Sound Velocity in Corrugated Pipes

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In this work, it is clarified how sound velocity slows down in corrugated pipes. The reduction of sound velocity, in particular, its dependence on geometrical structures of inner corrugation and frequency of sound sources are investigated in detail, and I found a certain limitation of validity of existing theory. Depending on height, width and period of corrugation and radius of inner pipe part, sound velocity can be remarkably slowed down, less than 50% of that in free space. Sound velocities in various corrugated pipes of my own making are measured by three methods, i.e., 1)using two microphones, 2)method by resonance and 3)method by reflection. As a result, it was clarified that velocity of short wavelength sound has much lower reduction ratio compared to that in free space. Besides, I found a connected tube with two smooth tubes with different inner radii also reduces the sound velocity. Moreover, through some experiments, I noticed absorption of sound by corrugated pipes and considered its nature. The phenomena found in this study will be applied to various acoustic technologies using the remarkable feature of sound velocity reduction by corrugated pipe depending on frequencies. Absorption of sound with a specific wavelength by corrugated pipes will have a possible technological application.

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