PUMP13L	3007654C95	1		MaxxForce 13 and N13
KIT,OIL PUMP11L	3007653C96	1		MaxxForce 11
FILTER CENTRIFUGE OIL KIT	2606467C92	1		MaxxForce 11/13 (Note: MF11 may or may not have this option)
KIT OIL COOLER W/SEALS	3007508C92	1		MaxxForce 11/13 and N13

DIAGNOSTIC STEPS

The following steps will help determine what parts must be replaced and whether or not the engine has experienced irrepairable damage. Follow the diagnostic steps first and then perform all necessary repairs once all steps are completed.

Step	Action	Decision

1	**MAIN AND ROD BEARING INSPECTION:** Drop oil pan and inspect each main and rod bearing and journal, individually ("one by one"). **Take note if metal shavings exist in oil pan from the fan drive failure for later reference so oil cooler can be replaced.** Do all bearings meet reuse guideline? Are journals free from defects? See Figures 1 and 2 for examples	**Yes**. Replace all cap bolts, then proceed to Step 2. **No, bearings do not meet reuse guideline but journals are free from defects**. Replace compromised bearings and all cap bolts, then proceed to Step 2. **No, journals are not free from defects.** See supervisor.

Figure 1: Good bearing - reusable

Figure 2: Unusable Bearings

Step	Action	Decision
2	**OIL PUMP BUSHING/BEARING INSPECTION:** Inspect oil pump bushing/bearing for misaligned oil supply hole or damaged bearing. Is oil supply hole correctly aligned and bushing/geartrain not damaged?	**Yes**. Proceed to Step 3. **No**. See supervisor.

Step	Action	Decision
3	**OIL PUMP GEROTOR REUSE OR REPLACE DETERMINATION:** Inspect oil pump gerotor. See Figures 3 and 4 for examples of damage. **NOTE: there may be some light scoring on the block behind the oil pump as pictured in Figure 5. This amount is acceptable and will not lead to loss of oil pressure or engine performance/longevity as long as gear end play is in spec.** End play between the oil pump cover and oil pump gears must be measured while inspecting the oil pump. This procedure is outlined in the Engine Service Manual found on the Master Service Information Site. If end play exceeds specification, replace oil pump cover, pinion (gear) for oil pump, and ring gear as a set. Is the gerotor damaged?	**Yes**. Replace gerotor, proceed to Step 4. **No**. Proceed to Step 4.

