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Structural Optimization of a Rigid Metal Container Cover Based on Parametric Solid Modeling

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Abstract

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Abstract:

Beads are a widespread technology for reinforcing sheet metal structures, because they can be applied without any additional manufacturing effort and without significant weight increase. The two main applications of bead technology are to increase the stiffness for static loading conditions and to reduce the noise and vibrations for dynamic loadings. However, it is difficult to design the bead patterns of sheet metal structures due to effect of the bead configuration. A wrong bead pattern layout can even weaken the properties of the structure. In the past, the designs were predominantly determined empirically or by the use of so called bead catalogues. In this paper, parametric modeling was used to build the bead model of an rigid metal container cover. The finite element model was used to simulate the performance of rigid metal container cover. The effects of design parameters on the structure performance of beads were discussed. A hierarchical design optimization method was developed based on the Response Surface Method, Sequential Quadratic Programming and parametric bead model. The proposed method can be used to optimize the other sheet metal structural.

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I. Back ground

The structure shown in Fig.1 is a rigid metal container cover which is used on space experiment container. Some instrument were installed on internal surface of the cover. During launch, the container was subject to dynamic loads and under operating mode it was loaded by inner pressure which change from 30KPa to 60KPa. For improving the stiffness and reducing vibrations, beads were used for reinforcing the cover. In this study, a container cover, 800mm×400mm×100mm was used.

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