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Coding Information

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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

- 1/12/2016 - Revised steps to follow a more logical order. Updated SRT table. Changed upper limit spec for shaft end play to 3mm.
- 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

NOTE: 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 3mm. 3mm 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.

Tool Description	Tool Number
Air and Fuel Cap and Plug Kit	ZTSE4891
Seal Installer (Crossover Tube Seal)	ZTSE6046
Extension Tube Small Installer	ZTSE6047
Front Crankshaft Seal Installer	ZTSE4873
Fan Hub Wrench	ZTSE4913
55MM Fan Clutch Impact Wrench	KL 5013 NAV
Coolant Management Tool	KL 5007 NAV
Extension Tube Installer	ZTSE6043
Extension Tube Installer Large	ZTSE6051-1
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		MaxxFace 11/13 and N13
KIT, BELT DRIVEN FAN RETROFIT	2515591C91	1	Kit used for chassis side installation only	MaxxFace 11/13 and N13
BEARING SET ASM MAIN STANDARD	7092910C92	1		MaxxFace 11/13 and N13
BEARING KIT, CONNECTING ROD NORMAL	3004714C91	6		MaxxFace 11/13 and N13
BOLT, HEX COLLAR	3003213C1	14	Main cap bolts	MaxxFace 11/13 and N13
SCREW	62904900079	12	Rod Cap Bolts	MaxxFace 11/13 and N13
KIT,OIL PUMP13L	3007654C95	1		MaxxFace 13 and N13
KIT,OIL PUMP11L	3007653C96	1		MaxxFace 11
FILTER CENTRIFUGE OIL KIT	2606467C92	1		MaxxFace 11/13 (Note: MF11 may or may not have this option)
KIT OIL COOLER W/SEALS	3007508C92	1		MaxxFace 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 irreparable damage. Follow the diagnostic steps first and then perform all necessary repairs once all steps are completed.

Step	Action	Decision
1	INITIAL CHECKS: Have any of the following occurred? 1. Metal shavings in the oil. Both the oil and oil filter should be checked for this. See Figure 1 for an example. 2. Complete loss of oil. 3. Multiple fan shaft failures (i.e. this is not the first occurrence of the fan shaft failing on this vehicle.)	Yes: Proceed to Step 2.
		No: ProStar/PayStar models: proceed to Step 8. TranStar models: replace the fan drive.



Figure 1: Oil filter with metal shavings present

Step	Action	Decision
2	MAIN AND ROD BEARING INSPECTION: Drop oil pan and inspect each main and rod bearing and journal, one by one. A. Do all bearings meet reuse guideline? B. Are journals free from defects? See Figures 2 and 3 for examples.	A. Yes B. Yes Reinstall bearings and install new main and rod cap bolts, then proceed to Step 3.
		A. No B. Yes Replace damaged bearings and install new main and rod cap bolts, then proceed to Step 3.
		A. Either Yes or No B. No Create iApproval form for an engine replacement, continue to step 6.



Figure 2: Good bearing - reusable



Figure 3: Unusable Bearings

Step	Action	Decision
3	<p>OIL PUMP BUSHING/BEARING INSPECTION:</p> <p>Inspect oil pump bushing/bearing for misaligned oil supply hole or damaged bearing.</p> <p>A. Is oil supply hole correctly aligned? B. Is bushing/geartrain damaged?</p>	<p>A. Yes B. No</p> <p>ProStar/PayStar models: proceed to Step 4. TranStar models: proceed to Step 5.</p>
		<p>A. Yes B. Yes</p> <p>Replace damaged components.</p> <p>ProStar/PayStar models: proceed to Step 4. TranStar models: proceed to Step 5.</p>
		<p>A. No B. Either Yes or No</p> <p>Create iApproval form for an engine replacement, continue to step 6.</p>

