Mechanical Production

Shafts and Couplings

Continue

ASSEMBLY AND ALIGNMENT OF PARALLEL SHAFTS

Two parallel shaft systems supported by bearings require the shafts to be:

- horizontally aligned
- parallel to each other
- a specified distance from a datum
- square to mounting plate
- assembled so that axial loads are absorbed by the bearings

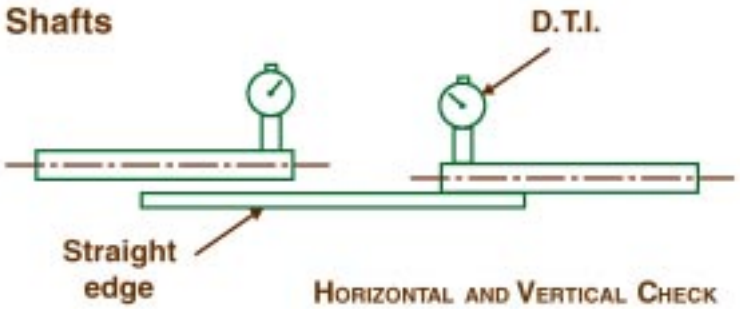
Correct shaft alignment is important as poor alignment will cause vibration and lead to rapid wear of couplings, bearings, seals and other rotating equipment. It is normal practice to adjust the position of the driving machine relative to the driven machine. When both are mounted on the same base plate, a shimspack may be installed under both machines to make vertical adjustment.

Shafts and Couplings

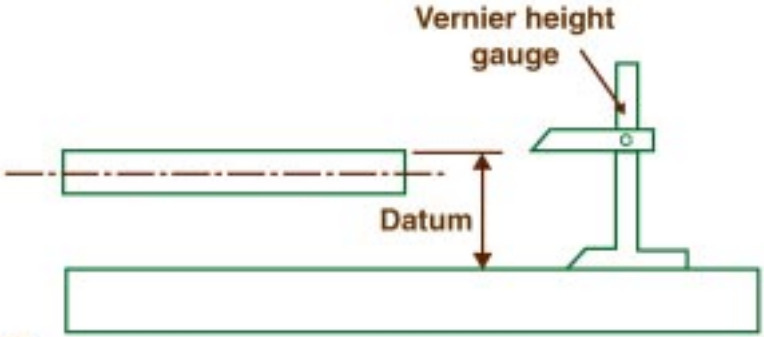
Alignment in the vertical and horizontal directions should be carried out separately using a dial test indicator or straight edge, the vertical adjustment should be completed first to avoid disturbing the horizontal alignment.

Parallel alignment may also be checked using a dial test indicator.

Where a datum height is specified this may be checked using a vernier height gauge.



HORIZONTAL AND VERTICAL CHECK

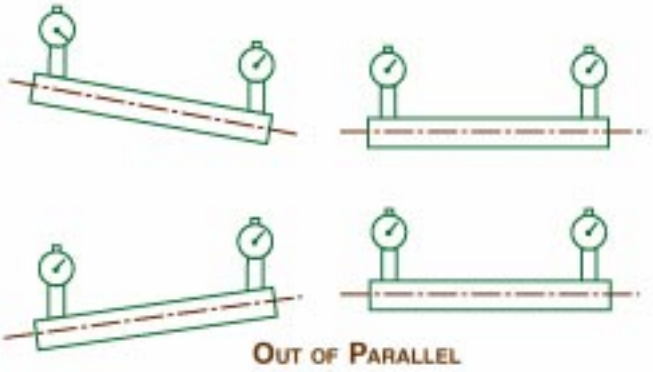


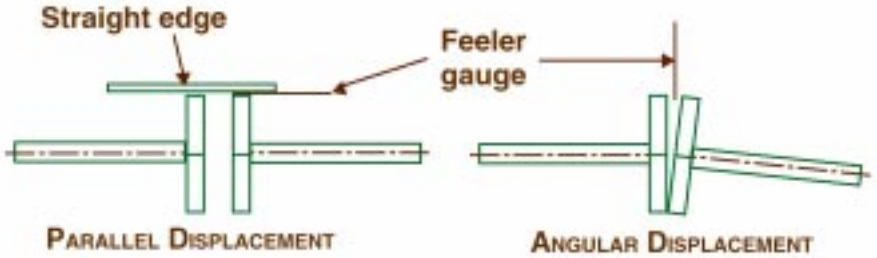
CHECKING DATUM HEIGHT

HOME
PRINT
BACK
HELP

Shafts and Couplings

Couplings





Shafts and Couplings

All couplings need to be checked for alignment and any packing beneath the driver or driven unit adjusted, or fitted, to obtain satisfactory alignment at design operating temperature.

