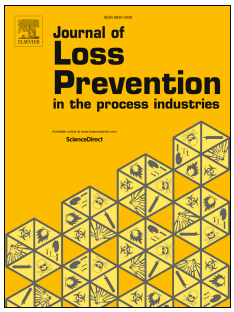
Accepted Manuscript



Deformation model and performance optimization research of composite blast resistant wall subjected to blast loading

Xingxing Liang, Zhongqi Wang, Runan Wang

PII: S0950-4230(17)30666-6

DOI: 10.1016/j.jlp.2017.07.010

Reference: JLPP 3559

To appear in: *Journal of Loss Prevention in the Process Industries*

Received Date: 20 March 2017

Revised Date: 9 July 2017

Accepted Date: 24 July 2017

Please cite this article as: Liang, X., Wang, Z., Wang, R., Deformation model and performance optimization research of composite blast resistant wall subjected to blast loading, *Journal of Loss Prevention in the Process Industries* (2017), doi: 10.1016/j.jlp.2017.07.010.

Deformation model and performance optimization research of composite blast resistant wall subjected to blast loading

Xingxing Liang[1]，Zhongqi Wang[1]*，Runan Wang[1]

1 State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, Beijing 100081, China

***corresponding author czqwang@bit.edu.cn**

Abstract

Experiment was performed to investigate the blast resistant performance of composite blast resistant wall subjected to variable blast loading. Then a numerical method was used to analyze the deformation process. In addition, an optimal design has been conducted to reduce the permanent maximum displacement and improve the stability of energy absorption. Effect of several design parameters, i.e. face-sheet thickness, concrete thickness, frame spacing are discussed. The research results show that composite blast resistant wall tend to have localized center dishing on the surface subjected to lower level blast loading. With the loading increasing, the center dishing expands to boundary. The tensile deformation at the center transform to the shear deformation at the boundary. When the blast loading is increasing continually, the penetration and the global failure occurs. After optimization of the structure parameters, the performance of the composite blast resistant wall is improved, and the optimization results can be used to guide the practical design.

Key words: composite blast resistant wall; deformation model; structure parameter; optimization

1 Introduction

Composite blast resistant wall is widely used in industrial production due to its superior performance. It is an effective way to reduce the explosion damage by setting up blast resistant structure to separate the producing departments or production equipment in the plant. Nowadays, different materials have been used for explosive response mitigation structures such as polymer foam, sand, fiber reinforced polymer (FRP) composites, porous materials, metal foams, sandwich structures and so on. The protective structure under the action of blast loading includes stiff and non-reinforced steel, reinforced concrete panel and sandwich structure, which can dissipate energy by plastic deformation.