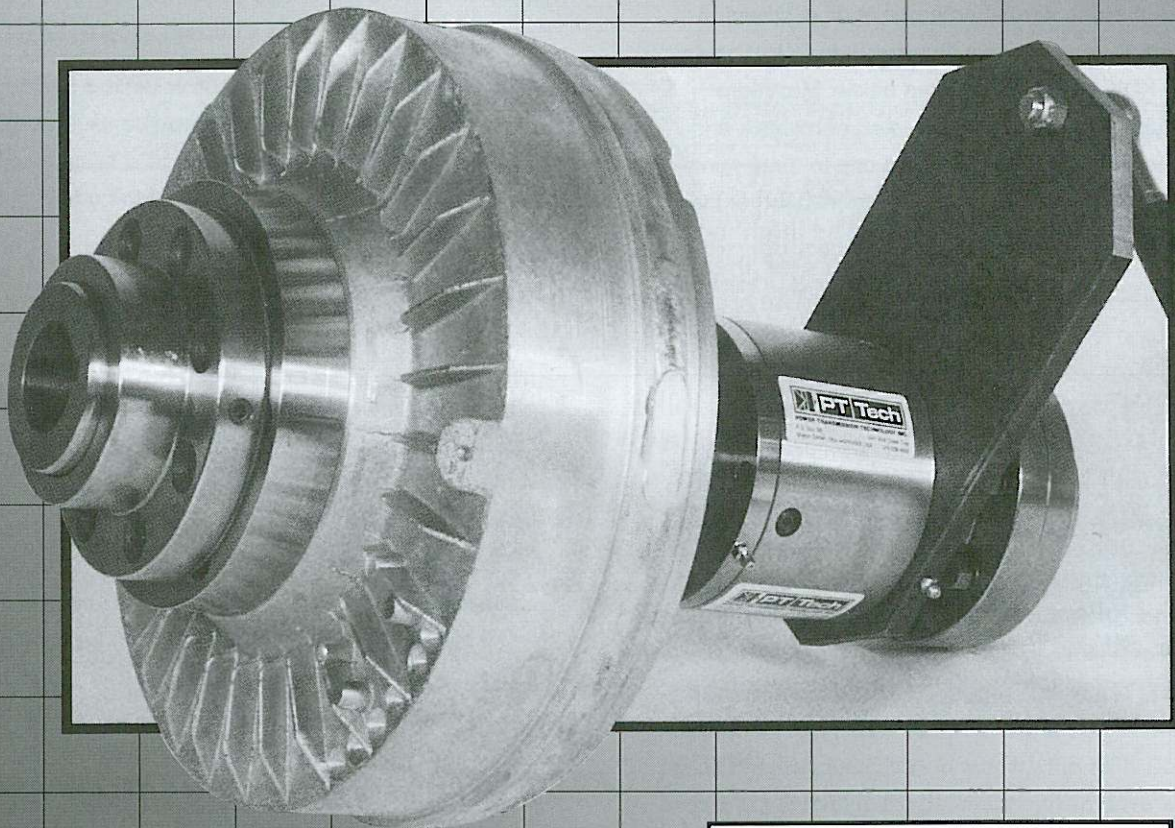


KDK KILN DRIVE COUPLING



 **PT Tech**[®]
POWER TRANSMISSION TECHNOLOGY INC.

KDK KILN DRIVE COUPLING

CONTROL KILN ROLLBACK

The high mechanical efficiency of modern rotary kilns allows relatively free reverse rotation (rollback) that can overspeed drive components. This presents a danger to equipment and personnel in that uncontrolled rollback can result in centrifugal explosion of these components. The PT Tech KDK Kiln Drive Coupling provides a simple, reliable, and economical method of controlling kiln rollback.

