

The Westerly Owners' Association

The Volvo 2000 Series Gearbox Problem

Collated by Eric Hyett & Mike O'Brien from various sources with contributions from Jack Cairns, John Mathias, Walter Reed and many others. Apologies if you contributed and haven't got a credit.

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Many members with Volvo engines have experienced sudden failure of the engine to gearbox drive coupling with no prior warning.

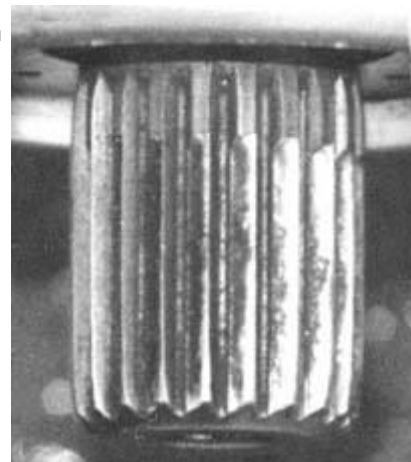
The photo on the right shows serious wear typical of this problem

Are you at risk?

If your Volvo engine serial number is 2300059128 or less - then you are at risk *

*At different times Volvo have quoted other serial numbers - use this 'cut-off' number with caution.

The technical background as supplied by Mike O'Brien



In a PBO article in September 1999 Dr. Ron Colyer reported his concern about the engine to gearbox coupling on Volvo series 2000 engines.

1. Most engines, (but not the series 2000) incorporate a resilient coupling/damper to minimise the effect of substantial cyclic loads arising from torsional vibration and resonance in the prop shaft/prop assemblies.
2. The coupling on the 2000 series consists of an internally splined plate mounted on the flywheel, which engages directly with the gearbox-input shaft.
3. Over the course of time, the splines can suffer damage and wear, so that the splines no longer engage, and all drive is lost.
4. It is not possible to determine the extent of spline wear without removing the gearbox.
5. Complete failure can therefore occur unexpectedly.
6. Rectification involves replacing the top gear set at a cost of around £1,000 plus labour, or a replacement gearbox at £1,600 plus.
7. Ron Colyer has had this problem with an engine that has done less than 500 hrs and has found that of four engines examined in his sailing club, all showed severe fretting and two needed replacement gear shaft sets.

When approached about this the main points of the reply by Volvo Penta UK Ltd. were as follows;

1. Dr. Colyer is right about torsional vibrations and wear in the drive-line, but other issues can influence this e.g. prop-tip clearances, rotation of prop whilst sailing, poor running of engine etc.
2. In the experience of Volvo, the drive coupling lasts much longer than the number of hours quoted by Dr.Colyer.
3. A rubber element drive plate was fitted to the last months of production for the 2000 series beginning with engine serial no. 2300059128*
4. This rubber drive can be fitted to earlier models but was never intended as a retrofit, and would involve either modifications to, or a replacement, flywheel.
5. For owners whose couplings are still serviceable, Volvo supply a service kit no.3581117 which includes a new carrier and the necessary fittings to replace a worn part. It costs £67.54 + VAT. (Now approx £80+VAT)

An Illustrated summary for the non-technically minded by Eric Hyett

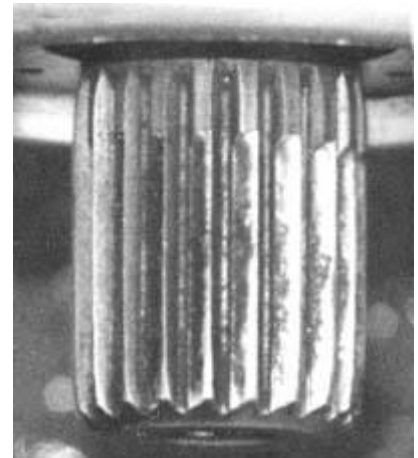
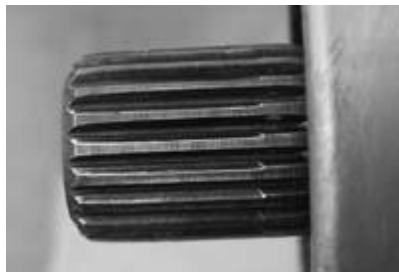
(Drawing heavily upon Chris Brown’s original article in WOA Spring Newsletter 2001 and other reports from Westerly Owners)

The gearbox input shaft was modified by Volvo from engine number 2300059159*. After that number there does not appear to be a problem. Some owners report modification even before that number but owners with engine numbers before that number should be aware that there is a potential risk of sudden and unpredictable failure.

There is also a remedy!



Gearbox detached from the engine and the position of the splined drive shaft



Examples of the worn splines



These spline shaft engages with a plate bolted to the flywheel shown in place and removed

These splines carry the drive from the engine to the gearbox (and of course to the propeller) and have been reported to have failed suddenly and without warning on yachts as young as three years old. The result is complete loss of drive. The wear shown here is after 1611 indicated engine hours. The splines have become saw teeth like in profile and the interior is covered in thick red rust dust. The same wear is present on the flywheel plate. This gearbox was inspected as a precaution, not after failure. There were no symptoms.



Here is another set of photographs showing the same wear. They were taken after 1449 hours on the meter and show the second failure on this installation since new in 1987. The first failure occurred under previous ownership without warning in 1990. Thanks again To Mike O'Brien for these four pictures of wear.



