

Insight: Fire Pump Elastomeric Couplings

Recognizing the Risk

Couplings are a critical component on many industrial pump applications- including fire pumps supporting fire protection systems. In general terms, a pump coupling's main purpose is to connect (i.e. couple) an electric motor or diesel engine "driver" shaft to a pump impeller shaft facilitating the transfer of rotational power to increase material or media flow in some form. For a fire pump, the media is water supplying fire protection and suppression systems typically in the form of increasing available supply pressure needed for successful fire sprinkler operation. Couplings also have a secondary purpose to facilitate slight pump and driver shaft elongation that occurs due to temperature changes when operating.

Pump couplings come in several designs and materials. Elastomeric-type couplings are a common choice used in numerous industrial applications as they are relatively inexpensive, maintenance-free (requiring no lubrication), and easy to install. And while a good choice in many industrial applications, although still occasionally installed due to contractor familiarity, they are not the right choice for fire pump installations. In fact, one of the most commonly used global references for fire pump design and installation which AIG also generally follows, NFPA 20, has not allowed their use in this application for over two decades. Since 1996 NFPA 20 has required all critical components of a fire pump system including pumps, drivers, controllers, and couplings to be "Listed" or "Approved" by a recognized testing agency specifically for fire service. And elastomeric couplings are not UL Listed or FM Approved for use in fire pump applications.

Why the concern?

There have been numerous documented failures specific to elastomeric shear-type couplings utilized on fire pumps. Elastomeric couplings are extremely sensitive to shaft misalignments. Fire pumps are designed to operate under service conditions different from industrial applications that create added failure potential. Unlike other industrial pump systems and applications, fire pumps connected to electric motors can see immediate maximum torsion when energized which is transmitted directly through a coupling. And while there may be a slight speed ramp up on diesel-engine driven pumps, this torsional power transmission is also near instantaneous. And most fire pumps, unlike most industrial applications, do not use variable frequency drives or other methods to create soft (slow speed ramp up) starts.

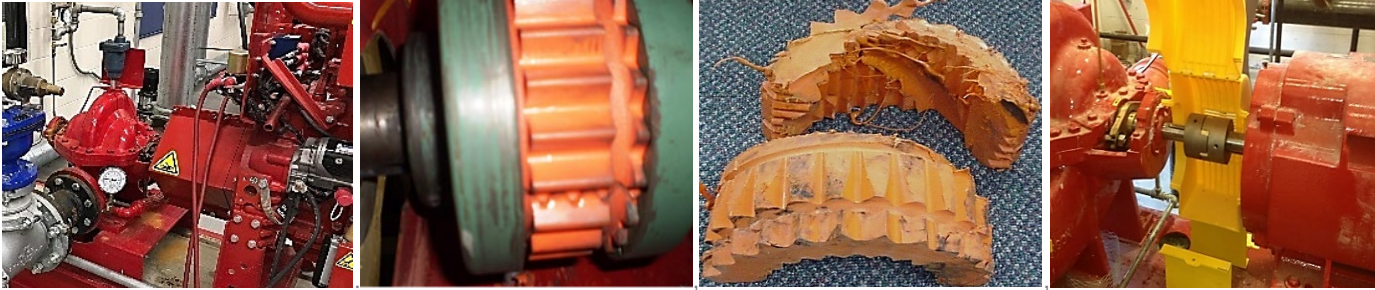
This risk is significant.

If installed, they are a critical component in effective fire protection systems operation. A coupling failure most likely means the total impairment of all connected fire sprinkler systems from operation as the driver loses all connection to spin the pump and create flow/pressure. And in the event of a fire, without full backup, this means the loss of almost all chances of fire control. Additionally, elastomeric coupling failures on fire pump systems typically occur instantaneously without warning and when the pump is operating under full load- such as during a fire event.

Controlling the Hazard

Only Listed/Approved couplings should be installed in fire pumps systems per NFPA 20. More specifically, shear-type elastomeric couplings should never be utilized. Years of industry experience (and failures) have indicated that couplings relying on all-elastomeric material can fail catastrophically and unpredictably without warning. Listed/Approved jaw-type couplings, with metallic jaw inserts to transmit power from driver to pump as a secondary means with elastomeric material failure, or equivalent should be utilized.

Angular and parallel horizontal driver/pump shaft alignment should also be completed annually as a minimum by qualified personnel (such as a trained millwright or engine mechanic) and, using laser alignment equipment. Additionally, to also ensure driver-pump alignment, fire pump baseplate should be grouted when a fire pump is installed on a steel frame per NFPA 20.



Fire Pump System

Elastomeric Coupling

Elastomeric Coupling Failure

Listed Jaw Coupling

References & Resources

NFPA 1: Fire Code

NFPA 13: Standard for the Installation of Sprinkler Systems

NFPA 20: Standard for the Installation of Stationary Pumps for Fire Protection

NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

UL Test Standard 448A: Flexible Couplings and Connecting Shafts for Fire Pumps”

FM Approvals Approval Standard 1336: Flexible Fire Pump Couplings and Flexible Connecting Shafts for Fire Protection Service

*While NFPA documents are the global standard used by AIG, international equivalents may be acceptable.

For more information, contact your local AIG Risk Engineer.

The information, suggestions and recommendations contained herein are for general informational purposes only. This information has been compiled from sources believed to be reliable. Risk Consulting Services do not address every possible loss potential, law, rule, regulation, practice or procedure. No warranty, guarantee, or representation, either expressed or implied, is made as to the correctness or sufficiency of any such service. Reliance upon, or compliance with, any recommendation in no way guarantees any result, including without limitation the fulfillment of your obligations under your insurance policy or as may otherwise be required by any laws, rules or regulations. No responsibility is assumed for the discovery and/or elimination of any hazards that could cause accidents, injury or damage. The information contained herein should not be construed as financial, accounting, tax or legal advice and does not create an attorney-client relationship.

This document is not intended to replace any recommendations from your equipment manufacturers. If you are unsure about any particular testing or maintenance procedure, please contact the manufacturer or your equipment service representative.

American International Group, Inc. (AIG) is a leading global insurance organization. AIG member companies provide a wide range of property casualty insurance, life insurance, retirement solutions and other financial services to customers in approximately 70 countries and jurisdictions. These diverse offerings include products and services that help businesses and individuals protect their assets, manage risks and provide for retirement security. AIG common stock is listed on the New York Stock Exchange.

Additional information about AIG can be found at www.aig.com | YouTube: www.youtube.com/aig | Twitter: [@AIGinsurance](https://twitter.com/AIGinsurance) www.twitter.com/AIGinsurance | LinkedIn: www.linkedin.com/company/aig. These references with additional information about AIG have been provided as a convenience, and the information contained on such websites is not incorporated by reference herein.

AIG is the marketing name for the worldwide property-casualty, life and retirement and general insurance operations of American International Group, Inc. For additional information, please visit our website at www.aig.com. All products and services are written or provided by subsidiaries or affiliates of American International Group, Inc. Products or services may not be available in all countries and jurisdictions, and coverage is subject to underwriting requirements and actual policy language. Non-insurance products and services may be provided by independent third parties. Certain property-casualty coverages may be provided by a surplus lines insurer. Surplus lines insurers do not generally participate in state guaranty funds, and insureds are therefore not protected by such funds.

Copyright © American International Group, Inc. All rights reserved.