NewsStand - The Good, the Bad, and the Ugly

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We live in a world where change is the norm. Some change is good, and we simply have to adjust our own personal attitudes to adapt. On the other hand, sometimes change can appear to come from good motivations, but when implemented has unforeseen consequences. Sometimes those problems don't show up until later, when the damage is done. The end result is that more changes are required to fix the problems caused by the first change.

An example has been the reduction of the antiwear additive zinc dialkyldithiophosphate (ZDDP) in motor oil. The intentions here were good because zinc and phos were interfering with the job catalytic converters are supposed to do. But let's step a little further back to get a handle on what catalytic converters are doing on cars in the first place.

The first Air Quality Act was passed in 1967. It had no teeth, however, and really didn't accomplish anything. Three years later a new Clean Air Act was passed into law requiring the Environmental Protection Agency to identify and establish pollution standards for six items deemed harmful to humans. These were carbon monoxide, lead, ozone, nitrogen dioxide, sulfur dioxide and aerodynamic particulate matter of a 10 micrometers or less.

Auto manufacturers weren't the only ones targeted by these efforts, but cars and trucks were a contributing factor with regard to air pollution. The internal combustion engine is an imperfective but effective means of powering motorized vehicles. The downside comes from the exhaust stream which can, in addition to other substances, spew unburned fuel (hydrocarbons) and oxides of nitrogen (NOX) into the atmosphere. The geographic features of cities like Los Angeles caused all these by-products of combustion to wreak serious havoc on peoples' lungs. As a result, later amendments to the Clean Air Act made catalytic converters a required feature on automobiles.

The role of the catalytic converter is to convert all these harmful pollutants into less harmful byproducts before they leave the exhaust system. Catalytic converters transform or convert these bad things into carbon dioxide and water. In case you ever wondered, that's why you see water dripping out of tailpipes. That's the catalytic converter doing its job.

Unfortunately, the zinc and phos in motor oil, which was there for wear protection among other things, has been shown to have a possibility of poisoning catalytic converters. A catalytic converter requires heat to operate properly so that a chemical reaction can take place. If you put zinc and phosphorus through it these elements can stick on the internals of the catalytic converter. Net result: the chemical reaction doesn't happen and the vehicle doesn't pass emissions tests.

Once this was understood, a decision was made to reduce zinc and phosphorus levels in motor oil to accommodate these emission-reduction devices. The American Petroleum Institute (API) implemented the change in late 2004 with API SM and ILSAC GF-4 specifications for gasoline engines have maximum and minimum phosphorus levels of 800 ppm and 600 ppm, respectively, for SAE 0W-20, SAE 5W-20, SAE 0W-30, SAE 5W-30 and SAE 10W-30. Shortly after this rollout of a better oil for catalytic converters there followed a huge outbreak of flat tappet camshaft failure. The cam companies saw this and people began to scratch their heads wondering what was going on. The culprit turned out to be the motor oil.

Flat tappet camshafts undergo extreme pressure and loads, thus requiring engine oil that is fortified with anti-wear additives to provide premium protection. The severity of higher valve spring pressure in racing engines also creates the need for additional wear protection.

The problem did not show up in newer cars because they employ a roller cam instead of the flat tappet. But street rod guys and engine builders were running into problems they'd not had experienced before.

First off, the cams themselves are somewhat soft. They need to be heat cycled which will season it, making the metal on it very hard and resilient to wear. It also needs to be broken in. That is each lobe on the camshaft is mated, so to speak, to a lifter. All the little imperfections on that lobe need to match all the imperfections on the lifter and that usually takes place within the first 15 to 20 minutes of that engine's run time. So when you first start it, all of this is going to take place and that break in procedure produces heat. The lobes on the cam are not pressure lubricated like the bearings in the engine would be. They're splash lubricated so they're getting run off oil from the cam galley, getting splashed from the crank shaft when the engine is running. Because that's all that lubricates these parts, anti-wear additives are critical in this area.

This is why the oil in muscle cars and vintage cars needs beefier levels of zinc and phos. It also explains why some motor oil companies have added some of the specialty oils they carry in their product mix.

As for the rest of the cars you service, there will no doubt be more changes coming. Fortunately, through trade shows and trade publications like this one, unexpected consequences of change get communicated quickly to business owners and managers who invest the time to stay current with what's happening.