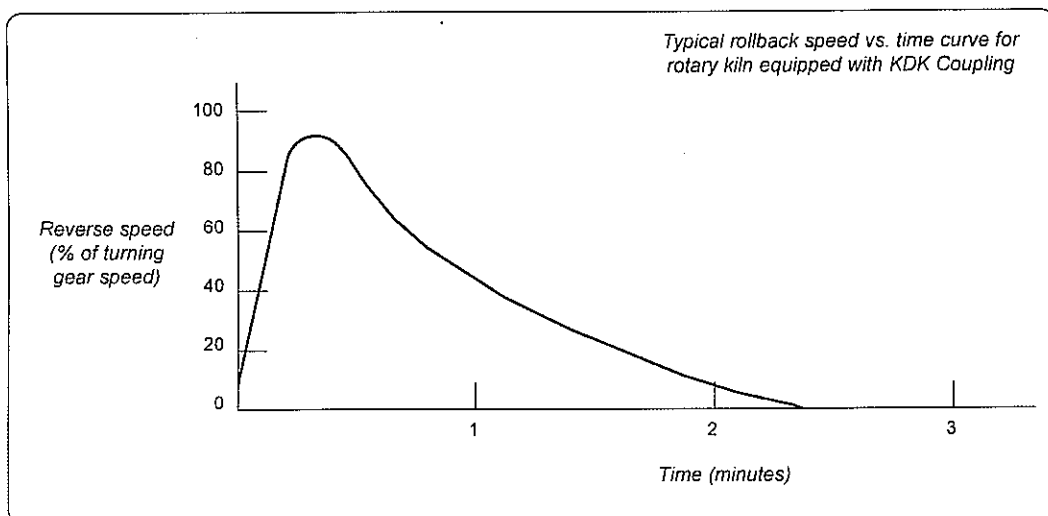
The KDK Coupling is designed to fit between the emergency drive prime mover and the emergency drive reducer. It utilizes a hydrodynamic fluid coupling device to retard the reverse rotation of the kiln thus controlling rollback. The high energy capacity and torque characteristics of the fluid device makes it ideal for this purpose. The retarding torque of the KDK Coupling increases exponentially (squared function) as the speed increases. Testing of the KDK Coupling indicates that it will generally allow a maximum rollback speed of approximately 70 to 90 percent of the normal emergency drive speed. A typical rollback speed versus time curve for a kiln equipped with a KDK Coupling is shown below. Maximum speed is quickly attained upon the start of rollback and slowly diminishes to zero rpm over a one to three minute period. There is no oscillation or forward rotation of the kiln at completion of rollback.

In addition to controlling rollback, the KDK Coupling functions as a normal fluid coupling for the emergency drive prime mover. On electric motors, it provides high-starting torque and absorbs shock loads. For internal combustion engines, it provides easy start up and smooth, vibration-free operation.

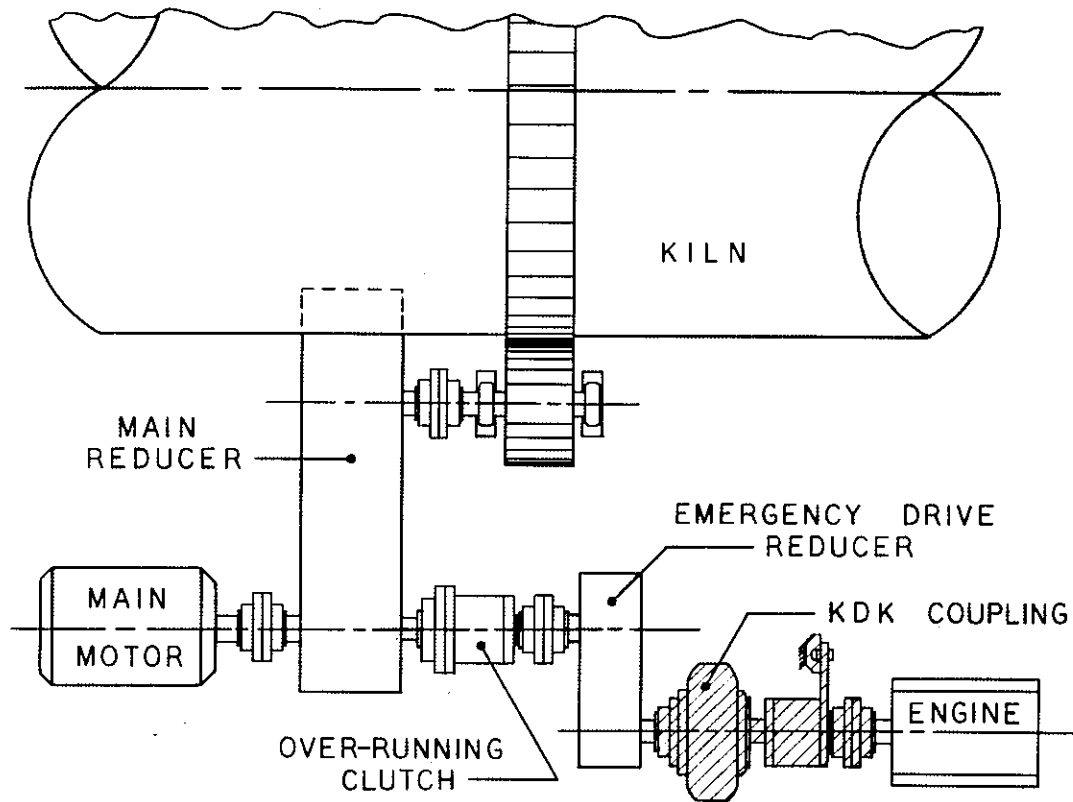
A sprag-type backstopping clutch is utilized in the KDK Coupling to enable the fluid coupling device to act as a retarder during rollback. In the forward direction, the backstopping clutch freewheels, allowing the fluid device to function as a normal fluid coupling. The backstopping clutch has taconite-type regreaseable seals for long life in adverse environments.

