



Optimize framework of canopy for hydraulic support based on the Random Ray Method

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Abstract

The canopy of hydraulic support as the main load component is the important part in the strength design of roof support. It contacts with the roof direct, and subjects to the complicated working conditions, so it is strict on the design of strength, stiffness and stability. In tradition, the design was conservation or danger by experiences, and the optimize space is large. In this paper, the optimal model is built up by taking the weight of the canopy as the optimal objective function, structural strengthen as constraints, the thickness of canopy and steel board as well as the intervals of steel board as design variables. Using the Random Ray Method, the optimal calculation is achieved by programming in Visual Basic 6.0, the optimization results are get. The canopy weight decreases 20 percent comparing with the original results.

Key words: *Hydraulic support, Canopy, Random ray method, Optimization*

1. Introduction

Hydraulic support is the critical apparatus for coalmine comprehensive mining coalface, which can not only holds up the roof, maintain the working space safety, but also can play the role of pushing and moving the transporter and shearer (Ding, 1991). Canopy, rear shield and base are the main load components and they are all box-shape framework, having large volume and weight, ordinary being designed by experiences. Therefore, optimal design for the framework dimension of these components will decrease the weight of hydraulic support and manufacture cost and produce best economic benefits.

2. Building up mathematical model for optimizing design

2. 1. Objective function

With the increasing for weight of hydraulic support, the manufacturing cost increases, and the economic benefits will be influenced, the installation and transport of apparatus become inconvenient (Ren, 2005). Therefore, selecting the weight of canopy as optimal object has real significance. As the length and width of canopy during the whole designing process for support have been decided, and the density of material is constant, so the problem