sphericity

Sphericity is a measure of how closely the shape of an object resembles that of a perfect sphere. For example, the sphericity of the balls inside a ball bearing determines the quality of the bearing, such as the load it can bear or the speed at which it can turn without failing. Sphericity is a specific example of a compactness measure of a shape. the sphericity, of a particle is the ratio of the surface area of a sphere with the same volume as the given particle to the surface area of the particle:

$$\Psi = \frac{\pi^{\frac{1}{3}} (6V_p)^{\frac{2}{3}}}{A_p}$$

where Vp is volume of the particle and Ap is the surface area of the particle. The sphericity of a sphere is unity by definition and, by the isoperimetric inequality, any particle which is not a sphere will have sphericity less than 1. Sphericity applies in three dimensions; its analogue in two dimensions, such as the cross sectional circles along a cylindrical object such as a shaft, is called roundness.

Roundness

Roundness is the measure of how closely the shape of an object approaches that of a mathematically perfect circle. Roundness applies in two dimensions, such as the cross sectional circles along a cylindrical object such as a shaft or a cylindrical roller for a bearing. In geometric dimensioning and tolerancing, control of a cylinder can also include its fidelity to the longitudinal axis, yielding cylindricity. The analogue of roundness in three dimensions (that is, for spheres) is sphericity.

Roundness is dominated by the shape's gross features rather than the definition of its edges and corners, or the surface roughness of a manufactured object. A smooth ellipse can have low roundness, if its eccentricity is large. Regular polygons increase their roundness with increasing numbers of sides, even though they are still sharp-edged.

In geology and the study of sediments (where three-dimensional particles are most important), roundness is considered to be the measurement of surface roughness and the overall shape is described by sphericity.

Specific gravity

specific gravity, also called **relative density**, ratio of the density of a substance to that of a standard substance. The usual standard of comparison for solids and liquids is water at 4 °C (39.2 °F), which has a density of 1.0 kg per litre (62.4 pounds per cubic foot). Gases are commonly compared with dry air, which has a density of 1.29 grams per litre (1.29 ounces per cubic foot) under so-called standard conditions (0 °C and a pressure of 1 standard atmosphere). For example, liquid mercury has a density of 13.6 kg per litre; therefore, its specific gravity is 13.6. The gas carbon dioxide, which has a density of 1.976 grams per litre under standard conditions, has a specific gravity of 1.53 (= 1.976/1.29). Because it is the ratio of two quantities that have the same dimensions (mass per unit volume), specific gravity has no dimension.