Step	Action	Decision
4	<p>Perform the following:</p> <p>A. Perform Fan Drive Retrofit (see Step 8) B. Replace oil & filter C. Replace Centrifugal filter D. If necessary replace oil pump (see Other Inspection Guidelines section below) E. If necessary replace gears in front gear train (see Other Inspection Guidelines section below) F. If necessary replace oil cooler (see Other Inspection Guidelines section below)</p> <p>Run engine fan test and inspect for leaks or any other damage. Are there any other repairs needed?</p>	<p>Yes: Complete repairs as needed and return vehicle to customer.</p>
		<p>No: Release vehicle to customer.</p>

Step	Action	Decision
5	<p>Perform the following:</p> <p>A. Replace fan drive B. Replace oil & filter C. Replace Centrifugal filter D. If necessary replace oil pump (see Other Inspection Guidelines section below) E. If necessary replace gears in front gear train (see Other Inspection Guidelines section below) F. If necessary replace oil cooler (see Other Inspection Guidelines section below)</p> <p>Run engine fan test and inspect for leaks or any other damage. Are there any other repairs needed?</p>	<p>Yes: Complete repairs as needed and return vehicle to customer.</p>
		<p>No: Release vehicle to customer.</p>

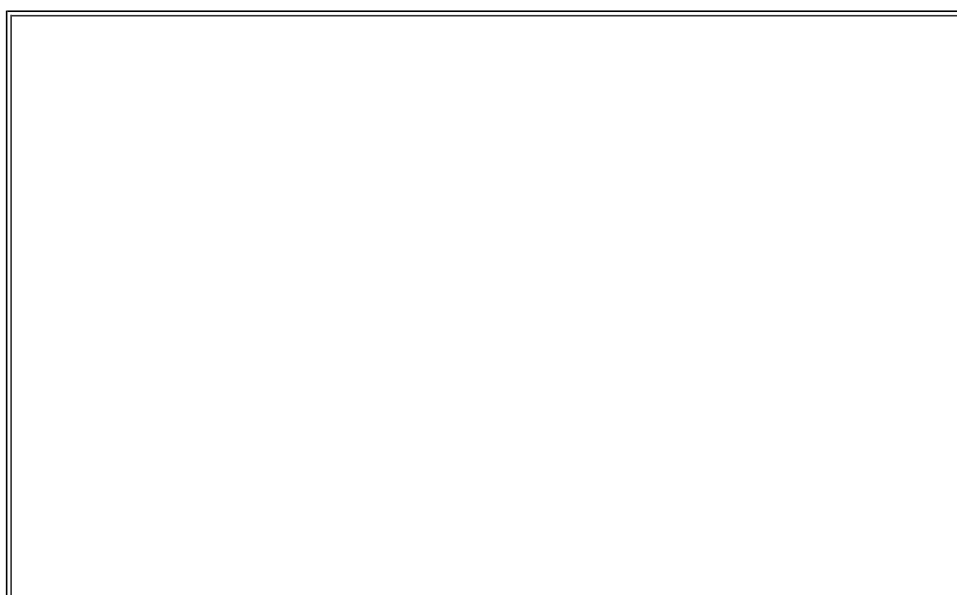
Step	Action	Decision
6	<p>Perform the following:</p> <p>A. Replace the engine.</p> <p>Is the chassis being worked on a TranStar?</p>	<p>Yes: Complete repairs as needed and return vehicle to customer</p>
		<p>No: Continue to Step 7.</p>

Step	Action	Decision
7	Perform the Following: A. Inspect replacement engine	Yes: Install chassis kit. Refer to retrofit instruction sheet .
	Does replacement engine have 2-speed fan drive equipped?	No: Complete all necessary repairs and release vehicle to customer.

Step	Action	Decision
8	FAN DRIVE RETROFIT: Reference IK0900105: Retrofitting a Horton VMaster(Stratis) fan drive to Horton 2spd air operated fan drive .	Yes. Complete all other repairs as needed.
	Was fan drive retrofit and programming successful?	No. Repeat step.

