

## Analysis of Structure of Gantry Post Based on Solidworks Simulation

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### Abstract

According to the optimized design of the column structure of Gantry cutting machine, the simulation model is established according to the structure parameters of the 3 groups. The Simulation module of Solidworks is used to simulate the analysis. The analysis shows that the large wall thickness can reduce the deformation and the deformation amount can be reduced.

### Keywords

Simulation; optimization; Gantry machine tool.

### 1. Introduction

Gantry structure has the advantages of easy production, high bearing capacity, stability and so on. It is widely used in engineering. There is an optimal solution for different structural parameters in gantry. In the practical engineering application, the safety factor is higher, which can meet the load demand, and the weight is less. In this paper, the advantages and disadvantages of the column structure of the gantry cutting machine (as shown in Figure 1) are compared with the method of simulation analysis.

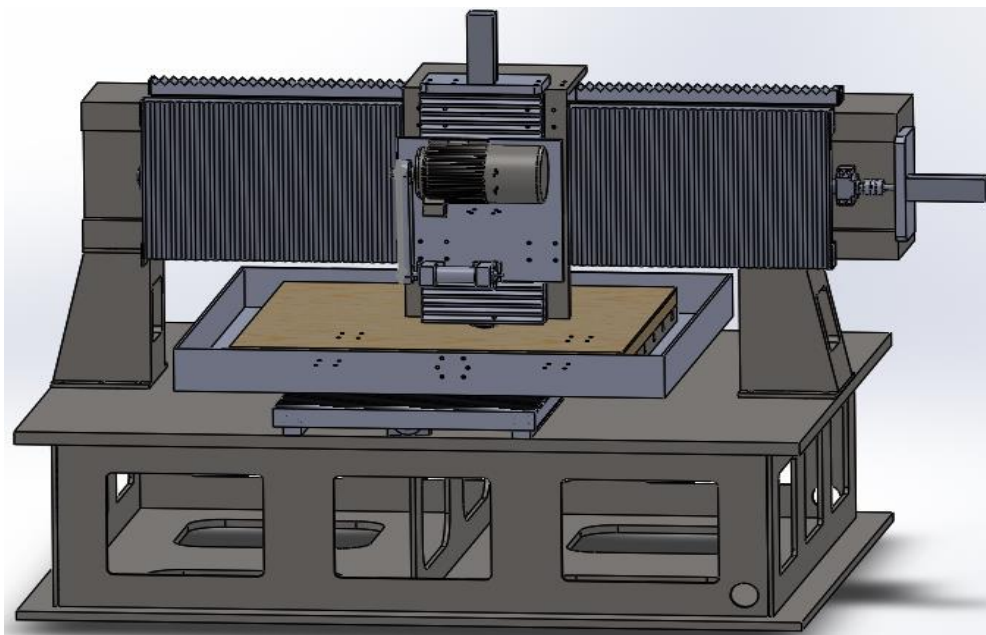


Fig.1 Structure of gantry type cutting machine

### 2. Column structure model

Establish the model of the column, as shown in figure 2. The bottom size is 400 \* 300mm, the thickness is 25mm, the roof size is 300 \* 210mm, the thickness is 25mm, and the vertical load is 3000N, which can change the thickness of the vertical plate, the addition of the reinforcement plate, and the weight loss hole.

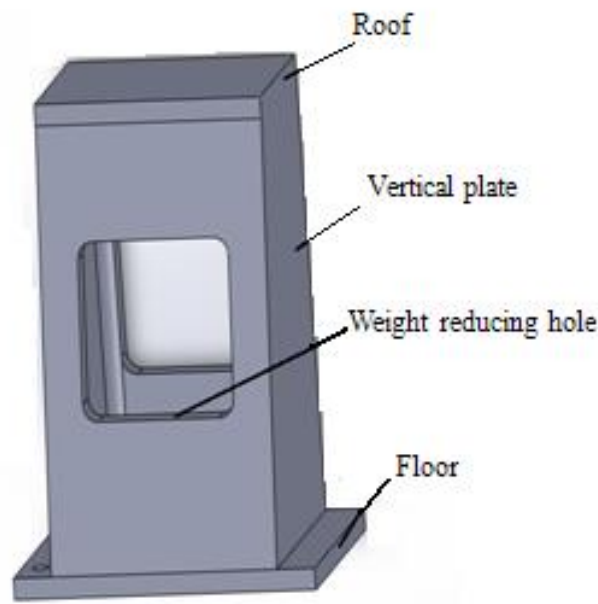


Fig.2 Structure of column model

### 3. Influence of structural parameters on column rigidity

In order to analyze the influence of the structural parameters of the column, the contrast analysis of the thickness, the weight loss hole and the reinforcing bar are carried out respectively.

#### 1. Thickness, weight loss hole on the column stiffness

Column structure parameters such as table 1 shows that in these four structures, respectively, the column wall thickness 30mm, 20mm, open the weight loss hole with no weight loss hole, not reinforced composite structure, in the same load conditions, the simulation results are shown in figure 3-4.