An off-set for cold conditions has to be calculated using the actual dimensions, temperature rises under working conditions and coefficients of thermal expansion.

The thermal movements that occur as machinery warms up to its operating temperature can be significant.

These displacements have to be allowed for when aligning a half coupling of a driving machine to the other half fitted on a driven unit, like a pump or compressor, under ambient conditions.

Shafts and Couplings

A driven unit may also be affected by thermal movement which must be taken into account when calculating the correct alignment off-set for cold conditions.

Accurate alignment between driving and driven machines is normally carried out by mounting a dial indicator on one half coupling to registers on the perimeter or face of the other half coupling.

Before doing this it is necessary to remove the driving pins, or other connecting devices, to allow the two halves of the coupling to be turned independently.

First mark the periphery of each coupling at the top, sides and bottom so that repeat readings may be taken in identical positions after any adjustments to the packing have been made.

Shafts and Couplings

The half coupling with the indicator fixed to it, is rotated around the other half coupling and any variation in the indicator readings are recorded. From these readings the amount of packing to be added or removed may be determined. It is customary to set the dial gauge to zero in the top position and then move the dial gauge around to record each reading, at each side and at the bottom, underneath the half-coupling where the dial indicator may be difficult to read.

If two half-couplings are in perfect alignment and have been accurately machined and fitted concentrically on their shafts there should be no variations in the dial gauge reading in any position. In practice, some small variations usually occur. For high speed machinery the total indicated reading on the dial gauge should not generally exceed 0.254 mm depending on the type of coupling, its speed of rotation, size and length between shaft ends.

Shafts and Couplings

There are different procedures for checking alignment. One method is to record dial indicator readings at intervals of 90° traversing around both the periphery (to obtain one set of readings) and the face of a half-coupling (to obtain a second set).

Both sets of readings are obtained with the DTI mounted on the other half-coupling which has to be rotated (along with the DTI).

If the dial gauge remains in a fixed position mounted on one stationary half-coupling, and the other half-coupling on which it is registered is rotated, only the concentricity of the rotated coupling will be indicated.

The alternative called the reverse procedure removes the requirement to traverse around the face of the half coupling and is advantageous because many half-couplings are too close together to allow such readings to be taken.

Shafts and Couplings

The differences in gap in between the half-couplings can be determined by measuring the gaps in each quadrant with feeler gauges and any lack of linearity determined.

However, the reverse alignment procedure eliminates the need for this by taking two sets of peripheral readings. One with the dial indicator mounted on the driver, registered on and rotated around the driven half-coupling.

A second set with the dial indicator mounted on the driven half-coupling registered on and rotated about the driver half-coupling.

These two sets of readings permit the exact adjustment of packing beneath the plant supports to be calculated.

Shims may then be added to, or removed from, the plant supports and the required alignment achieved.

Shafts and Couplings

After any adjustments to the packing and transverse positions have been made it is necessary to check the results.

If the resulting alignment is satisfactory both the driver and the driven units should be properly secured in position by fitting tapered or parallel dowels between the supports and the baseplates.

Examine some examples of heavy plant and machinery to see how the various items have been dowelled to prevent them from moving out of alignment and to enable them to be repositioned correctly.

Couplings are designed to operate in alignment and usually have a very limited capacity to accommodate misalignment as a result of thermal changes.

Shafts and Couplings

If this limit is exceeded, misalignment will cause rough running, imbalance and vibrations and may cause coupling or plant failure.

Alignment is critical for safe and satisfactory operation of machinery but can be badly affected by other influences on an assembly.

One of these can be the fitting of misaligned pipework by bolting it on with heavy flanges.

If there is any doubt, compare alignment before the pipework has been fitted with that after the pipes have been attached.

Activity

With your tutor's permission and help, if necessary, visit your workshops and inspect shafts and note the methods used to adjust their alignment. Use the table on the following screen to record your findings.

Shafts and Couplings

MACHINE	SHAFTS	METHOD OF ALIGNMENT

Click the Home Button to move on

HOME

PRINT

BACK

HELP