

Studying flow of granular materials and pressure flow during centric and eccentric discharge in rectangular silo

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Abstract

Present investigation is to study the variation in the shape of flow due to centric and eccentric discharge and to show how it affects on the wall pressure. The dynamic effects occurring during centric and eccentric discharge were discussed and analyzed, in addition to experimental results of the pressure exerted during discharge. The model was designed in order to study deeply this phenomena, the study was carried out on the corn and rectangular silos. A significant effect in flow pattern and wall pressure has been determined due to the change in the outlet place.

Moreover the present study describes the effect of this parameter (in a mathematical model) which was not considered earlier even though its influence on the wall pressure and this study revealed its importance .

Keywords: Silo pressure, Flow pattern, Granular materials

For the abstract in Arabic see pages (85-100).

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References:

1. ACI Committee 313, "commentary on standard practice for design and construction of concrete silos and stacking tubes for storing granular materials", American concrete institute, Farmington hills, mich., 1997, 20pp.
2. DIN 1055, "Design loads for buildings/ loads in silo bins" German standards (DIN Normen), 2000, 6pp.
3. Sargis S. Safarian, Ernest C. Harris "Design And Construction of Silos and Bunkers" van No Strand Reinhold company, 451pp.
4. Ph.D. Hala Hammadeh "The effect of Silo Geometry on the Shape of Funnel Flow and wall pressure of granular material", 1995, 137pp.
5. Ph.D. Carson, P.Eng. Jenkeyn "Load Development and Structural Considerations in Silo Design" JENIKE and JOHANSON incorporated, Oslo, Norway, August 1993, 16pp.
6. Bulk solids handling, the international Journal, Germany, Volume 23, Number 5, January/ March 2003, 6pp.
7. powder and bulk weblog "Solving Powder flow Problems in Bins/Silos" Joe Lewis, April, 2006.
8. Irena Sielamowicz, Tomasz A. Kowalewski, Slawomir Blonski "Central and eccentric Granular Material Flows in bins /hoppers registered by DPIV Optical Technique" Acta Agrophysica, Poland, 2004.
9. 12 TH International Symposium on flow visualization, "DPIV Technique for granular material flows in silo models", German Aerospace Center (DLR), Germany, September 2006, 9pp.
10. Sielamowicz, Z. Mroz, R. Balevicius, R. Kacianauskas "DEM simulation of wall pressure in a model of silo and comparison to experimental measurements" Poland, 2007.
11. F. Ayuga, P. Augado, E. Gallego, and A. Ramirez "New steps towards the knowledge of silo behavior" International Agrophysics, Spain, 2005.
12. Carson J.W, Royal T.A "modeling the flow of bulk solids" Powder handling and processing, Volume 3, Number 3, 1991, 4pp.
13. Johanson J.R "Modeling Flow of Bulk Solids. Powder Technol, 5, 1971/72.
14. Diploma degree of Nabeel AL-Shawaf "Studying the compare of silo loads due to international codes" 2006.
15. Dr Wael Malla, Dr Amjad Zeno, Dr Wesaam Nahlea, Dr Yousef Merry "Applied Hydraulic" Damascus university published, 2009.
16. V. Ganesan, K.A. roesnrater, K. Muthukuma rapan "flow ability and handling characterizes of bulk solids and powders" USA, 2008.