A new approach to increase land reclamation rate in coal mining subsidence area: A case study of Guqiao Coal Mine, China

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Abstract

Underground coal mining will inevitably cause land ponding in high groundwater table, which will affect the land sustainable development. However, the traditional reclamation (TR) is poor in land rate. Thus, finding a suitable reclamation approach is crucial to alleviate the conflicts between coal exploitation and land protection. In this paper, taking Guqiao Coal Mine of China was seriously affected by mining-induced ponding as an example. Firstly, dynamic distribution of surface subsidence and land damage from 2007 to 2017 was revealed base on concurrent mining and reclamation (CMR). Second, the land-water layout of five reclamation schemes (no reclamation, TR, CMR I, CMR II and CMR III) were simulated. Then, and the dynamic filling elevation model and filling thickness model were constructed. Finally, the sequence of earthwork allocation was optimized. The results revealed that: 1) reclaimed land area: CMR III > CMR II > CMR I > TR > no reclamation; 2) The digging depth is directly proportional to earthwork volume and land area, and inversely proportional to water area, but with increase of digging depth, the increase in the reclaimed land area relatively slowed down; 3) CMRs had reclaimed 426.31~637.82 ha and 259.62~471.13 ha more than the no reclamation and TR respectively. Compared with the no reclamation and TR, CMRs can increase the proportion of reclaimed land by 33.77~50.52% and 20.57~37.32% respectively. The research results provide a reference to increase the reclamation rate of mining areas in the high phreatic table.

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