Because the PT Tech KDK Coupling is connected to the emergency drive, it remains stationary when the main drive is operating. The only wear on the KDK components occurs during rollback and operation of the emergency drive. This low usage combined with the high-quality components of the KDK Coupling assures long life.

All components of the KDK Coupling are sealed and are suitable for most adverse environments. The KDK Coupling is capable of operating up to a full year without maintenance. Periodic relubrication of the components is the only routine maintenance required.



HOW THE KDK COUPLING OPERATES



A typical kiln drive arrangement equipped with a KDK Coupling is shown above. The KDK unit couples the emergency drive engine (or motor) with the emergency drive reducer. The emergency drive reducer is coupled to the main drive reducer through an over-running clutch device such as a PT Tech SGK Coupling (refer to PT Tech Catalog SGK-2). If the main drive or the emergency drive shuts down for any reason, the KDK Coupling controls reverse rotation by absorbing the rollback energy in its fluid coupling device. A backstopping clutch in the KDK Coupling prevents reverse rotation of the coupling input and the emergency drive engine. A torque arm attached to the backstop is anchored to the foundation through spherical rod end connections to restrain the reverse torque.

When the emergency drive is operating, the KDK Coupling functions as a conventional fluid coupling providing high-starting torque and smooth running.

The KDK Coupling can be used with a spiral jaw clutch in place of the overrunning clutch disconnect. If so, the KDK Coupling would provide controlled rollback only when the jaw clutch is engaged. This would protect the emergency drive from reverse overspeed. However, when the jaw clutch is disengaged, the KDK Coupling would not control rollback; and the main drive would not be protected from reverse overspeed.

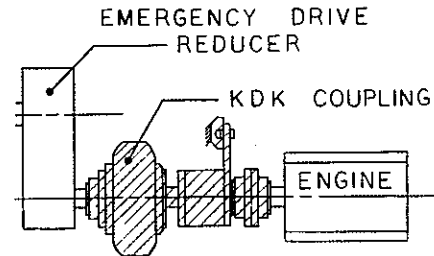
SELECTION

The following selection procedure is suggested by PT Tech as a guide to aid rotary kiln designers in the use of the PT Tech KDK Coupling. It is intended for use with an emergency drive capable of operating a fully loaded kiln. This procedure will select a KDK Coupling with

torque characteristics to properly retard rollback, allowing a maximum rollback speed generally between seventy and ninety percent of the emergency drive speed of the kiln.

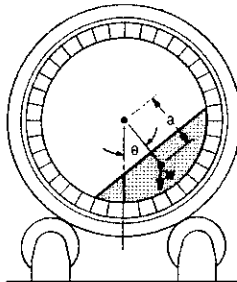
Step 1

The KDK Coupling is sized on the horsepower and speed requirements of the emergency drive prime mover since it transmits the emergency drive power. The unit should be selected based on nameplate, horsepower, and speed of the motor or engine. A service factor is normally not required. The KDK performance data chart lists horsepower ratings at various common speeds. For horsepower ratings at other speeds, consult PT Tech.



