

#### Introduction to Shaft Couplings & Awareness Training on Quick-Flex Couplings



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#### What Is A Coupling?

Definition: **Coupling** - *In the bearing* & *power transmission industry,* a device used to directly connect two shafts together at their ends for the purpose of transmitting power

- What applications use a coupling?
  - Motors to gearboxes
  - Gearboxes to driven equipment
  - Motors to pumps
  - Any drive shaft to a driven shaft
- Other common options for power transmission or driving a shaft
  - Sheaves and belts
  - Sprockets and chain



#### - Couplings Installed and Working



Example 1: Motor driving a pump

Example 2: Gearbox driving work rolls





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# - Coupling Categories



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#### **Typical Application Considerations**

Torque requirements of the drive

<u>Definition</u>: **Torque -***The tendency of a force to rotate an object about its axis. Just as a force is a push or a pull, a torque can be thought of as a twist."* 

- Misalignment of shafts being connected
  - Misalignment is the number #1 cause of failure for couplings
- Dampening requirements for shock and vibration

<u>Definition</u>: **Dampening -** *Reduction of the shock or vibration being transmitted* 

#### Backlash

<u>Definition</u>: **Backlash -** The clearance between two mating components

#### Operating speed

#### Misalignment

- Misalignment is the number #1 cause of failure for couplings
- Sources of coupling misalignment
  - Unstable foundations or bases
  - Installation practices









#### Dampening of Shock and Vibration

 Quick-Flex coupling transmits power through the polyurethane (elastomeric) insert, which dampens shock and vibration



<u>Definition</u>: **Dampening -** Reduction of the shock or vibration being transmitted



# Backlash

- A consideration in applications requiring absolutely positive engagement, such as indexing, servo, positioning.
- Quick-Flex inherent design has clearance between Hub teeth and insert resulting in Backlash.
- Disc couplings are the preferred design in such applications.

# <u>Definition</u>: **Backlash -** The clearance between two mating components



**Disc Couplings** 



# - Operating Speed

- Typically as the coupling size increases, speed capability decreases
- As speed increases, the out of balance is magnified
- Quick-Flex inherent design is well balanced





#### Mechanical Gear Couplings

- Benefits
  - Handles extreme amount of torque in small package
  - Accepts 1-1/2° misalignment
- Concerns
  - Metal-on-metal
  - Needs lubrication
  - Abrasive wear
  - Keeping lubrication in coupling
  - Move equipment to replace
  - Replace complete coupling
  - Transmits shock and vibration
- Common brands
  - Falk
  - Kop-Flex
  - Lovejoy



	Gear Coupling Rating	Quick-Flex Rating		
Torque	High	High		
Misalignment	Med	Med		
Speed Capability	High	High		
Dampening Capability	Low	High		
Backlash	Yes	Yes		
Purchase Price	Med	Med		
Lubrication	Yes	No		
Replacement Cost	High	Low		

#### - Gear Couplings



# Mechanical Grid Couplings

- Benefits
  - Cost
  - Dampens vibration and shock
  - Accepts misalignment
  - Axial float
- Concerns
  - Metal on metal
  - Grease and seals
  - Vertical applications
  - The grid may only be replaced once
  - Seal replacement
- Common brands
  - Falk
  - Lovejoy
  - Kop-Flex



	Grid Coupling Quick-Flex Rating Rating			
Torque	Med	High		
Misalignment	Low	Med		
Speed Capability	Med	High		
Dampening Capability	Med	High		
Backlash	Yes	Yes		
Purchase Price	Med	Med		
Lubrication	Yes	No		
Replacement Cost	Med	Low		

#### - Grid Couplings





#### Elastomeric

Shear: Tire Couplings

- Benefits
  - Accepts severe misalignment
  - No lubrication
  - Replace element in place
  - Dampens vibration and shock
- Concerns
  - Limited torque capacity
  - Element releasing
  - Pulling hubs together under high torque
  - Expensive replacement
- Common brands
  - Rexnord "Omega"
  - TB Woods "Dura-Flex"
  - Dodge "Para-Flex"
  - Falk "Taurus"



	Tire Coupling Rating	Quick-Flex Rating	
Torque	Low	High	
Misalignment	High	Med	
Speed Capability	High	High	
Dampening Capability	Med	High	
Backlash	Yes	Yes	
Purchase Price	Med	Med	
Lubrication	No	No	
Replacement Cost	High	Low	

#### - Elastomeric Tire Style Coupling





#### Elastomeric Compression Compared to Shear



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#### Elastomeric

#### Compression: Jaw Couplings

- Benefits
  - Low purchase price
  - Simple (usually three pieces)
  - Will handle some misalignment
- Concerns
  - Compressed mode
  - Transmits shock and vibration
  - Accepts very little axial end float
  - Requires moving equipment to replace insert
  - Jaws may become damaged and require complete coupling replacement
- Common brands
  - Lovejoy
  - TB Woods
  - Browning



