COST OPTIMIZATION IN DC SOLENOID VALVE USED IN AIR BRAKING BY REPLACING COPPER WINDING WIRE TO ALUMINUM

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Abstract: Solenoid valves are used in air braking system in heavy vehicles. This is essentially used to prevent skidding in vehicles. Traditionally the coil uses copper wounded coils for producing the working flux for plunger attraction. Recent Cu price increases motivate careful examination of approaches to minimize Cu use. Approaches that can reduce Cu use without increasing losses include careful winding design, trading winding volume for core volume; replacing Cu with Al. Al wire is particularly attractive. The cost of Al is lower than it might appear from the cost per unit mass when the much lower density of Al is also considered, and the disadvantage of higher resistivity becomes less important. This paper shows the design details of a solenoid valve with aluminum wiring along with the advantages and disadvantages of copper and aluminum. It also includes the testing and performance results of aluminum air solenoid.

Index Terms---solenoid valve, air braking system,
Standard wire gauge, actuation, Retraction, on leak test, off leak test, endurance test.