HP = _____ RPM = _____

Step 2



$$\text{Rollback Energy} = Wa(1 - \cos\theta)$$

W = Total weight of load in kiln (lbs.)

a = Radial distance from kiln centerline to center of gravity of load (ft.)

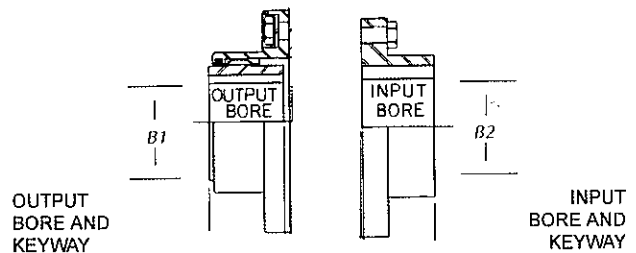
θ = Angle of repose

The rollback energy of the kiln should be checked against the energy capacity of the KDK Coupling. A simple and conservative formula for rollback energy is given below. This formula neglects friction in the system which absorbs part of the rollback energy.

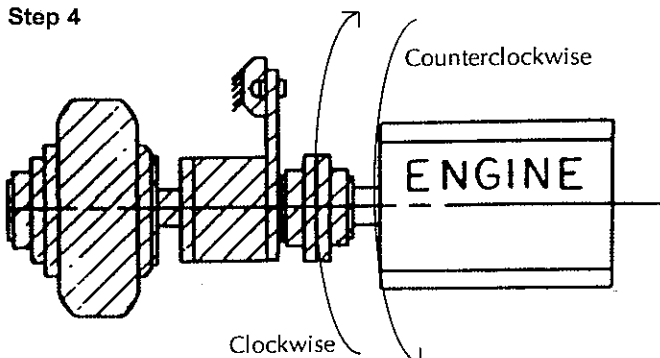
MODEL NO.	H.P. RATING AT R.P.M.					ENERGY CAPACITY FT-LBS
	1150	1450	1750	2000	2200	
KDK 20	7.4	12	20	26	33	650,000
KDK 30	25	41	60	82	100	1,250,000
KDK 40	35	70	100	120	-	2,000,000
KDK 50	65	100	130	150	-	3,000,000

Step 3

Check bore capacity of the input and output hubs and specify tolerances. (Coupling bores will be supplied with standard AGMA interference fits if tolerances are not specified.)

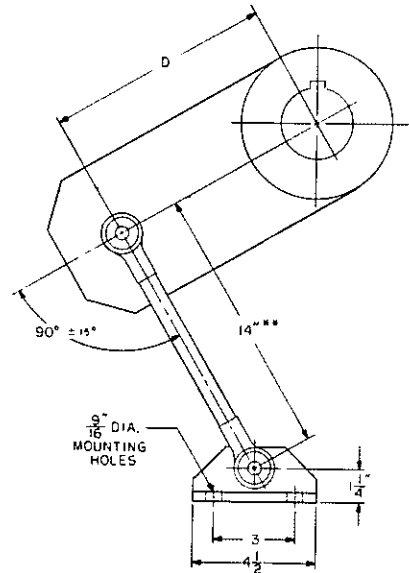
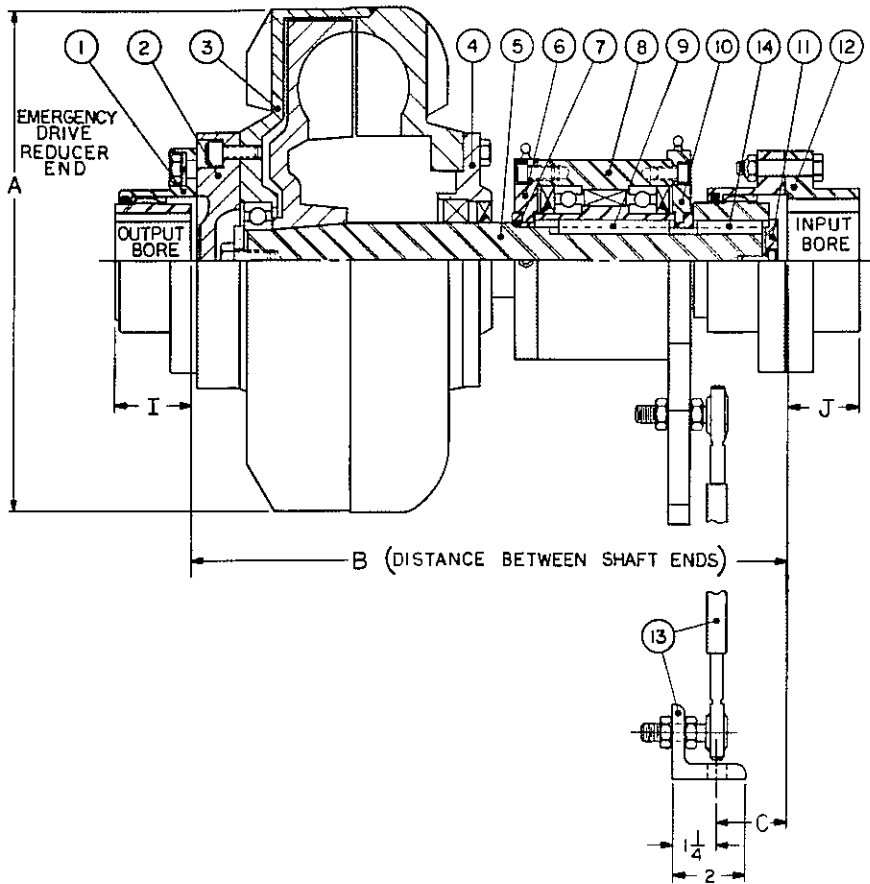


