Answer on Question #46081 - Math - Statistics and Probability

Steel rods are manufactured to be 3 inches in diameter but they are acceptable if they are inside the limit 2.99 inches and 3.01 inches. It is observed that 5% are rejected as oversized and 5% are rejected undersized. Assuming that the diameters are normally distributed, find the standard deviation of the distribution.

Solution

Let *X* denote the diameter of the rods in inches and let $X \sim N(\mu, \sigma^2)$.

Here we are given

$$P(X < 2.99) = 0.05 \text{ and } P(X > 3.01) = 0.05$$

It is seen from the above table that the value of Z for 10% level of significance is $Z = \pm 1.645$, as the 5% rejection region lies in two tails of the normal distribution, then we have

$$\frac{2.99 - \mu}{\sigma} = -1.645 \text{ and } \frac{3.01 - \mu}{\sigma} = 1.645$$
$$3.01 - \mu = 1.645\sigma \text{ and } 2.99 - \mu = -1.645\sigma$$
$$\mu = 3 \text{ and } \sigma = 0.006079.$$

Answer: 0.006079.

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