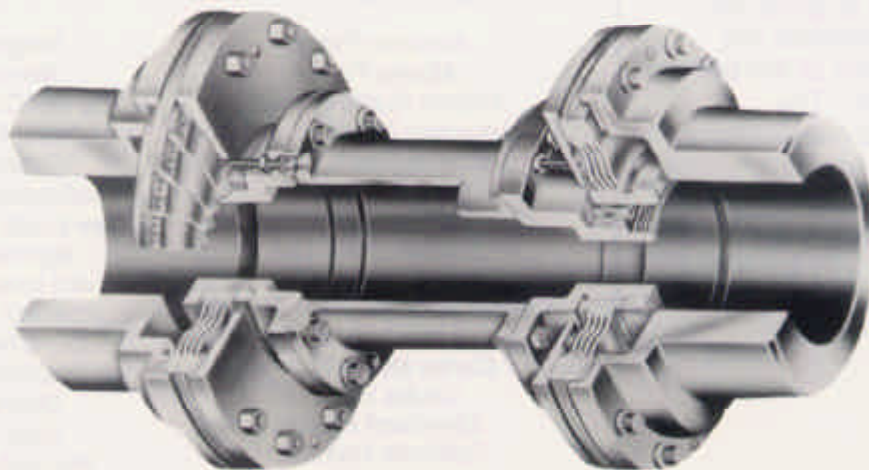


Ameriflex®

Electric Power Plant Dry Coupling Retrofits

Throughout the Power Generation Industry there have been maintenance programs established to improve reliability of plant equipment. One area of concentration by many power plants throughout North America is the conversion of high performance couplings from the gear tooth design to the dry flexible membrane type coupling on critical equipment. The steam turbine to boiler feed pump train has been specifically identified as an application where, if properly engineered and applied, the flexible membrane coupling offers significant advantages over the grease packed or continuous lube gear tooth coupling. **Ameriflex** couplings are the users' choice when retrofitting critical equipment such as generator set and boiler feed pump applications.



Ameriflex RR Series Coupling

Some of these advantages include:

- 1) Dry couplings tolerate greater parallel and angular misalignment without distress wear that results from high misalignment of a gear coupling.
- 2) Dry couplings produce much less angular moment, which is predictable since it does not depend on an underterminable coefficient of sliding friction. Diaphragm couplings produce 10-20% of the angular moment produced by the gear coupling.
- 3) Radial and thrust bearing life is dramatically increased due to the lower moments and thrust loads.
- 4) Coupling hub to shaft fretting wear is virtually eliminated due to lower moments.
- 5) Coupling lock up potential is eliminated.
- 6) No lubrication required, eliminating the need for regreasing or special oil filtration.
- 7) No sliding or rubber parts to wear. The diaphragm type coupling will give infinite life.
- 8) Dynamic balance is dramatically improved since there are no pilot/tooth tip clearances that create unbalance.

Upgrade Your System the Right Way

Since its introduction in 1971, the **Ameriflex** multiple convoluted diaphragm coupling has continued to set new standards for life and reliability in high performance applications for the power generation market.

Couplings are an integral part of the boiler feed pump train and should be a major consideration when upgrading the system. **Ameriflex** couplings have been engineered specifically to accommodate the strenuous requirements of the boiler feed pump application. The **Ameriflex** coupling is maintenance free and requires no lubrication making it the ideal choice for continuous duty applications. Power plant applications include generator drives, auxiliary pumps, fans and other rotating equipment.



Ameriflex 8-7 RR/RM

Ameriflex Power Plant Users List

- | | |
|-------------------------------|---------------------------------|
| Alabama Power | Magma Electric |
| Alberta Power | Memphis Light |
| Arizona Public Service | Mid-Set Cogeneration Co. |
| Arkansas Power & Light | Midwest Power Systems |
| Baltimore Gas & Electric | Mississippi Power |
| Basin Electric | Nebraska Public Power |
| Big River Electric | New England Public Power |
| Canadian Ind. Ltd. | Northeast Utilities |
| Carolina Power & Light | Northern Indiana Public Service |
| Central Hudson Gas & Electric | Northern States Power |
| Central Illinois Public Power | Ohio Power |
| Center Maine Power | Omaha Power |
| Chuba Electric | Orlando Utilities |
| Cleveland Electric | Otter Tail Power |
| Colorado Interstate | Pennsylvania Electric |
| Colorado Utilities | Perry Nuclear Power Plant |
| Commonwealth Edison | Philadelphia electric |
| Consolidated Edison | Potomac electric |
| Consumer Power | Public Service Electric & Gas |
| Dayton Power | Public Service of Indiana |
| Detroit Edison | Public Service of New Mexico |
| East Kentucky Power | Roseton Electric |
| Florida Power | Santee Cooper |
| Georgia Power | Seminole electric |
| GPU Nuclear | Sierra Pacific Power |
| Gujarat Industries Power | South Carolina Electric & Gas |
| Gulf Power | Southern Company Services |
| Gulf States Utilities | St. Johns River Power |
| Homer Electric | Sunflower Electric |
| Houston Power & Light | T.V.A. |
| Illinois Power | Tampa electric |
| Intermountain Power | Texas Utilities |
| Iowa-Illinois Gas & Electric | Tokyo Electric |
| Israel Electric | Union Electric |
| Jersey Central | Utah Power & Light |
| Kansas City Power & Light | Washington Public Power |
| Kissimmee Utility Authority | West Coast Energy |
| Louisville Gas & Electric | |



