In this study, laboratory tests were carried out on 15 different volcanic and carbonate rocks collected from the marble processing plants to determine the specific cutting energy value in cutting operation with circular saw of each rock. Circular sawing measurements were performed on a specially designed high precision rock block cutter. All rock specimens used in the cutting tests were having a length of 50×100×200mm section. The sawing analyses were performed in the down cutting mode. The main sawing parameters which are peripheral speed of the saw blade (60 m/s), cutting depth (20 mm) and workpiece traverse speed (0.5 m/min) was kept constant in the cutting tests. To calculate elastic parameters of rocks, the velocities of P and S-waves were measured using the high frequency ultrasonic pulse technique instrument. The ultrasonic elastic parameters such as modulus of elasticity, shear modulus, bulk modulus and Poisson’s ratio of rocks were calculated from the measured wave velocities and the bulk density according to ASTM D 2845. Specific cutting energy and rock elastic properties were evaluated using simple regression analysis by statistical methods. Regression analysis showed that high correlations exist between specific cutting energy and elastic parameters of rocks.