

# Porous Heads Explained

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## What is a Porous Head?

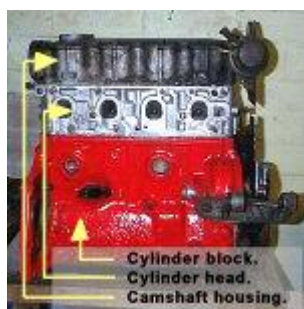


Figure 1  
Showing three parts of a engine, cylinder block, cylinder head and camshaft housing.

The head of the engine (cylinder head as shown in [figure 1](#)) has small thin veins cast inside which carries water (the coolant) and the oil. This does two things. One is that the water is pumped around the engine to cool it down after the intense heat generated from each explosion in the cylinders. Without it, temperatures would rise rapidly and metal would start to change form, i.e. it warps. If it warps the engine stops working (i.e. expensive engine rebuild).

The oil on the other hand supplies oil to the mechanical parts, which lubricates all moving parts inside. Again without oil, problems soon come apparent when items begin to seize without oil. The engine would stop working (again expensive engine rebuild).

To make efficient use of the water and oil, they must NEVER mix. If it does then the effectiveness of each liquid falls, which results in a failed engine. Because the head is cast at manufacture with the coolant and oil veins inside, everything should be OK. Unless there is a defect in the material or the casting process. The common failure is either cracks or the metal goes porous. If a head goes porous it means that the cast metal allows liquid to past through walls. Which means liquids can mix inside. It is caused by the Cylinder Head allowing oil, under normal operating pressure, to seep from the main oil gallery to the water jacket, but not the reverse. This is because the oil pressure is higher than the water pressure.



Figure 2  
2L 16v DOHC C20XE engines that were effected.

## Are all Vauxhall engines effected?

No not all engines, in fact only a very small minatory of engine cylinder heads were discovered to have this defect. Unfortunately by the time the manufactures realised the fault, it was too late and customers have now unwittingly brought cars with defected heads/engines. GM now don't want to know anything about it and even the BBC Watchdog got involved.



Figure 3  
2L 16v DOHC C20LET Turbo engines that were effected.

## What engines are affected with porous heads?

It is claimed Vauxhall doesn't actual know the true figure of faulty heads there are out on the market. But the two main engines affected are the 2L 16v Double Over Head Cam (DOHC) 'red -top' engines, [C20XE](#) (2L 16v DOHC) and [C20LET](#) (2L 16v DOHC Turbo). These are found in the Astra GTE, Astra GSi, Cavalier 2L 16v, Cavalier Turbo, Calibra 2L 16v and Calibra Turbo. No other engines or cars were affected. So any 8v, SOHC, V6 or Ecotec engines are NOT affected by the problem.



Figure 4  
Manufacture stamp is under port 3 of the

The table below shows the years effected and the types of engines. The main culprit was the manufacture, there were two. Heads were either made by Cosworth (Coscast) or Kolben Schmidt (KS).

Supplier	Year	Vehicle	Engine Type	Tensile strength	Problem
(Coscast)	1987-	KADETT-E	C20XE	350N/mm <sup>2</sup>	No Problem!

exhaust.



Figure 5  
Close up of manufacture stamp (Coscast in this case).



Figure 6  
Locate the oil gallery tube on the cylinder head.

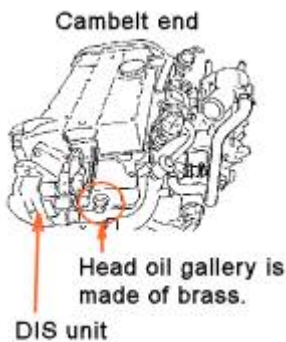


Figure 7  
Simplified drawing of the oil gallery tube on the side of the cylinder head.



Figure 8  
Close up of the oil gallery tube on the side of the cylinder head.



Figure 9  
Coolant sensor covered in brown sludge. Sign of either porous head or

Cosworth	1989				
(KS) Kolben Schmidt	1989-1991	KADETT-E	C20XE	380N/mm <sup>2</sup>	Water damage possible
(KS) Kolben Schmidt	1989-1993	ASTRA-F VECTRA-A CALIBRA	C20XE C20LET	380N/mm <sup>2</sup>	Water damage possible
(Coscast) Cosworth	1993-199x	ASTRA-F VECTRA-A CALIBRA	C20XE C20LET	350N/mm <sup>2</sup>	No Problem!
(KS) Kolben Schmidt	1993-199x	ASTRA-F VECTRA-A CALIBRA	C20XE C20LET	220N/mm <sup>2</sup>	Material too soft! Head screws come loose!

