Technical Bulletin:

Engineering Considerations in Gasket Material Selection

Engineering Considerations in Gasket Material Selection

Dan Towers
Magnum Diesel Parts
7--07

To understand how a gasket works, we must first understand the many properties within a gasket material that make it desirable for the given application and the operating conditions it will encounter. Careful consideration to the gasketing environment is essential to maintaining a robust, long-lived sealed assembly. Temperature, flange rigidity and bolt load, as well as media to be sealed are some of the important factors to consider in the material selection process.

Gasket Materials

Gasket materials are made from either organic, or in-organic fibers, rubber binders, and various fillers to form a compressible material that when compressed between two load bearing surfaces prevent liquid, gas, or contaminants from passing. The gasket must conform to the surface imperfections and maintain a seal over the acceptable life of the assembly.

Important Load-Bearing Properties

Due to the wide variety of sealing conditions encountered within the Diesel Industry, it is necessary to provide gasket materials with varying physical properties to meet these individual demands. The following are important load-bearing material properties considered in selecting the right material for a given application.

Compressibility: *The gaskets ability to conform to flange surface conditions and imperfections.*
Gasket thickness and compressibility must be matched to the rigidity, surface conditions, and load-bearing properties of the flange. It is said that gaskets fabricated from compressible materials should be as thin as possible and as thick as necessary to conform to the flange surface.

Recovery: *The gaskets ability to accommodate the motions encountered through thermal and mechanical cycling of a flange.*
Recovery, or the degree to which a gasket recovers its initial thickness after removal of an applied load is generally associated with compressibility. While a materials compressibility under varying loads determines its ability to conform to the flange surface, it must also exhibit adequate recovery to remain seated and resist unloading through thermal, or mechanical motions of the flange.

Creep Relaxation: *The gaskets ability to retain sufficient stress and resist thinning under an applied load.*
It is important for a gasket to maintain sufficient sealing stress for the acceptable life of the assembly. In varying degrees, all gaskets exhibit relaxation, or a decrease in applied stress. Stress is applied by tension in a bolt, or stud and transmitted as a compressive force to the gasket. Over time, relaxation decreases tension in the bolt resulting in “torque loss”. The amount of relaxation increases as thickness increases in a given material.

MAGNUM DIESEL PARTS
21800 Barton Road, Suite 108, Grand Terrace, California, 92313 USA
Phone: 909-825-5605 Toll Free: 877-624-6866 Fax: 909-825-3035
Parts@MagnumDieselParts.com

Environmental Properties

The following are some additional properties important to the material selection process.

Chemical Compatibility: *The materials ability to resist the media to be sealed.*
Because gasket materials are bound with various rubber compounds, it is important to consider the compatibility of the binder to the various media gaskets encounter. Not all binders are suitably compatible with the various media in which gaskets are used, and therefore becomes an important consideration in the material selection process.

Temperature Resistance: *The materials ability to accommodate the thermal conditions it will encounter.*
The type of rubber binder and fiber used is selective to the thermal conditions encountered in an application.

Tensile Strength: *The materials ability to resist blow-out due to internal pressures and lateral flange motion.*
The strength of a gasket material can be characterized by its Tensile Strength, (in addition to its crush resistance, not covered in this writing). Tensile Strength is the materials resistance to a tensile force, or pulling in the plane of the material, as opposed to a perpendicular tearing action.

Fluid Resistance and Sealability: *The materials resistance to wicking through the material itself. The materials permeability to specified fluids, (expressed in milliliters per hour), and resistance to the fluid to be sealed.*
Fluid sealability is determined by the materials sealing ability under varying compressive flange loads. The fluid resistance identifies the gasket materials ability to maintain its physical properties when exposed to various fluids.

MAGNUM DIESEL PARTS
21800 Barton Road, Suite 108, Grand Terrace, California, 92313 USA
Phone: 909-825-5605 Toll Free: 877-624-6866 Fax: 909-825-3035
Parts@MagnumDieselParts.com