COMPARISON OF WALL PRESSURES MEASURED IN THE MODEL SILO WITH DEM SIMULATION

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1. Introduction

Wall stresses are very important parameter in processes run in silos and tanks. DEM method appeared to be a very useful numerical tool in simulation of granular materials [1]. The paper presents the comparison of measured wall stresses exerted by 20,400 pea grains with DEM simulation in the model of silo by the DEMMAT code [2]. Two sensors of 55 mm in diameter were placed on the lateral wall and wall stresses were registered.

2. Filling process

Figure 1 shows the initial state of the experiment before filling the model. The measurements were registered by two sensors – one placed 5.5 cm above the bottom and the second placed 11.5 cm above the bottom.

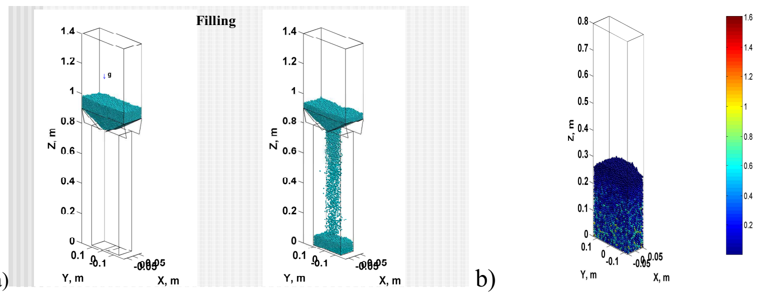

Figure 1. Initial state, a) filling the model, b) after filling.

3. Experimental measurements of wall stresses.

Figure 2 presents the registered wall stresses in the model by sensor 1 and sensor 2.

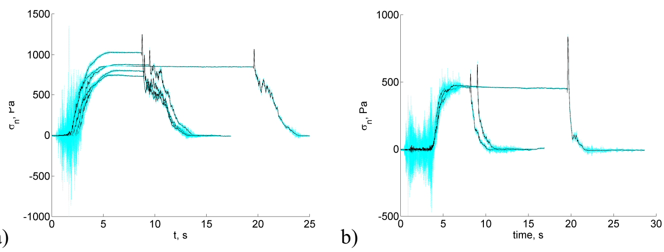

Figure.2 Experimental measurements of wall stresses during filling, storage, discharge by, a) sensor 1, b) sensor 2.

Figure 3 presents the comparison of experimental results of wall stresses with the numerical model for the filling state.

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4. Wall stresses. Filling state.

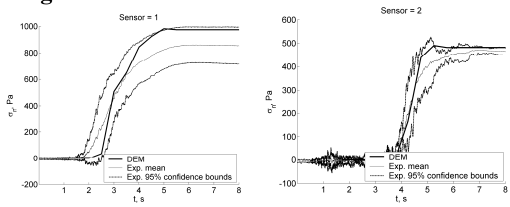

Figure 3. Comparison of the measured wall stresses with DEM for, a) sensor 1, b) sensor 2. Filling state.

DEM simulation of wall stresses in filling state is presented in Figure 4.

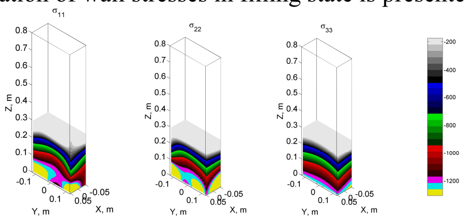

Figure 4. DEM simulation of wall stresses in the model.

5. Wall stresses. Discharge state.

Comparison of the experimental results registered by two sensors during the discharge state with DEM simulation is presented in Figure 5.

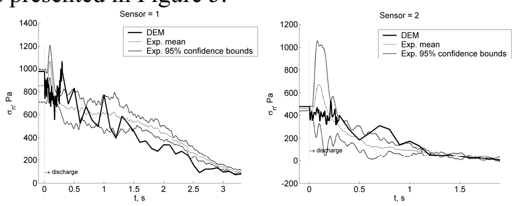

Figure 5. Discharge state of the grains. DEM simulation compared with the experiments.

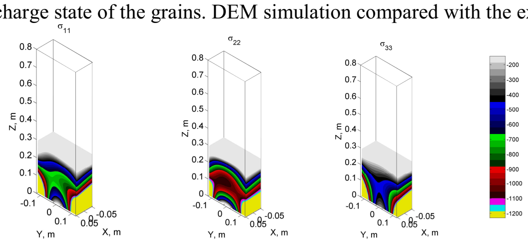

Figure 6. Wall stresses by DEM simulation.

6. Conclusions

The numerical model of DEM gave a good fit to the experimental results. Numerical model does not exceed the confidence bounds that means that the numerical model predicts the values of wall stresses in a proper way.

7. References

[1] P.A. Cundall, O.D.L. Strack (1979) *A discrete numerical model for granular assemblies*. Geotechnique, 29, 47-65

[2] R. Balevičius, R. Kačianauskas, R. Džiugys, A. Maknickas, A. Vislavičius (2005) *DEMMAT code for numerical simulation of multi-particle dynamics*. Information Technology and Control 34(1): 71-78

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