Step 4



Specify direction of forward drive rotation as viewed from emergency drive prime mover end.

PRODUCT DETAIL



** CONSULT P T TECH FOR OTHER LENGTHS

KDK KILN DRIVE COUPLING

ITEM	DESCRIPTION	QTY
1	GEAR COUPLING	1
2	OUTPUT ADAPTER	1
3	FLUID COUPLING	1
4	BEARING ASSEMBLY	1
5	SHAFT	1
6	TACONITE SEAL COVER	1
7	SPACER	2
8	BACKSTOP CLUTCH	1
9	KEY	1
10	TORQUE ARM	1
11	KEEPER PLATE	1
12	GEAR COUPLING	1
13	ROD & BRACKET ASSEMBLY	1
14	KEY	1

DIMENSIONAL DATA - INCHES					
MODEL NO.		KDK 20	KDK 30	KDK 40	KDK 50
MAX BORE	OUTPUT	2.38	2.38	3.63	3.63
	INPUT	2.88	2.88	3.25	3.25
A		10.25	13.50	16.50	17.88
B		14.75	16.00	17.79	18.65
C		1.50	1.50	2.00	2.00
D		8.25	8.25	12.00	12.00
I		2.06	2.06	3.03	3.03
J		1.84	1.84	2.28	2.28
WEIGHT		100	125	200	235

INSTALLATION

PRE-INSTALLATION

- 1) Prior to installation, check the direction of rotation of the main drive, the emergency drive prime mover, and the KDK coupling. The KDK coupling should allow the emergency drive prime mover to rotate in the forward direction but prevent reverse rotation.
- 2) Check equipment shafts, KDK coupling bore, and key seats for proper dimensions and fit.

INSTALLATION

- 1) Inspect and clean input and output gear coupling parts.
- 2) On the output coupling, (shrouded, bolt-type, flex-half gear coupling) lightly coat the "O" ring seal with grease.
- 3) Coat shafts with anti-galling compound. Insert keys in keyways. Install output hub on reducer shaft with long end flush with shaft end. Install rigid half input hub flush with input shaft end. A shrink fit is recommended. Apply heat to hubs uniformly, preferably submerging in 300° F oil. (Do not exceed 350° F.) Do not allow "O" ring in output coupling sleeve to contact heated output hub.
- 4) Align shafts. For best results, always use a dial indicator. Mount indicator on output hub. Take a 360° sweep on OD of input coupling flange. Align to .030" total indicator reading (TIR). Take a 360° sweep on face of input coupling. Align to .020" TIR. Set distance between shafts to within 1/32" of dimension "B" on KDK drawing. (See product detail on page 5.)
- 5) Thoroughly fill output coupling sleeve and flex-half coupling sleeve on input end of KDK spacer assembly with recommended grease. (See maintenance instructions on page 7 for list of greases.)
- 6) Place gaskets between coupling flanges and bolt KDK spacer assembly between the shafts. Torque coupling bolts in accord with values shown in *Table #1*, *Figure #1*.

