Data

This is an example of the graphical output received from the oscilloscope when conducting the experiment.  In this graph there are two kinds of waves: the compressional and the shear waves.  The waves can both be seen in this graph in different forms.  The compressional wave, which has a much smaller amplitude and higher frequency, strikes the transducers after about 5.7 microseconds.  This is the point just before the wave begins to head upwards on the graph.  After about 11 microseconds the shear wave hits, which has a very long period, and large amplitude compared to the compressional wave.  By acquiring the speeds of these 2 waves, and inserting them into the following equations, you can attain such elastic constants as Young�s Modulus and the Shear Constant.

Results from Experimentation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PSI (Lb per in2) | Time for Compressional(�s) wave to strike transducer | Velocity of compressional. wave  (m/s) | Time for shear wave to strike transducer (�s) �1.5�s | Velocity of shear wave (m/s) |
| 0 | 5.700 | 2985.964 | 12.0 | 1418.333 |
| 20 | 5.790 | 2939.550 | 12.0 | 1418.333 |
| 25 | 5.800 | 2934.483 | 12.0 | 1418.333 |
| 30 | 5.800 | 2934.483 | 11.0 | 1547.273 |
| 35 | 5.795 | 2937.015 | 11.0 | 1547.273 |
| 40 | 5.810 | 2929.432 | 10.8 | 1575.926 |
| 45 | 5.830 | 2919.382 | 10.6 | 1605.660 |
| 50 | 5.835 | 2916.880 | 10.8 | 1575.926 |
| 55 | 5.855 | 2916.880 | 10.5 | 1620.952 |
| 60 | 5.860 | 2904.436 | 10.5 | 1620.952 |

Young�s Modulus-                                         Shear Constant-

ρ  = Density (1700 kg/m� for our specimen)

Vs = Velocity of shear wave

Vp = Velocity of compressional wave

These two elastic constants display the strength of a substance.  Young�s Modulus is defined as the force needed to elongate a material.  This can be described simply as how much a substance will give under pressure.  Due to the relatively high Young�s Modulus that was calculated for the dentin, it shows that dentin is very strong structurally.  As pressure applied increased on the dentin, the Young�s modulus increased, displaying that the bone gets increasingly stronger with higher pressure applied upon it.

The shear constant, which only involves the speed of the shear wave and the density of the material displays how inclined the substance is to withstanding torque.  The higher the shear constant the higher the amount of torque it can take before being disfigured.  The graph of the shear constant has an upward slope, showing that as it is pressured together, it can also withstand higher pressures.

This is the graph of PSI (Pounds per In2) vs. Wave Velocity.  As indicated by our graphs, the shear wave has a much lower velocity than that of the compressional wave.  Even though the speed of the compressional wave slowed down somewhat contrary to our hypothesis, the speed of the shear wave did increase slightly.