Two levels of remedy are available.

1/ The Cushion Plate approach

Volvo, although still denying any problem with the original design, blame abuse for the fretting of the splines and produce a "cushioned plate" kit, which is used as a substitute for the plate bolted to the flywheel and still uses the splines on the shaft. It is cushioned in the way it sits on the heads of Allen keys, which in turn replace the original flywheel bolts. The cushioned plate is floating, i.e. not attached to the flywheel. The synthetic material inserts on each Allen key bolt cushion the thrust.

This remedy is, only suitable for shafts showing little or no wear as a preventative. Worn splines engaging with an unworn plate must be a cause for concern, in the long term. It is unlikely to be suitable for engines with normal wear from before 1993.

2/ Modification of the input shaft

An alternative remedy used by some members is to remove the input shaft from the gearbox and either send to either:

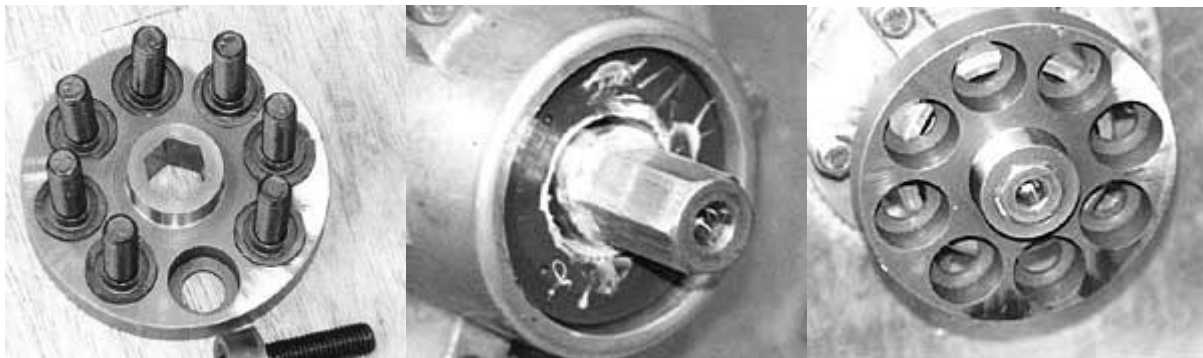


Volvo cushion plate kit

DB Marine, Volvo Agents, Cookham Bridge, Cookham on Thames, Berks, SL6 9SN –Tel. No 01628 526032 or:

Mr David Abraham, [email](mailto:email@www.versatilemarine.co.uk) at www.versatilemarine.co.uk who have taken over the engineering side of the business of Watercraft Services in Falmouth Cornwall who previously supplied this kit.

Both of these companies offer a similar service They will convert the splined shaft to a hexagonal shape and provide a replacement matching flywheel plate. It is reported that this conversion has been applied to 60 gearboxes to date at a cost of £250, (February 2002) and seems to have been in use without problem since the early manifestation of this problem on charter boats.



The DB Marine conversion kit

The removal of the gearbox for examination is a relatively straightforward procedure for a competent mechanic. The gearbox water hoses will probably have to be detached to allow the gearbox to move sufficiently rearwards to allow inspection of the splines.

The shaft couplings will also need to be undone for the same reason. The gearbox is unbolted and supported as it is moved clear and can then be lifted clear for inspection on a bench. If the shaft is to be removed, the gearbox oil will need to be drained first. If the cushioned plate option is followed, this is not necessary.

Instructions are provided with both kits on measuring the number and size of shims required when re-inserting the gearbox into the flywheel.

The reinstallation is just a matter of reversing removal and locating the fixed cutter of any rope cutter which may be present, including the correct clearance for thrust, before final coupling of the shaft.

It is clear that only removal and inspection will tell owners whether they have a problem if their engine number is in the frame. The problem has occurred on engines fitted with both two and three blade props.

Some engineers have said that because Westerly fitted the gearbox without grease or lubrication this may be a cause of the fretting of the splines. Advice from Volvo is varied and guarded on the matter of lubrication.

There is no word of any yacht which has been converted suffering failure but in the case of serious shaft wear, such as those illustrated above, my yard would not vouch for the reliability of the cushioned plate modification alone, unless it was regularly inspected. I therefore went for the DB Marine Hex option. This is also cushioned.

Owners must be guided after inspection by advice and their own judgement, as to what level of modification is appropriate, but based upon what I have seen in a well maintained and well treated yacht, I would strongly recommend that all owners take the trouble to check the conditions of their own gearbox drive shaft splines without delay!!

Eric Hyett

This summary was produced, by request, with the help of members of Westerly Owners Association and the Westerly Owners Discussion List. Particular thanks are owed to Chris Brown who warned us all in the first place, to John Mathias, Walter Reed & Mike O'Brien for supplying photographs to supplement my own and all the other owners whose accumulated experiences have led to the knowledge base.

For anyone interested in purchasing engine and gearbox manuals they can be ordered from J Hawkins Marina [email](#)

original engine workshop manual £24.00. inc. post
original gearbox workshop manual £24.00. inc. post
original DIY Manual £19.00 inc. post
original handbook £14.00. inc. post
(as at 5.2.02)