

# What Balancing Is About

**STATIC BALANCE** . . . a state of balance existing in a rotating body when there is coincidence between its center of mass and its axis of rotation, so that the body is in neutral equilibrium under the action of static forces.

Synonym . . . *standing balance*.

**DYNAMIC BALANCE** . . . a state of balance of a rotating body wherein its weight (mass) is so distributed about the axis of rotation that there will be no tendency to displace the axis of rotation when running.

Synonym . . . *running balance*.

To illustrate the difference between static and dynamic balance see *figure 1*, a disc on a shaft resting on knife edges. The unbalance,  $W$ , acted upon by the force of gravity causes the assembly to roll until the weight is at the bottom. This is static, or *force*, unbalance.

The disc can be brought into balance by removing weight  $W$ , or by adding a similar weight at a point opposite the original unbalance and equidistant from the center of the shaft.

In *figure 3* there are two discs on the shaft. The unbalance in one disc is exactly compensated for in the other, so the assembly is in static balance . . . but dynamically (rotating) it is badly out of balance.

The centrifugal forces acting on this rotating assembly will tend to displace the axis of rotation as shown in *figure 4*. The ends of the shaft, unrestrained, would describe cones. Held fast by bearings the moment unbalance would cause vibration and noise and undue bearing wear. This form of dynamic unbalance is called *couple*.

Changes in weight in the planes where required or where practical, will eliminate both force and couple in any rotor. Knowing exactly where to make the weight changes is the precise art of balancing . . . and the specialty of **THE BALANCING COMPANY**.

## Why Balance?

*A balanced rotor . . .*

- . . . runs without noise — for a cleaner environment.*
- . . . runs without vibration — for a greater reliability.*
- . . . is essential to accuracy in machining operations.*
- . . . requires less power to turn it.*
- . . . increased bearing life*

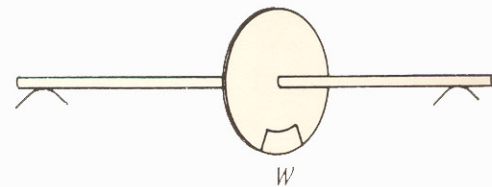


FIGURE 1. Static or force unbalance.

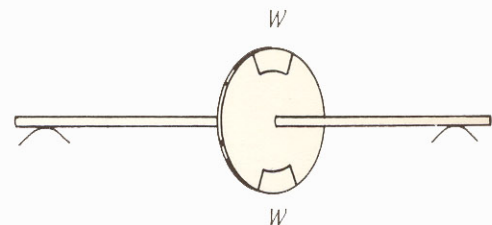


FIGURE 2. Balanced disc.

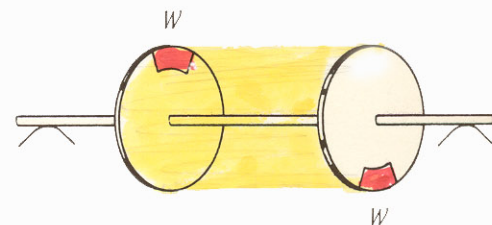


FIGURE 3. Dynamic (moment) unbalance.

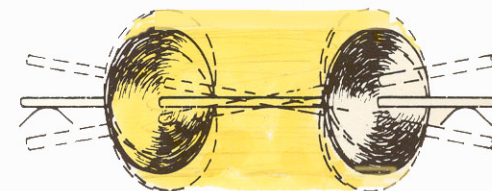


FIGURE 4. Effect of dynamic unbalance.

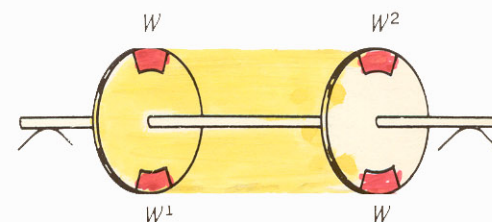


FIGURE 5. Balanced rotor — both static and dynamic unbalances corrected.