Metrology Laboratory
Department of Mechanical Engineering

Experiment No. 3

INSPECTION OF CRANK SHAFT AND JIG PLATE

Aim:

- To measure eccentricity of the crankshaft.
- To measure all necessary dimensions of the jig plate.

Instruments used:

A set of slip gauges and accessories.

Theory:

The crankshaft, sometimes casually abbreviated to crank, is the part of an engine which translates reciprocating linear piston motion into rotation motion. To convert the reciprocating motion into rotation, the crankshaft has "crank throws" or "crankpins", additional bearing surfaces whose axis is offset from that of the crank, to which the "big ends" of the connecting rods from each cylinder attach. This offset distance i.e. the axis of the crank throws from the axis of the crankshaft, called as eccentricity of the crank shaft. The eccentricity determines the piston stroke measurement or engine displacement.

The crankshaft typically connects to a flywheel, to reduce the pulsation characteristic of the four-stroke cycle, and sometimes a torsional or vibrational damper at the opposite end, to reduce the torsion related vibrations, as shown in Fig. 1.

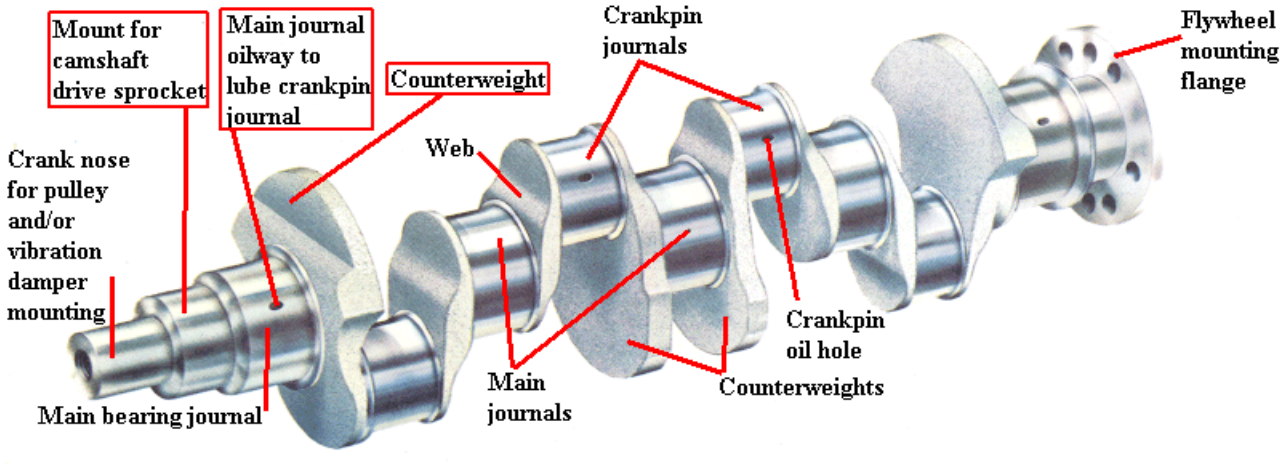

Fig. 1 Crank shaft with a Flywheel

A fixture is a tool of the manufacturing industry used in mass production. Fixtures are used to hold objects in place and clamp them to machines or operating surfaces, so that the object can be machined or assembled.

Fixtures differ from jigs, in that the fixture holds the workpiece in one place while a tool or cutter is moved in relation to it. A jig guides the tool along a path defined by the shape of the jig. The jig may also hold the tool during this operation. The primary purpose for a jig is for repeatability and exact duplication of a part for reproduction. The purposes of jigs and fixtures are widespread.

- An example of a jig is when a key is duplicated; the original is used as a jig so the new key can have the same path as the old one. In the advent of automation and CNC machines, jigs are not very much required because the tool path is digitally programmed and stored in memory.

There are many types of jigs, and each one is custom-tailored to do a specific job. Many jigs are created because there is a necessity to do so by the manufacturers. Some are to increase productivity, to do repetitious activities and to do a job more precisely.

Jigs include machining jigs, woodworking jigs, welders' jigs, jewelers' jigs, and many others.

- A drill jig (Fig. 2) is a type of jig that expedites repetitive hole center location on multiple interchangeable parts by acting as a template to guide the twist drill or other boring device into the precise location of each intended hole center. In metalworking practice, typically a hardened bushing lines each hole on the jig to keep the twist drill from cutting the jig.

Fig. 2 Drill Jig

Procedure:

- For crank shaft inspection (Ref. Fig. 3)

1. Place the crankshaft with its crank pin at lowest position freely supported on two equal sized steel blocks kept on a surface plate.
2. At this lowest position measure the gap between the crank pin and the surface plate using slip gauges. Note down this reading as Rl.
3. Rotate the crankshaft till the crank pin is brought to the upper most position and note down reading as R2, similar to step 2.
4. Eccentricity of the crankshaft = (R2-Rl)/2.

