

## **Design and optimization of spray unit holder and shaft assembly of a linear motor operated spray gun**

### **ABSTRACT**

In order to reduce the labor and production cost, linear motor operated automatic spray gun has been designed and developed. This spray gun consists of 2 spray units, spray unit holder and shaft assembly an air control and supply unit and a triggering unit to carry out the multiple spray operations. This study focuses on the design optimization and fabrication of the spray unit holder and shaft assembly. There are 2 links to this holder and they are 90° apart from each other. One end of the holder links are used to hold the spray units and the other ends are attached with a shaft. The shaft is kept in position in the spray gun body by the adjusting lever and can rotate 90° to either side. Due to this rotation, the position of spray units can be adjusted during the desired spray operation. Since, the highly pressurized fluid is passed through the spray unit, a high force is subjected to the end of the holder where the spray unit is held and the holder behaves like a cantilever beam. Meanwhile, the shaft is subjected to the bending moment and the torque due to the fluid pressure and the weight of the spray unit, respectively. After analyzing, dimensions and material selection have been optimized in order to fabricate the spray unit holder and shaft assembly. During the performance test, it is observed that the fabricated spray unit holder and shaft assembly can support the spray operation without any deflection and failure.

**Keyword:** Deflection analysis; Failure analysis; Shaft; Spray gun; Spray process; Spray unit holder