Technical Bulletin

040
23/12/2010

www.gates.com/europe

Overrunning Alternator Pulleys (OAP)

GATES REFERENCE :	**Various**
MAKE :	Various
MODEL :	Various
ENGINE :	Various
ENGINE CODE :	Various

Modern engines produce more torsional vibrations than before; especially on diesel engines (due to making them compliant with Euro 4, 5, 6). These vibrations are partly due to higher forces working on the crankshaft; resulting in the crankshaft pulley speed not being constant.
These torsional vibrations could lead to excessive bearing wear, accessory belt wear/noise, (automatic) tensioner wear/seizure, even crankshaft breakage.

So it is important to dampen these vibrations. One way this is done by the dual mass flywheel which can be found on the majority of modern engines, but it is also done by the Torsional Vibration Damper (TVD) (See TB039 dated 20/12/2010).
Apart from these 2 elements, damping is also done at the alternator pulley (alternators became a lot more powerful, resulting in more severe speed fluctuations/shocks/vibrations).
In order to dampen vibrations at the alternator, 2 different systems are used: there is the One Way Clutch (OWC) (Fig. 1) and there is the Overrunning Alternator Decoupler (OAD).(Fig. 2)

An OWC rotates freely in one direction and locks immediately in the other direction; while an OAD rotates freely in one direction and allows a small angular rotation in the other direction. These movements are mainly needed when the engine speed goes down e.g. when switching the engine off, or changing gears (the heavy alternator rotor can rotate further at a higher speed compared to the pulley speed); and to absorb angular rotation/non constant belt speed.

Fig 1

Fig 2

OAD's exist in 2 versions: the dry (older) version and the new wet (filled with oil) version.

How to recognize what is what?

An OWC usually has a rust free steel color. An OAD usually has a black color. A dry OAD is closed up with a plastic cap in order to keep pollution out; while a wet version has a rubberized steel cap. This (undamaged) cap always has to be placed, in order to keep dirt out.

Observations:

- A prematurely worn tensioner can be caused by a defective OWC/OAD, or the use of a solid pulley instead of an OWC/OAD. Also using an OWC where an OAD is needed will lead to premature failures.
- A worn OWC/OAD can lead to a broken tensioner unit (Fig. 3); when the engine is running on idle, excessive tensioner movement (leading to breakage) can be seen.
- One might believe the alternator is not functioning anymore, while in fact it is the OWC/OAD which is out of order.

Recommendations:

- Replace the OWC/OAD every time the Micro-V belt is replaced
- Replace the OWC/OAD when the alternator is changed.
- Regularly check the belt tension, if not sufficient, the belt could slip, resulting in low alternator output and error sign on the dashboard.
- Only use the OWC/OAD on the applications prescribed.

On vehicle testing:

- With the engine running at idle: look for abnormal tensioner movement. If present, the OWC/OAD might need replacement.
- With the engine running at high revolutions, switch it off and listen out for abnormal alternator rotor noise. If present, the OWC/OAD might have a worn bearing.

Off vehicle testing:

OWC: Clamp the outer ring with one hand and the inner ring with the other (thumb and finger). One should be able to turn the inner ring to the right and not to the left, otherwise the OWC is broken.

OAD: The proper way of testing an OAD is to put a(n) (old) belt firmly around the OAD, clamp the belt with a vice and turn the OAD shaft (gently and smoothly) with a proper tool (wrench/bit). If it turns freely in overrun direction (clockwise), this is ok; if the spring force also feels smooth in the drive direction (anticlockwise), the OAD still works.

Gates
A Tomkins Company
www.gates.com/europe

 # 040
23/12/2010

Technical Bulletin

Important!!!

• Never clamp the OAD directly in the vice, this will damage the OAD
• The OAD uses a stiff spring and therefore spring function can only be felt with a wrench.

Conclusion

• If shaft spins in both directions or slips in the drive direction under load, the OAD should be replaced.
• If it spins freely in drive direction, a possible reason is: broken OWC/OAD clutch.

Result: alternator will not be charging, heat generation, heat damage, discoloration (Fig. 4).
Root cause: part incorrect, not made for this application (high torsional vibration); no cap used (grease purge, heat generation); OWC/OAD clutch problem.

Fig 3

Fig 4

• If the shaft does not rotate in either direction, possible reason: spring broken or broken bushing.
Root cause: part incorrect, not made for this application; a cylinder not firing (high torsional vibration).

As both systems (OWC and OAD) are not interchangeable (never use an OWC for an OAD or vice versa), Gates have chosen to list both systems in the catalogue as “OAP” (Overrunning Alternator Pulleys).

Only use OE quality products as supplied by Gates!

Visit our web catalogue www.gatesautocat.com