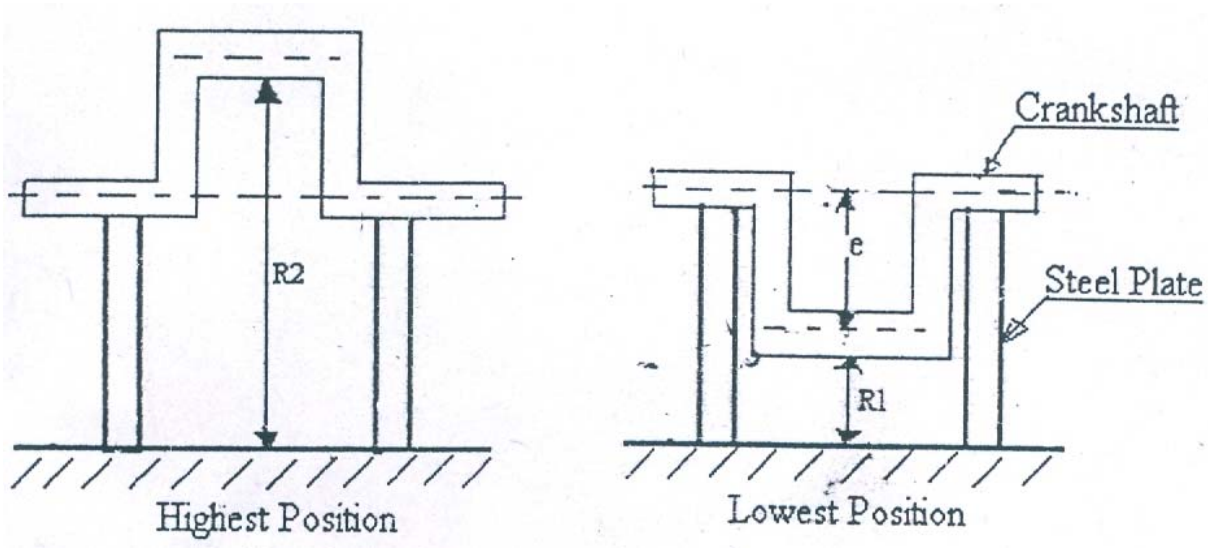

Fig. 3 Determination of Eccentricity of the crank shaft

- For jig plate inspection (Ref. Fig. 4)

Using the slip gauges and accessories measure the following dimensions.

1. Diameter of the four holes.
2. Distance L_{AB}, L_{BC}, L_{CD}, L_{DA}, L_{AC}, L_{BD}.
3. Center distance between the holes A-B, B-C, C-D, D-A, A-C, B-D.
4. Check the square of the jig plate holes.

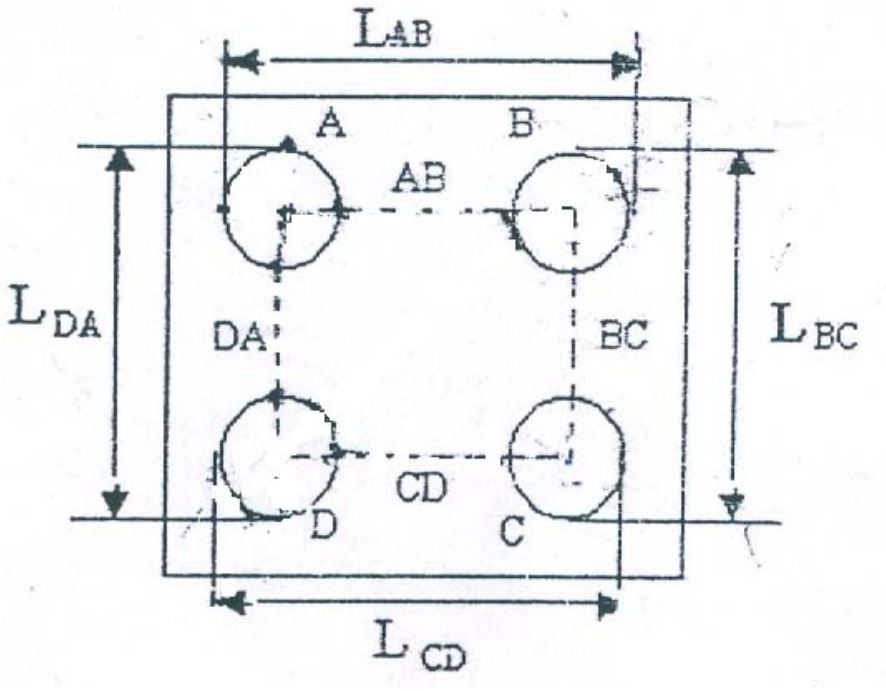

Fig. 4 Jig plate Inspection

Questions

1. What is crankshaft? With a neat sketch briefly explain the functions of each part of a crankshaft assembly. Discuss briefly about its application areas.
2. What is jig? Why is it required in manufacturing industries?
3. Differentiate between a jig and a fixture?