Figure 3: Damaged oil pump/gerotor

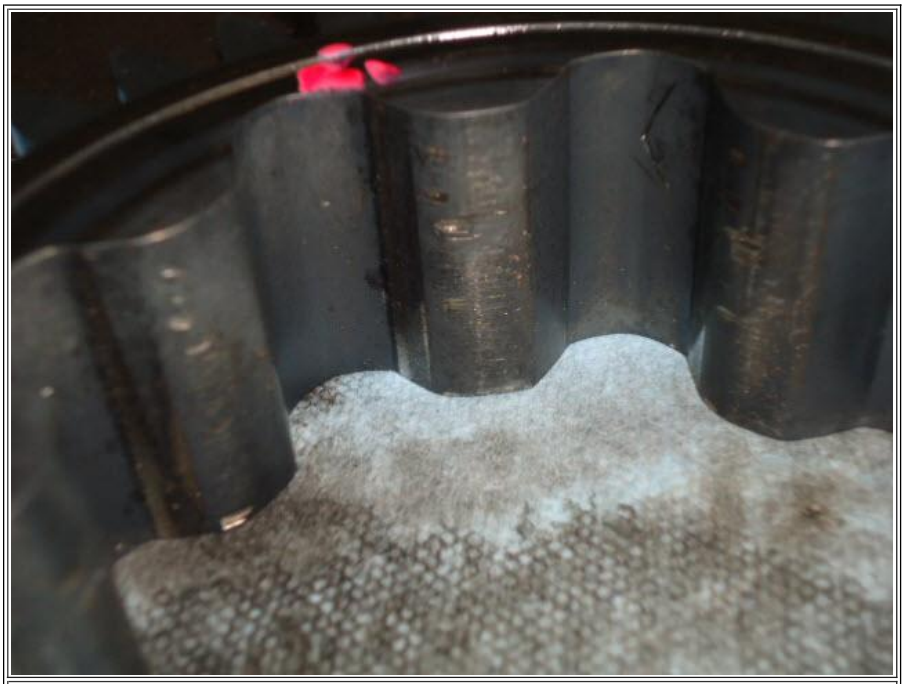

Figure 4: Damaged oil pump/gerotor

Figure 5: Acceptable engine block wear behind oil pump

Step	Action	Decision
4	**FRONT GEAR TRAIN INSPECTION:** While the front cover is off, inspect remaining gears for damage. **NOTE: It is possible that gear contact to the engine block has occured. These engine blocks should be reused, and will not lose performance/longevity. See Figures 6 and 7 for examples.** Are there any other gears damaged?	**Yes**. Replace damaged gears. **No**. Proceed to Step 5.

Figure 6: Acceptable engine block wear

Item 1: Gear contact to the engine block

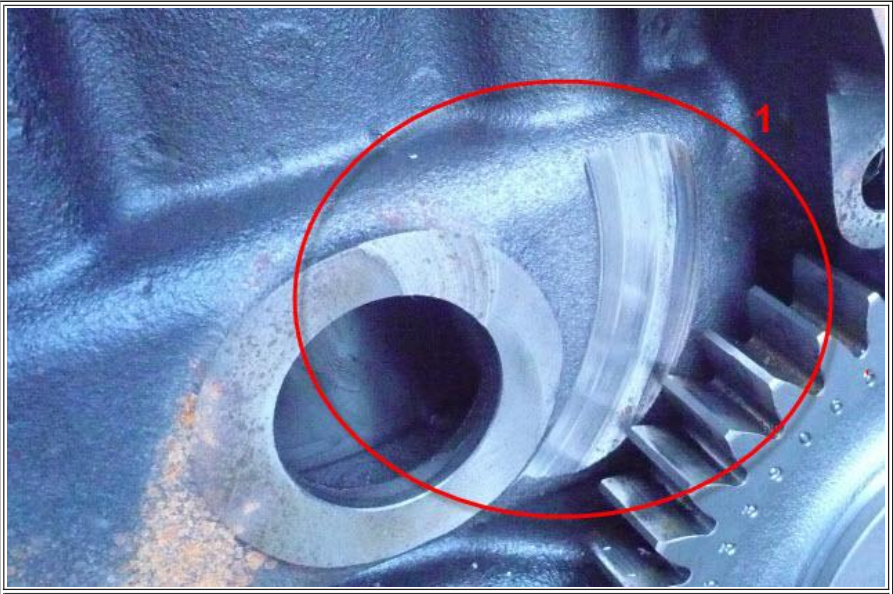

Figure 7: Acceptable engine block wear

Item 1: Gear contact to the engine block

Step	Action	Decision
5	**OIL COOLER REPLACE OR REUSE DETERMINATION** Inspect oil filter. Are there metal shavings in the oil filter? See Figure 8 for an example.	**Yes**. Replace oil cooler, centrifuge, oil, and oil filter then proceed to Step 6. **No**. Replace centrifuge, oil, and oil filter, then proceed to Step 6.