Tab.1 Column structure parameter (one)

Structure type	Parameter 1	Parameter 2	Parameter 3	Parameter 4
Wall thickness	30mm	30mm	20mm	20mm
Weight reducing hole	200×200mm		200×200mm	
Reinforcing rib				

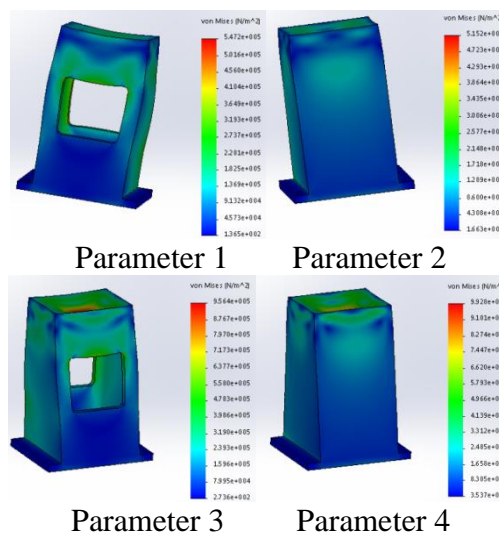


Fig.3 Stress simulation results

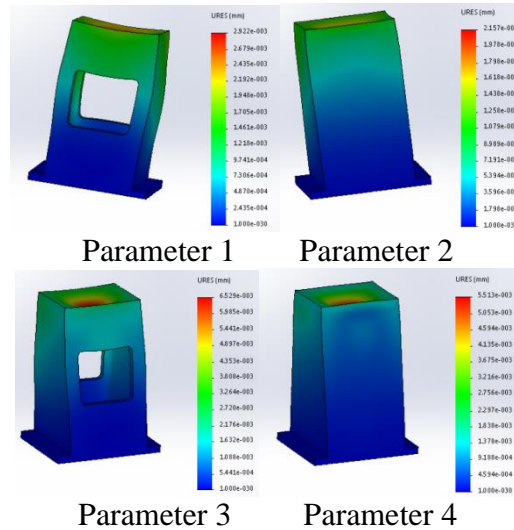


Fig.4 Displacement simulation results

It is found that the wall thickness of the column structure is smaller, the deformation is small, the total amount of the total weight loss decreased by 20%, the maximum displacement increased by 27%.

2. The influence of reinforcement and weight loss hole on the rigidity of column

The column structure parameters are shown in table 2, column wall thickness is 30mm, 20mm, and the open weight loss hole and non open weight reducing hole, and the composite structure of the reinforcing bar is arranged, and the simulation results are shown in figure 5-6.

Tab.2 Column structure parameter (two)

Structure type	Parameter 1	Parameter 2	Parameter 3	Parameter 4
Wall thickness	30mm	30mm	20mm	20mm
Weight reducing hole	200×200mm		200×200mm	
Reinforcing rib				

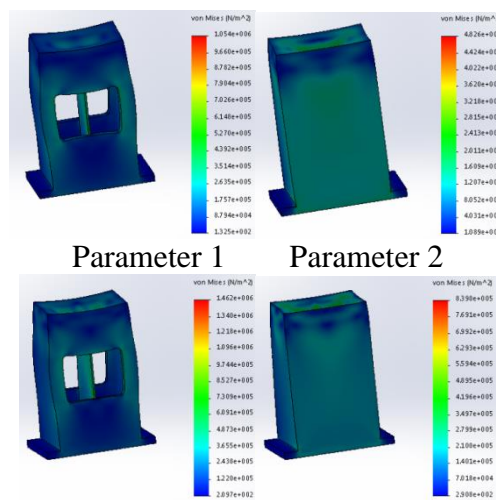


Fig.5 Stress simulation results

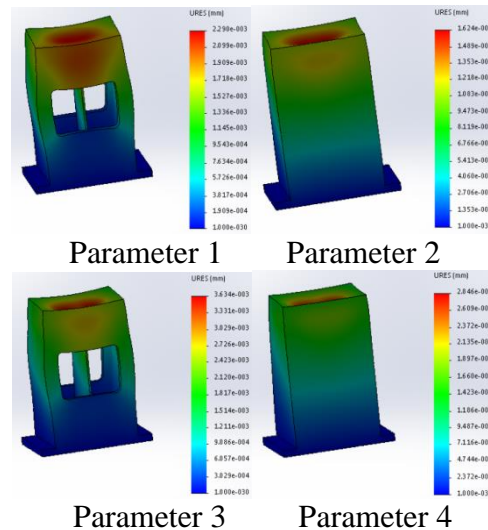


Fig.6 Displacement simulation results

The results show that the wall thickness of the column is smaller, and the deformation is small, the deformation of the thin-walled structure is reduced significantly, and the deformation of the structure is increased by about 22%.

#### 4. Conclusion

For the design of the column structure of the gantry type cutting machine, 3 kinds of structural parameters are given. The two types of simulation programs are determined. The simulation model is given, and the simulation analysis is carried out by using Solidworks software Simulation module. The analysis shows that the increase of wall thickness can effectively reduce the deformation amount and increase the weight of the body, but it can reduce the total weight.

#### References

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