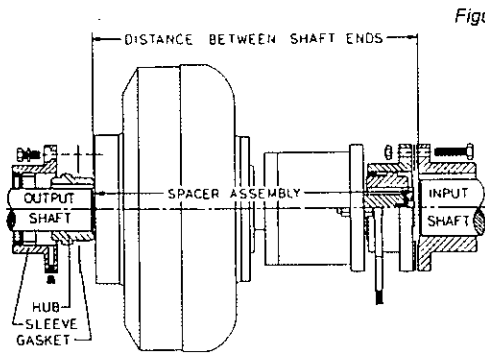


Figure #1

SERIES	TORQUE LB-FT
KDK 20	30
KDK 30	30
KDK 40	70
KDK 50	70

- 7) Position KDK input gear coupling so that the two lube holes at 180° are horizontal. Remove the two lube plugs. Apply recommended lubricant in one hole until grease flows through the second hole. Replace and tighten plug. Repeat for output gear coupling.
- 8) Mount angle bracket to a firm base, at a distance in accord with the values shown in *Table #2*, *Figure #2*, from center line of coupling. Secure rod ends to angle bracket and KDK torque arm. Note the threaded rod and tube between the rod ends should be cut if necessary to keep the torque arm approximately horizontal and the threaded rod approximately vertical.

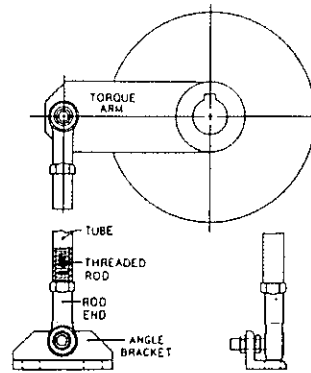


Figure #2

SERIES	DISTANCE INCHES
KDK 20	8 1/4
KDK 30	8 1/4
KDK 40	12
KDK 50	12

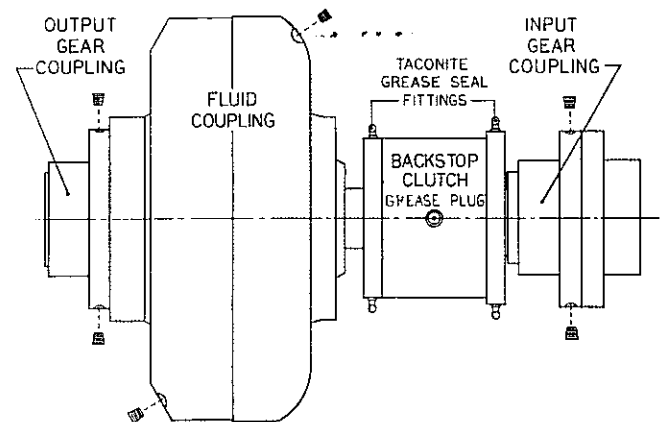
- 9) The fluid coupling part of the KDK coupling was properly filled at the factory. Check that there is no fluid leakage. If the KDK coupling has been in storage for more than one year, refill with new fluid. (See maintenance instructions on page 8 for proper fluid and quantity.)
- 10) The backstop clutch was lubricated at the factory with *Shell Aeroshell No. 7* grease. No additional greasing is required at installation. Refer to Maintenance Instructions for proper regreasing.
- 11) Recheck all mechanical connections to make certain that they have been properly tightened. Install proper coupling guards (not supplied by PT Tech).

MAINTENANCE

The KDK coupling is designed to operate for up to one full year without shutdown for maintenance. The following annual maintenance should be performed.

GEAR COUPLINGS

Position KDK input gear coupling so that the two lube holes at 180° are horizontal. Remove the two lube plugs. Apply recommended lubricant in one hole until grease flows through the second hole. Replace and tighten plugs. Repeat for gear coupling at output end of KDK unit.



