

Packager Guidelines

Section 3: Drive System

3-1. General

The compressor drive system includes the driver and coupling, and flywheel if required. Reciprocating compressors are most often driven by gas engines or electric motors, but occasionally may be driven by gas or steam turbines through a gearbox. The design of the drive system requires consideration of the maximum horsepower available to drive the frame, and the torsional characteristic of both the driver and the compressor frame. Gas engines equipped with viscous damped vibration dampers normally present very few torsional problems, while electric motors often require compromises with the motor supplier to achieve a torsionally acceptable solution. A torsional analysis should be performed when utilizing:

- A new engine / frame combination.
- Electric motor drivers, particularly those with horsepower ratings approaching those of the frame and / or those with variable speed drives.
- Any drive with a gearbox.

3-2. Coupling Selection

The selection of the coupling will depend on the torsional characteristics and/or horsepower requirements of the driver/frame combination. Most direct driven units use a torsionally rigid, flexible disc type coupling. When sizing a flexible disc type coupling, a service factor of 3.0 is often used, though it is prudent to consult the coupling manufacturer for their recommendation. In those cases requiring a torsionally soft coupling, care must be taken to insure the supplier is fully aware of the torsional requirements of the coupling, as many are not familiar with reciprocating compressor applications.

All current Siemens Energy HSRC units use keyless shafts and rely upon an interference fit between the coupling hub and the shaft to transmit driver torque. The degree of interference is dependent upon shaft diameter and hub material and design.

3-3. Coupling Counterbalance Weight

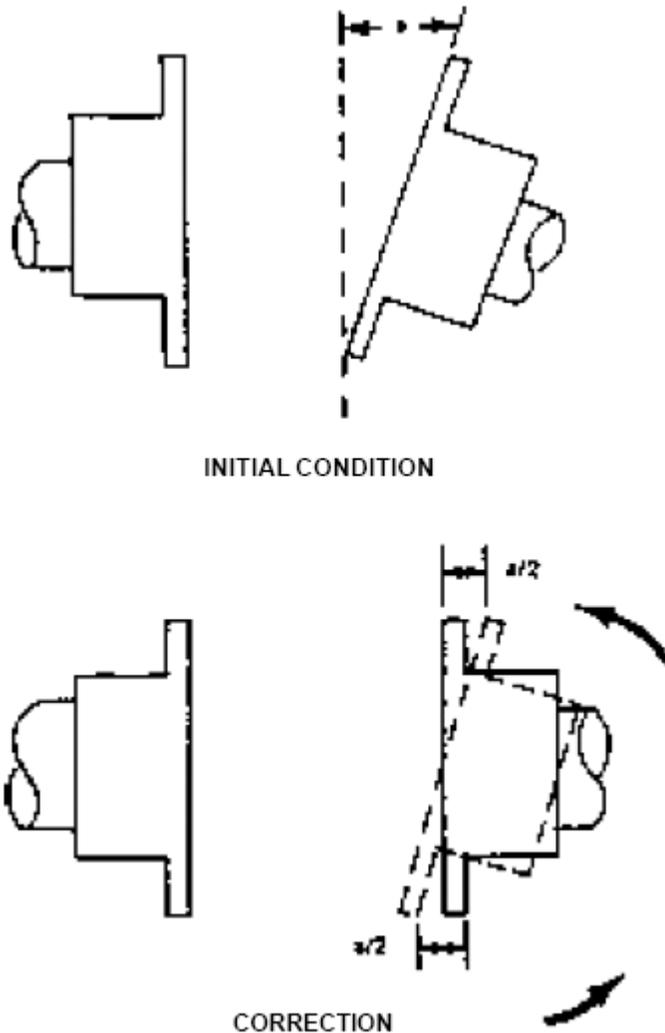
Some couplings supplied on 2 and 4 throw old style HOS compressors where there is only one internal weight connected to the crankshaft at the pump end, need to be equipped with a weight that is fastened to the coupling hub unless the flywheel has a bolted on weight or a machined flat to counter the internal weight. Together, these two weights convert a large portion of the horizontal moments into vertical moments. This reduces the potential for high mechanical vibration seen in most reciprocating type compressors. The MOS and new style HOS and HOSS have both these counterweights mounted internal to the frame.

