Ashtabula Rubber Co.

DESIGN • PROTOTYPING • PROJECT MANAGEMENT • GLOBAL MANUFACTURING & SOURCING

Can your Current Elastomer Handle Changing Regulations?

In December of 2000, the EPA assigned engine emission standards for the 2007 model year and later heavy-duty highway engines. These new regulations specifically included diesel fuel regulation. One aspect of the diesel fuel regulation is limiting the sulfur content in the fuel itself, reducing the current sulfur content of 500 ppm down to 15 ppm.

Although Ashtabula Rubber manufactures components for myriad of industries, we have kept a close eye on the changes happening within the truck market. Some may view the changes as only affecting the engine conditions, when the reality is these regulations are adversely affecting the performance of elastomer seals in a variety of truck systems, including the firewall and air brake components.

As most engineers know, the temperature of the operating environment is a huge factor in designing an effective seal. Keeping that in mind, the new EPA regulations for truck engines have resulted in a temperature increase of almost 50 Degrees Fahrenheit. This new "overheated" environment can have a drastic effect on the performance of rubber components. Not only will it cause the rubber to deteriorate more quickly, but many elastomers will react in the form of a higher (poorer) compression set. When dealing specifically with rubber seals, a rapid transition to a higher compression set will almost always result in component failure (in this case, a leaky seal).

There is general agreement that the new fuel has changed the chemical makeup of the operating environment. One component we supply for this market consists of a custom rubber compound chemically bonded to an aluminum insert. Through injection molding, Ashtabula Rubber molds the rubber directly to the insert and effectively eliminates the time and cost of a secondary assembly for our customer. When it was realized that the current rubber compound may deteriorate more quickly as a result of the "new" diesel fuel, we began working on different formulas. In addition, new diesel fuel byproducts can affect the chemical bond between the rubber and metal itself. Any weakening of this bond will ultimately lead to product failure.

Another long standing customer of ours approached us about enhancing the performance of a rubber spring that we currently manufactured. Although the old spring was working well, the component was going to be exposed to higher temperatures as a result of changing regulations. We were asked to alter the elastomer compound to allow the spring to maintain its properties in temperatures that would climb as high as 250 Degrees Fahrenheit. In addition, the "new" component needed to have a service life of at least 500,000 miles. By working closely with our client's design engineers and understanding the details of the new environment, Ashtabula Rubber quickly supplied prototypes of three alternative materials.

When talking specifically about engines though, one of the most common applications for a rubber component is its use as a seal. Many engineers understand when and where a seal will be needed and may have an idea of the interface and geometry. However, there are some subtleties where detailed knowledge and experience of rubber materials, characteristics, and design are required to achieve an effective seal.

Recently, we were involved in a job concerning a compression seal. The currently supplied component (not ours) met print material specifications. However, under certain conditions at low temperature (-50 Degrees Fahrenheit) the seals leaked. Because of Ashtabula Rubber's knowledge of materials and application environments, we were able to formulate a new material that met specifications and eliminated the low temperature leak problem. Although this case involved a much colder environment, the same rule applies: temperature changes affect the compression set, which may alter the effectiveness of the seal.

The fact remains that standards change quite frequently for engine-powered equipment and component markets. Although not all changes affect rubber seals or other elastomer components, it is important to know when they do.

To help engineers better understand the effect of changing standards on their rubber components, there are a few questions that engineers should ask themselves.

1) What materials are in contact with the elastomer seal and have these materials changed in chemical composition?
2) Has the temperature of the operating environment changed?
3) Is the performance requirement of the rubber component expected to change?

If the answer is "yes" to any of these questions, then we recommend a review of your elastomer formula.