OTHER INSPECTION GUIDELINES

Action	Decision
<p>OIL PUMP GEROTOR AND OIL COOLER REUSE OR REPLACE DETERMINATION:</p> <p>Inspect oil pump gerotor. See Figures 4 and 5 for examples of damage.</p> <p>NOTE: there may be some light scoring on the block behind the oil pump as pictured in Figure 6. 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.</p> <p>However, this scoring does indicate that the oil cooler must be replaced.</p> <p>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.</p> <p>Is the gerotor damaged?</p>	<p>Yes. Replace gerotor and oil cooler.</p> <hr/> <p>No. Complete all other repairs as needed.</p>



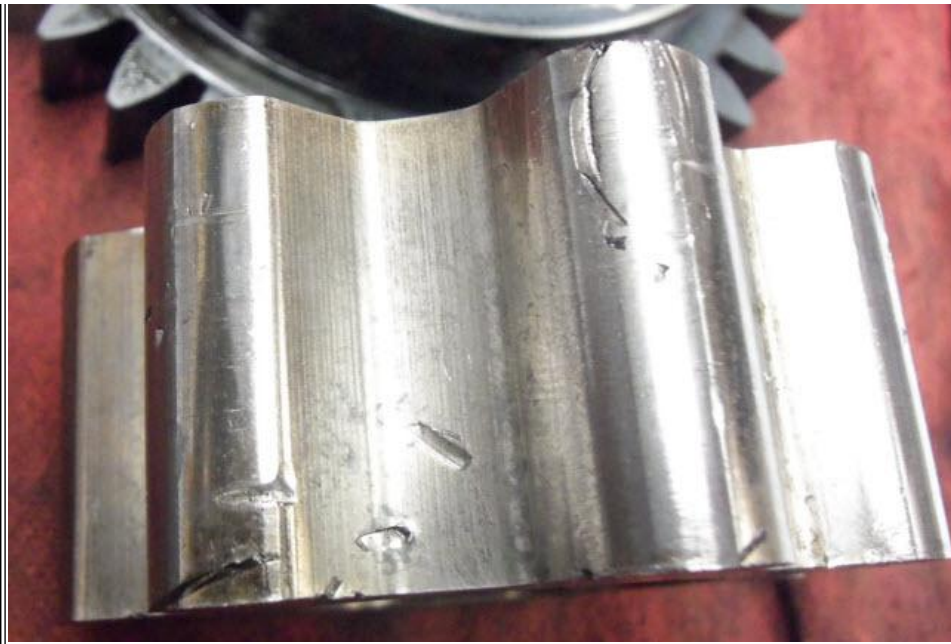


Figure 4: Damaged oil pump/gerotor



Figure 5: Damaged oil pump/gerotor

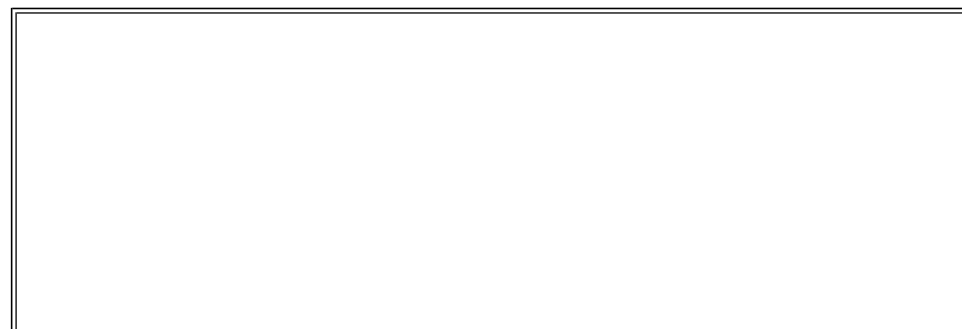




Figure 6: Acceptable engine block wear behind oil pump

Action	Decision
<p>FRONT GEAR TRAIN INSPECTION AND OIL COOLER REUSE OR REPLACE DETERMINATION:</p> <p>While the front cover is off, inspect remaining gears for damage.</p> <p>NOTE: It is possible that gear contact to the engine block has occurred. These engine blocks should be reused, and will not lose performance/longevity. See Figures 7 and 8 for examples.</p> <p>If gear contact to the engine has occurred, the oil cooler must be replaced.</p> <p>Are there any other gears damaged?</p>	<p>Yes. Replace damaged gears and oil cooler.</p> <hr/> <p>No. Complete all other repairs as needed.</p>



