



**Tim Stock**

## Assembly camshaft damaged by timing belt failure

A recent call at the Helpline was from a new member for assistance with an unusual popping sound from the inlet. The vehicle, a 2013 Citroen Berlingo 1.6 HDI, had suffered a timing belt failure.

As expected, it had bent valves on one cylinder, so the technician removed the cylinder head to replace the bent valves, measured the piston height relative to the other cylinders and then rebuilt the engine with new timing belt components. As a technician with many years'

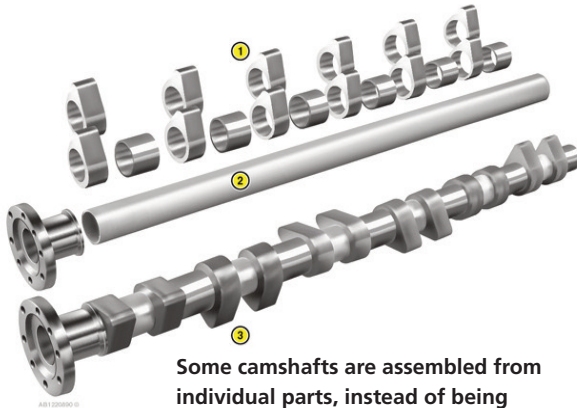
experience, he could not find a valid reason for the continual popping sound from inlet.

He had ruled out the injector, no codes were present. So he called the Helpline with all the information on the repair up to date to get the problem sorted out. It was not long on the call before we provided a diagnosis as to the root cause.

We explained that he should inspect the camshaft lobes on the cylinder with new valves. Some engine manufacturers use assembled camshafts, which he had never heard of before. We gave him a brief explanation of the process they use to press or shrink the lobes on to a hollow shaft, normally done to save weight and cost in manufacturing the camshaft.

In the event a valve to piston collision, it has been known for the cam lobes to shift position, affecting valve event timing on that cylinder. A new camshaft was compared to the fitted one, and an obvious lobe position error was present.

There are several methods used in the manufacture and assembly of these camshafts. Assembly camshafts can save up to 40% in component weight, and each component in the assembly can be of a different material, another saving in material and engineering costs. The most common process is interference fitting. An alternate method is hydroforming, where water under extreme pressure of around 2000 Mpa is pumped into the sealed shaft. This expands the shaft against the lobes and forms a tight fit.



**Some camshafts are assembled from individual parts, instead of being machined as one piece**



**Some camshafts are expanded with internal pressure to jam lobes into position**