As you can tell, any Cosworth head is not effected by the problem. However a small quantity of KS heads were (but NOT all).

Note:  
Kadett-E = Astra MK2  
Astra-F = Astra MK3  
Vectra-A = Cavalier MK2  
Calibra = Calibra

### How do I tell who made my head on my engine?

Fortunately there is a way of telling, as each manufacture moulded their logo on the head. Its quite difficult to see but if the head is made by Cosworth then it will have the words COSCAST in a ring (see [figure 5](#)). Similarly if the head is made by Kolben Schmidt then the words KS is in a ring. This logo can be found on the bottom ledge below port 3 of the exhaust port (see [figure 4](#)). So its below the manifold, its not possible to see it with the engine in the car from opening the bonnet. You'll have to get underneath the car and do a lot of cleaning and degreasing to catch a glimpse of it or remove the exhaust manifold.

But there is another way of telling from the top of the engine. Many engineering firms who deal with Coscast heads have noticed that the main oil gallery in the head was sleeved with a brass tube (see [figures 6, 7 and 8](#)). When the engine went into mass production with Vauxhall, the tube was left out. I assume it was designed in by 'Cosworth' as the gallery runs to within 6mm of the water jacket, hence the problem.

### How do I know if my head is porous?

The quickest way of telling is to look at the coolant tank. As mentioned before if a head has gone porous, then water and oil mix. This produces a brown sludge like substance, similar to curry in the coolant tank (see [figure 9](#)). Its most obvious of the coolant cap as you take it off as the pressure builds up in the tank and leaves a residue on the inside of the cap. But that could also mean the head gasket as gone as well. What ever the reason, if you find the brown sludge in the coolant tank, its bad (expensive) news.

### If my head is porous, can it be repaired?

Yes they can. It depends on your wallet but these engines are quite cheap to get on the market now days. At the time of writing 2L 16v C20XE engines were going for £400-£600 second hand. But Turbo C20LET engines are still going for £2000! So it may be cheaper to get the head repaired.

There are several engineering firms who can repair them for about £200-£300 which includes delivery. They inject a resin in the head which coats the veins inside. Hence the liquids can no longer mix. So you (or the

blown head gasket.

garage) take the head off the engine, you send it to them via post, wait a week or two and they send it back to you. You then need to refit it back on the car. Of course there are extra costs for new gaskets and bolts to put the head back on, but it still may be cheaper than getting another engine fitted.

Once the fault has shown itself, replace all the water hoses and the water pump. It is worth noting the water system in its entirety will have been contaminated and attention should be given to the radiator and heater matrix, to at least ensure there is a good flow when returning the engine back to service. One small item, often overlooked, is a small grub screw in the water pump housing. Because the engine has probably been overheating the sealant on the screw will have broken down and will eventually weep, if not resealed at repair time. **It is essential that all rubber water hoses are replaced once contaminated.** Oil will have attacked the rubber making it go soft. If one of the main hoses behind the water pump splits, while travelling at speed, it will take approximately two seconds to empty the engine of all its water and you know the rest. It will make this repair 'sink into insignificance'.

#### Is there a temporary fix?

Yes there is. Some users have put a small amount of washing up liquid in the coolant tank. The cleaning agent in the washing -up liquid cleans the oil veins more efficiently than water can, hence it basically flushes out the head, and then dumps it back in the coolant tank. The main trouble with this is that washing -up liquid contains small traces of salt, and salt and metal don't mix in that it makes things rust (that's why you should never wash your car with washing -up liquid, as it will make stone chips and other scratches rust more quickly).

Fortunately these heads are made out of aluminium (light alloy) anyway but not necessarily everything else (i.e. the cylinder block is made from cast iron). So that's why it should only be used as a temporary measure, never a permanent one.

#### Engineering firms to fix the porous heads:

Headway  
Unit 16 Garden City Industrial Est  
Sealand Avenue  
Deeside  
Flintshire  
tel 01244 821921

(QED) Quorn Engine Developments for treatment.

Costs approx. £300 (about 485 euro).

Quorn Engine Developments,  
4 Soar Road,  
Quorn,  
Leicestershire,  
LE12 8BN

<http://www.qednet.demon.co.uk/>

simon@qednet.demon.co.uk

Tel : +44 (0) 1509 412317

Fax : +44 (0) 1509 416555

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