Figure 7: Acceptable engine block wear

Item 1: Gear contact to the engine block

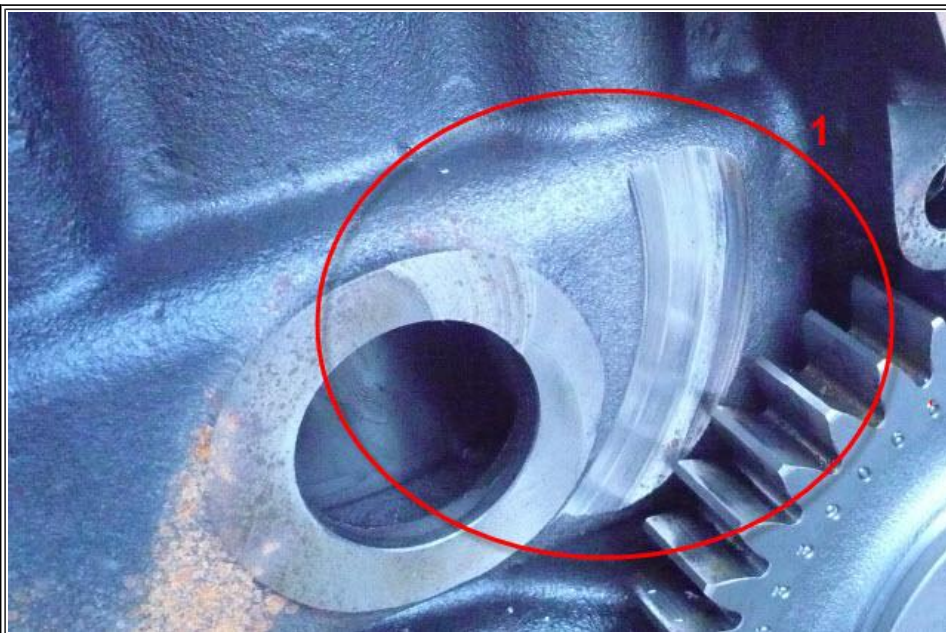


Figure 8: Acceptable engine block wear

Item 1: Gear contact to the engine block

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:

Step	Description	Chassis	Engine	Qualifier	SRT	Hours
1	Check engine oil and oil filter for metal debris	All Models	All Engines		T-time	0.3
1	Replace fan drive (TranStar only)	8600	MAXXFORCE 11/13	Requires Front Cover Removal	Q12-3742L	Link to Hours
			MAXXFORCE 11/13	With 2010 Emission Engines	Q12-3742U	
			N13	With 2010 Emission Engines	Q12-3742US	
2	Main/rod bearing inspection	All Models	All Engines		A12-3442	Link to Hours
3	Oil pump bushing inspection	All Models	All Engines		T-time	2.7
4A/8	Perform fan drive retrofit	All Models	All Engines		T-time	4.2
5A	Replace fan drive	All Models	All Engines		T-time	3.1
4/5B	Replace oil and filter	All Models	All Engines		T-time	0.3
4/5C	Replace centrifugal filter	All Models	All Engines		T-time	0.2
4/5D	Replace oil pump	All Models	All Engines		T-time	0.3
4/5E	Replace gears in front gear train	All Models	All Engines		T-time	0.2
4/5F	Replace oil cooler	All Models	All Engines		T-time	3.4
6	Replace engine	All Models	All Engines		T-time	13.1
7	Install 2 speed fan drive chassis kit	All Models	All Engines		T-time	0.6

OTHER RESOURCES

[Master Service Information Site](#)

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