3-4. Alignment

Angular misalignment should be as close to ZERO as possible, and should ideally be within 0.002 inch (0.05 mm) Total Indicator Reading (T.I.R.) for an average 12-inch (305 mm) indicated diameter coupling. If it is not possible to get this close, we will accept up to 0.005 inch (0.13mm) T.I.R. as an outside limit. These figures are not as liberal as those supplied by the coupling manufacturer, but those limits refer to what the coupling can tolerate and ignore coupled equipment limitations. The above figures are recommended for Siemens Energy equipment.

When doing coupling alignment, it is important to insure the thrust on the compressor is centered. You want to insure when the compressor is running there is no push or pull on either thrust shoe.

After the alignment is done, rotate the engine/motor and compressor through a few revolutions to insure the thrust of the compressor is centered.



PROCEDURE

1. DIAL INDICATOR READINGS IN THE VERTICAL DIRECTION INDICATE THAT THE DISTANCE BETWEEN COUPLING FACES AT THE 12:00 POSITION IS "a" DIMENSION GREATER THAN AT THE 6:00 POSITION.
2. BY REPOSITIONING THE EQUIPMENT TO NARROW THE DISTANCES AT 12:00 BY $a/2$ THE DISTANCE AT 6:00 IS INCREASED PROPORTIONATELY. THIS ALIGNS THE COUPLED SHAFTS.
3. CORRECTIONS IN THE HORIZONTAL DIRECTION (3:00 AND 9:00 POSITIONS) ARE MADE IN THE SAME MANNER.

Figure 4. Correcting for Angular Misalignment

3-5. Flywheel Installation (When required)

The flywheel, when needed, can be installed either with a shrink fit to the compressor shaft, or by use of a tapered bushing.

The following instructions apply to installation using the shrink fit bushing.

1. Clean the bore in the flywheel and the outside of the bushing. Also clean the bore of the bushing and the corresponding section of the crankshaft. Do not use any type lubricant during assembly.
2. Measure the crankshaft OD and the bushing ID. Insure there will be a 0.00050" (0.01 mm) - 0.00075" inch (0.02 mm) per inch of shaft diameter interference fit between the two before proceeding.
3. Heat the bushing until it has reached an average temperature of 500° F (260°C). This can be accomplished by using an oven or an acetylene torch in conjunction with a tempstick to monitor the temperature.
4. When the bushing comes up to temperature, it is vital that it be slipped on in a timely manner and pushed far enough down the shaft so that it becomes flush with the end of the crankshaft and no further
5. At this point, let the bushing cool before assembling the flywheel onto the bushing.
6. Using proper lifting techniques and a hoist having sufficient capacity, install the flywheel onto the bushing. Snug each of the attachment bolts, but do not tighten.
7. With the flywheel firmly in place, tighten the attachment bolts evenly to the required torque setting. Once tight, there should still be some clearance between the bushing flange and the flywheel. You may also check to ensure the bushing is tight by attempting to insert a 0.001 (0.03 mm) or 0.0015 inch (0.04 mm) feeler gauge between the wheel and the shaft (at two points diametrically opposed). Any clearance indicates improper installation.
8. The T.I.R. as measured on the face of the flywheel where the coupling adapter attaches should not exceed .005 inch (0.01 mm).

The following instructions apply to installation using the tapered bushing.

1. Clean the bore in the flywheel and the outside of the bushing. Also clean the bore of the bushing and the corresponding section of the crankshaft. Do not use or any other type lubricant during assembly.
2. Install the bushing into the flywheel. Snug each of the attachment bolts, but do not tighten.
3. Using proper lifting techniques, and a hoist having sufficient capacity, install the flywheel onto the crankshaft.
4. With the flywheel firmly in place, tighten the attachment bolts evenly to the required torque setting. Once tight, there should still be some clearance between the bushing flange and the flywheel. You may also check to ensure the bushing is tight by attempting to insert a 0.001 (0.03 mm) or 0.0015 inch (0.04 mm) feeler gauge between the flywheel and the shaft (at two points diametrically opposed). Any clearance indicates improper installation.
5. The T.I.R. as measured on the face of the flywheel where the coupling adapter attaches should not exceed .005 inch (0.01 mm).

NOTE

When installing any hub on the compressor crankshaft, there must be no less than 1" clearance from the back of the hub to the front cover of the frame. This is to facilitate removal of the crankshaft oil seal if service is required.

3-6. Compressor Cylinders

Compressor cylinders are normally installed on the frame at the factory and shipped complete. Under certain circumstances the cylinders may be shipped loose and then installed at the packagers. If this is the case refer to the MAINTENANCE section of the particular compressor Instruction Manual you are working on.