

WP0164

Dodge® Para-Flex couplings: element inspection criteria

Dodge Customer/Order Engineering

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The Dodge Para-Flex is a commonly utilized coupling due to its high misalignment capabilities and wide range of torque ratings. Even with such a versatile coupling, periodic inspections are valuable for reliable operation. When it is time to inspect or maintenance the coupling, it is important to know what to look for so elements can be replaced when appropriate and unplanned downtime is minimized.

Inspection of Para-Flex elements can be performed statically or dynamically. Static inspection involves stopping and locking/tagging out all equipment. With the coupling guard removed, the Para-Flex element is then visually inspected. Although not recommended due to safety concerns, inspecting an element in operation can be achieved by using a strobe light. The strobe light is adjusted until the frequency matches the running speed of the equipment. This method allows the operator to inspect the coupling without stopping the equipment. It is important to exercise extreme care when inspecting couplings using the dynamic inspection method. This method should only be used if the operator can access the coupling through a screen or hatch in the coupling guard and can perform the inspection safely. If the coupling cannot be accessed safely, the static inspection method should always be used.

Every application presents its own challenges for elastomeric couplings. Torque spikes and excessive misalignment can decrease the life of a Para-Flex element. During the inspection of the element, it is good practice to look for any signs of tearing or cracking of the element as well as signs of soft or tacky rubber.

Overload/Excessive Torque:

Figures 1 displays tearing consistent with overload or excessive torque. Overload and shock load conditions with rubber-based elements are evidenced with jagged wear patterns with the rubber. 45° tear propagation from the shaft centerline is also evidenced from the initial jagged tears. Overloads will often cause the element to slip between the hub and clamp ring, however, this condition is also representative of improper installation. If the tearing is severe, the element should be replaced at the time of the inspection.



Figure 1. Tearing Commonly Associated with Excessive Torque

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Fatigue:

Fatigue in rubber-based elastomers is evidenced by cracks in the region of the element split. However, the primary fatigue damage is evidenced by large cracks located slightly above the clamp circle. These cracks extend completely through the element and often radially over the outside diameter of the element, as shown in **Figure 2**. As the cracks propagate, rubber debris, often similar to coffee grounds, will be evident beneath the coupling. Replacement is recommended when cracks extend for 20% or more of the element circumference. If the element is not replaced the cracks will continue to propagate and the reinforcement fabric will become torn and exposed. The fabric strands are often extended and bare.



Figure 2. Tearing Commonly Associated with Cyclic Stress

Excessive Misalignment:

Though tearing radially over the diameter of the element show signs of fatigue failure, it can also be a sign of excessive parallel misalignment. Angular misalignment in rubber is usually represented by cracks above the clamp ring. These cracks and tears on the exterior sidewall that do not propagate angularly are indications of angular misalignment. Cracks on the interior surface of the element above the internal clamp ring are indicative of excessive end float.



Figure 3. Tearing Commonly Associated with Excessive Misalignment

Hysteresis:

The Dodge Para-Flex coupling is designed to aid in vibration and shock load dampening. Misalignment can occur over time as foundations settle which in turn can cause vibration. This vibration causes excess energy that is absorbed by the rubber element causing an internal buildup of heat. This phenomenon is known as hysteresis. As long as the heat is dissipated, the elastomeric couplings can handle high levels of misalignment. When the effects of vibration are high enough, the rubber will begin to revert to its natural rubber properties prior to vulcanization. Signs of soft or tacky rubber will be apparent. If severe, plans should be made to replace the element immediately.



Figure 3. Degradation of Rubber Due to Excessive Vibration

If any tearing on the element is found during inspection, steps should be taken to determine the cause of failure in the system. Alignment of the connected equipment should be checked and corrected to minimize the effects of misalignment on the system. System requirements should also be checked and compared with the Para-Flex performance ratings to ensure that the proper size and service factor has been selected. Any sources of excessive vibration should also be isolated to maximize coupling life.

For additional information or questions related to inspection or maintenance criteria, Dodge Bearings and PT Component Customer Order (C.O.) Engineering should be contacted. Contact information for Dodge C.O. Engineering can be found on the Dodge Engineering Support webpage.

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