Answer on Question #50139, Physics, Mechanics | Kinematics | Dynamics

If a sound is made in one end of an open iron tube of 1050m two sounds are heard at the other end with an interval of 2.8 sec. If the velocity of sound is 350m/s in air, what is it in the iron?

We have:
$$l = 1050m$$

 $t_1 - t_2 = 2.8 \ sec$
 $V_1 = 350 \ \frac{m}{sec}$
Need find: $V_2 = ?$

$$V_{1} = \frac{l}{t_{1}}$$

$$t_{1} = \frac{l}{V_{1}} = \frac{1050}{350} = 3 \text{ sec}$$

$$t_{1} - t_{2} = 2.8 \text{ sec}$$

$$t_{2} = 0.2 \text{ sec}$$

$$V_{2} = \frac{l}{t_{2}} = \frac{1050}{0.2} = 5250 \frac{m}{sec}$$

In common everyday speech, speed of sound refers to the speed of sound waves in air. However, the speed of sound varies from substance to substance. Sound travels faster in liquids and non-porous solids than it does in air. It travels about 4.3 times as fast in water (1,484 m/s), and nearly 15 times as fast in iron (5,120 m/s), as in air at 20 degrees Celsius. Sound waves in solids are composed of

compression waves (just as in gases and liquids), but there is also a different type of sound wave called a shear wave, which occurs only in solids. These different types of waves in solids usually travel at different speeds, as exhibited in seismology. The speed of a compression sound wave in solids is determined by the medium's compressibility, shear modulus and density. The speed of shear waves is determined only by the solid material's shear modulus and density.

Answer: velocity of sound in iron is 5250 m/s

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