	Jaw Coupling Rating	Quick-Flex Rating	
Torque	Low	High	
Misalignment	Med	Med	
Speed Capability	Med	High	
Dampening Capability	Low	High	
Backlash	Yes	Yes	
Purchase Price	Low	Med	
Lubrication	No	No	
Replacement Cost	High	Low	



# - Jaw Coupling





#### Elastomeric

#### Shear: Wrap-style Couplings

- Benefits
  - Accepts misalignment
  - No lubrication
  - Replace element in place
  - Dampens vibration and shock
- Concerns
  - Element releasing
  - Hubs push apart under torque
- Common brands
  - ATR "Atra-Flex"
  - Falk "Wrap-Flex"
  - Timken "Quick-Flex"

"Atra-Flex"	Quick-Flex	
	Elastomeric Coupling Rating	Quick-Flex Rating
Torque	Low to high	High
Misalignment	Med	Med
Speed Capability	Med	High
Dampening Capability	High	High
Backlash	Yes	Yes
Purchase Price	Med	Med
Lubrication	No	No
Replacement Cost	Low	Low

#### Quick-Flex Elastomeric Wrap Style Couplings







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### Metallic

#### **Disc Couplings**

- Benefits
  - No lubrication
  - Balanced
  - No backlash
  - Accommodates misalignment
- Concerns
  - Expensive
  - Poor dampening
  - Difficult installation
  - No reversing
- Common brands
  - Rexnord "Thomas"
  - TB Woods
  - Lovejoy
  - Falk



	Disc Coupling Quick-Flex Rating Rating			
Torque	Med	High		
Misalignment	Med	Med		
Speed Capability	Highest	High		
Dampening Capability	Low	High		
Backlash	No	Yes		
Purchase Price	High	Med		
Lubrication	No	No		
Replacement Cost	Med	Low		



#### - Interchange

Coupling Style	Timken Solution	
Gear		
Grid		
Tire	Quick-Flex Coupling	
Jaw		
Elastomeric		
Disc	N/A	

#### **Timken Quick-Flex Value Proposition**

Low total cost of ownership

- Minimal downtime
  - Quick change of insert
  - Requires no lubrication
- Flexible shaft coupling
  - Accommodates all types of shaft misalignment
  - Dampens vibration and shock loads
- Designed to operate in most applications
  - Low to high torque
  - Low to high speed
  - Small to large size range
- Minimize inventory
  - Standardization
  - Replaceable insert

#### Quick-Flex Components and Configurations



#### Spacer Quick-Flex Coupling



#### Quick-Flex Coupling Installation Animation





## Quick-Flex Coupling Types

Standard or non-spacer style

Consists of 4 components

- Drive hub
- Driven hub
- Elastomeric insert
- Cover

For close-coupled applications





#### Quick-Flex Coupling Types

Spacer couplings

- Same components with addition of a drop out spacer body
- Creates room to work and/or repair and/or move connected equipment
- Also used to connect equipment that is positioned a greater distance from the drive
- Spacer body can be removed without removing coupling halves



#### Quick-Flex Couplings





#### Quick-Flex Product Ranges

- Size offering
  - 11 different series ranging in size from 11mm (1/2 inch) to 285mm (11-1/4 inch)
- Torque ratings
  - Continuous torque handling from 43Nm (377 in-lbs) to 190,140 Nm (1,670,826 in-lbs)
- Temperature ratings
  - Ability to handle temperatures from  $54^{\circ}$  to  $170^{\circ}$  C (  $20^{\circ}$  to  $250^{\circ}$  T)
    - $-51^{\circ}$  to  $176^{\circ}$  C ( $-60^{\circ}$  to  $350^{\circ}$  F)





## Coupling Application Example



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  - Replaceable insert

# Agenda

- Expectations
- General functions of a flexible shaft coupling
- Coupling market overview
- Application considerations
- Coupling types
- Quick-Flex couplings overview: Components & configurations
- Competitive landscape

#### Price vs. Performance



# Styles by Industry

Industry	Common Styles		
Metals	Gear, grid		
Energy	Disc, wrap-style, jaw		
Forest Products	Gear, grid, tire		
Food and Beverage	Jaw, tire		
Mining and Aggregate	Tire, gear, grid		

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#### Cost of Ownership Example





# Where You Turn

# **Comparison Chart**

	Quick- Flex	Rigid	Gear	Grid	Jaw	Tire	Wrap	Disc
Torque	High	High	High	Med	Low	Low	Low	Med
Misalignment	Med	None	Med	Low	Med	High	Med	Med
Speed Capability	High	High	High	Med	Med	High	Med	High
Dampens Capability	High	None	Low	Med	Low	Med	High	Low
Backlash	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Purchase Price	Med	Med	Med	Med	Low	Med	Med	High
Lubrication	No	No	Yes	Yes	No	No	No	No
Replacement Cost	Low	High	High	Med	High	High	Low	Med
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