GEAR COUPLING GREASES	
MANUFACTURER	LUBRICANT
Amoco Oil Co.	Rykon Grease 1EP
BP Oil Co.	Energrease LS-EP1
Chevron U.S.A., Inc.	Dura-Lith EP1
Citgo Petroleum Corp.	Premium Lithium Grease EP1
Conoco Inc.	EP Conolith Grease #1
Exxon Company, U.S.A.	Lidok EP1
Imperial Oil Ltd.	Ronek EP1
Kendall Refining Co.	Lithium Grease L-416
Keystone Div., Pennwalt Corp.	Zeniplex-1
Lyondell Lubricants	Litholine Complex EP1
Mobil Oil Corp.	Mobilux EP1
Petro-Canada Products	Multipurpose EP1
Phillips 66 Co.	Philube Blue EP
Shell Oil Co.	Alvania EP Grease 1
Shell Canada Ltd.	Alvania Grease EP1
Sun Oil Co.	Sun Prestige 741 EP
Texaco Lubricants	Multifak EP1
Unocal 76 (East & West)	Unoba EP1

BACKSTOP CLUTCH

The backstop clutch was lubricated at the factory with *Shell Aeroshell No. 7* grease. It is suitable for backstop clutch operation in temperatures from minus 20° F to plus 250° F. If ambient operating temperatures do not drop below 0° F, *Fiske Bros. Lubriplate Low Temp* or *Aero-Lubriplate* grease may be used.

The backstop clutch should be regreased every year. When regreasing the clutch, remove one plug and insert grease fitting (1/4" -28). It is suggested that grease fittings not be left in the clutch due to the possibility of the wrong grease being inserted.

The clutch is equipped with taconite seals. Clutch fittings on each side of the backstop clutch should be purged with one of the above recommended greases annually.

WARNING: DO NOT USE GEAR COUPLING GREASE IN THE BACKSTOP CLUTCH OR TO PURGE THE TACONITE SEAL. EP ADDITIVES IN THE GEAR COUPLING GREASE MAY CAUSE BACKSTOP CLUTCH MALFUNCTION.

FLUID COUPLING

The fluid coupling portion of the KDK Coupling should be checked annually for proper fill. This can be accomplished by draining the fluid and measuring the amount in the coupling. The standard fluid fill for KDK Couplings are listed in Table #2.

SERIES	FLUID OZ.
KDK 20	64
KDK 30	150
KDK 40	256
KDK 50	352

PT Tech ships the unit with fire resistant fluid in the fluid coupling. The fire resistant fluid need only be replaced every two years. The following is a list of recommended fire resistant fluids. If fire resistance is of no importance in the installation, *Shell Tellus 46* or *Mobil DTE Light Oil* can be substituted.

RECOMMENDED FIRE RESISTANT FLUIDS

Pydraul 50E (Monsanto)
Pyrquel 550 (Stauffer)
Houghto Safe 1130 (Houghton)



POWER TRANSMISSION TECHNOLOGY INC.

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WARRANTY: PT Tech guarantees all its products will leave the factory in good condition. PT Tech warrants its products against defects in workmanship and material for a period of 365 days (one year) after shipment. Adjustments under this warranty will be made only after completion of inspection of the part or product in PT Tech's factory. PT Tech's liability under the warranty shall extend only to the replacement or correction of any defective part or product determined by PT Tech's inspection as not conforming to this warranty. Under no circumstances shall PT Tech be liable for consequential or incidental damages. This warranty shall not apply to any product which shall have been repaired or altered without PT Tech's knowledge and consent or operated or installed contrary to PT Tech's instruction or subjected to misuse, improper maintenance, or damaged by accident or negligence.

PERFORMANCE ASSURANCE: Rated torque and speeds are provided by PT Tech to assist the buyer in selecting the proper product. In addition, engineering assistance is offered by PT Tech for design and application of custom designed drives. Since the actual performance characteristics of the buyer's equipment cannot be completely analyzed nor duplicated in laboratory tests, performance assurance of all PT Tech products in the buyer's applications is the responsibility of the buyer. Performance assurance is usually accomplished through manufacture of a prototype by PT Tech and a test or qualification program on the part of the buyer.

Rotating equipment is potentially dangerous and should be properly guarded. The user should check all applicable safety codes in his area and provide suitable guards.