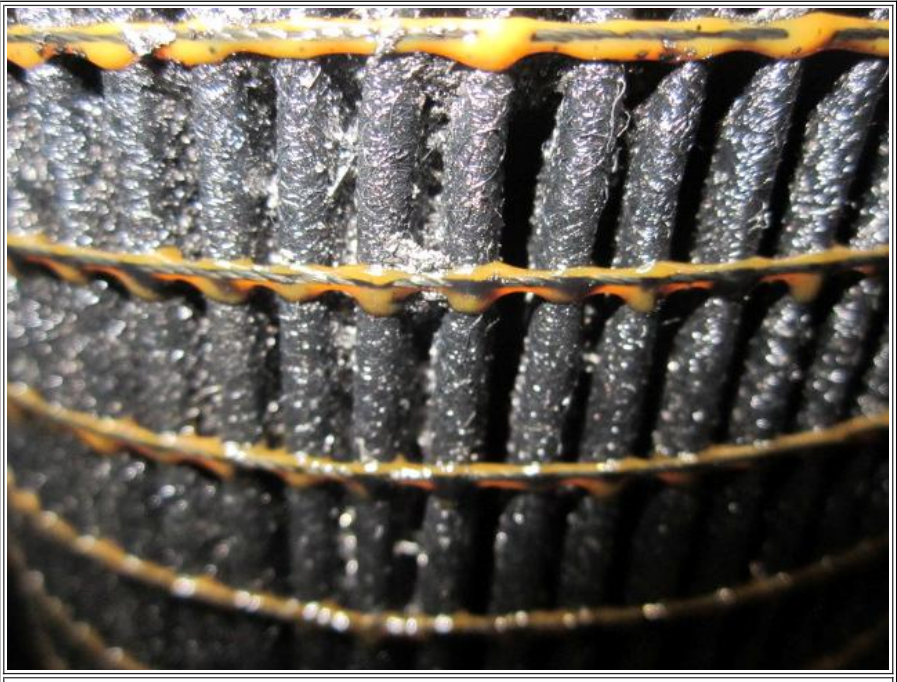

Figure 8: Oil filter with metal shavings present

Step	Action	Decision
6	**DETERMINE REPAIR:** Is the vehicle being serviced a TransStar and/or does it have a MaxxForce 11 engine?	**Yes - TransStar or 11L engine -** conversion is not needed, replace cooling fan drive and proceed to Step 8.
		No - ProStar or PayStar - Proceed to Step 7.

Step	Action	Decision
7	**FAN DRIVE RETROFIT:** Reference IK0900105: Retrofiting a Horton VMaster(Stratis) fan drive to Horton 2spd air operated fan drive. Was fan drive retrofit and programming successful?	**Yes**. Proceed to Step 8.
		No. Repeat step.

Step	Action	Decision
8	**VALIDATION:** Run engine fan test and inspect for oil leaks. Does the fan test pass and the engine NOT leak oil?	**Yes**. Release truck.
		No. See supervisor.

REPAIR STEPS

Replace necessary components per Engine Service Manual.

Master Service Information Site

WARRANTY INFORMATION

Warranty Claim Coding:

Group:	12000 - Engine
Noun:	742 - Fan, shaft and mounting

Standard Repair Times:

NOTE: For steps 1 and 5, SRT codes can only be applied to the repair if answered "No" and "Yes" to each respective question in the Diagnostic section. All other SRT codes should be applied as necessary.

Step	Description	Chassis	Engine	SRT	Hours
1	OIL PAN AND/OR GASKET, REPLACE	ProStar	MAXXFORCE 11/13	R12-4591U	2.0
			N13	R12-4591US	2.0
		5000/PayStar	MAXXFORCE 11/13	T12-4591U	2.0
			N13	T12-4591US	2.0
		8600/TransStar	MAXXFORCE 11/13	Q12-4591U	2.0
			N13	Q12-4591US	2.0
1	ENGINE BEARING, INSPECTION	All Models	All Engines	A12-1213A-20	0.4
1 - No	CRANKSHAFT MAIN / CONECTING ROD BEARINGS (I-6 ENGINES), REPLACE	All Models	All Engines	A12-3442	3.2
2	Oil pump bushing and gerotor inspection	ProStar	MAXXFORCE 11/13, N13	A08-T1	0.3
		5000/PayStar	MAXXFORCE 11/13, N13	A08-T1	0.4
		8600/TransStar	MAXXFORCE 11/13, N13	A08-T1	0.4
3	ENGINE OIL PUMP, REPLACE	ProStar	MAXXFORCE 11/13, N13	R12-4713U	6.0
		5000/PayStar	MAXXFORCE 11/13, N13	T12-4713U	6.2
		8600/TransStar	MAXXFORCE 11/13, N13	Q12-4713U	6.2

5 - Yes	OIL COOLER ASSEMBLY, REPLACE	ProStar	MAXXFORCE 11/13, N13	R12-4686U	4.1
		5000/PayStar	MAXXFORCE 11/13, N13	T12-4686U	4.1
		8600/TransStar	MAXXFORCE 11/13, N13	Q12-4686U	4.1
5	ACCESS TIME, WITH CENTRIFUGAL OIL FILTER	All Models	All Engines	A12-4656T-20	0.2
5	ENGINE OIL AND FILTER, CHANGE	All Models	All Engines	A12-1889U	0.6
7	FAN DRIVE RETROFIT, PERFORM	ProStar	MaxxForce 11/13, N13	R12-3742U-20	6.5
		5000/PayStar	MaxxForce 11/13, N13	T12-3742U-20	6.5

OTHER RESOURCES

Master Service Information Site

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