#34-11 HP Short Design

Retrofit Reasoning

Q. Couplings are working fine - why should they be replaced?

- A. 1) Gear Coupling Wear
- As they wear, their potential unbalance increases
 - By replacing a gear coupling with an Ameriflex, you reduce risks of coupling and bearing failures.
 - Ameriflex couplings are designed for infinite life.
- 2) No Maintenance Required for Flexible Diaphragm Coupling.
- Less frequent inspection periods/down time for dry type.
 - Eliminate lubrication systems.
 - Fewer spare parts and simplified assembly.

Q. Dry couplings cost more. Lubricated couplings were originally approved by the O.E.M. Why should a replacement be considered?

- A. Actually, a dry coupling costs less if you consider the total operation package including the lubrication system, improved equipment reliability, etc.
- B. With field interchangeable flex elements the main coupling and spare parts are often less expensive than the gear coupling.

Q. What is most apt to fail on a dry coupling?

- A. Multiple separated diaphragms provide an additional safety feature. The stresses in each diaphragm in a pack are not equal due to the offset stress. Therefore, if a fatigue failure was to occur due to overalignment, the outer diaphragm will fail first.

Since the diaphragm flex area are separate, one failed diaphragm will not necessitate the next to fail. The next diaphragm will have a lower combined alternating stress than the first, due to a lower offset stress.

If machinery operations continue and the next outermost diaphragms continue to fail, the decreased stress effect would continue until approximately one-half of the diaphragms have failed.

As a failed diaphragm continues to operate, cracks can develop into broken pieces. These will centrifuge and be caught in the coupling anti-flail guard. Most turbomachinery today incorporates vibration monitoring equipment designed to detect and unbalance by such a failed diaphragm.

The diaphragm pack subassembly and fastener set are all that is generally stocked as spare parts.

Q. Steam Turbines generally have a significant amount of thermal growth both vertically and horizontally. Can the diaphragm coupling handle this growth?

- A. Yes, Ameriflex couplings are designed for the thermal growth of steam turbines by "pre-stretch" In most cases the couplings will operate in their neutral or relaxed position therefore imposing very little force on the connected equipment.

Q. Is Ameriflex limited in torque capacity?

- A. No. Ameriflex Couplings have been supplied for power generation applications for up to 105,000 HP. The Ameriflex Coupling design is not limited by horsepower or diameter restrictions.

Q. If dry couplings are so great why isn't everyone converting their power plant applications?

- A. You would be surprised at how many power plants have made the conversion. See the list of users on page 2.

The Retrofit

When planning maintenance of turbomachinery, the proper selection of dry couplings to replace gear couplings should be considered. Quite often high performance couplings are used to "tune" a turbomachinery train. The rotodynamic response can be greatly influenced by a change in the couplings mass distributions. In addition to the basic information required to size a coupling, there are several areas of consideration for proper retrofit selection. The most significant coupling characteristics to be considered are:

- Axial travel capacities
- Weight and center of gravity location
- Torsional stiffness
- Axial Natural Frequencies
- Lateral critical speed
- Windage/temperature rise
- Equipment envelope

When designing Ameriflex couplings for retrofit applications, our engineers will attempt to match the mass elastic data of the existing coupling. To properly select a coupling the following information is required.

1. A drawing of the existing coupling providing the following data:
 - A. Weight
 - B. Torsional Stiffness
 - C. Polar moment of inertia (WR^2)
 - D. Centers of gravity
 - E. Axial bending stiffness for disc or diaphragm couplings
 - F. Distance from journal bearing centerline to end of shaft
 - G. Thermal growth
2. A drawing of the existing coupling guard.
3. History of the existing coupling
 - A. Length of time in service
 - B. Any problems experienced

Type of equipment: _____
Installation location: _____
Target installation for turn around or new coupling: _____

Have original couplings been changed? Yes No

Type and Model of existing coupling? _____

Changes to equipment: (BSE, guard, shafts, etc?) _____

Have speed ranges or HP changed? Yes No

Any observed operational problems (vibration, etc.?) _____

What are your spare parts requirements for couplings?
(Sub-assemblies, complete spares, etc.?) _____

Any additional details on new requirements or the existing couplings that may affect a coupling selection? _____

Type of response required:

Formal proposal: _____

Site visit requested: _____

Power Plant Inquiry

To help us serve you better, please complete this form and have the indicated information ready when inquiring about a retrofit proposal.

Person Requesting Information:

Name: _____

Title: _____

Company: _____

Telephone: () _____ Fax: _____

Mailing Address: _____

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Please address all inquiries to:

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