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GASTVORTRAG

Prof.F.D. Fischer, Dr. M. Wasicek
Montanuniversität Leoben - Institut für Mechanik

Thema: Silos subjected to dust explosion – experiments and modelling of the burst load

Zeit: Donnerstag, 27. April 2005, 16:00 Uhr c.t.

Ort: Bau fakultät, Technikerstrasse 13, Hörsaal B619 (6. Stock)

Kurzfassung

Vertical silos consisting of a cylindrical wall, a conical bottom and a spherical head a rather thin aluminium or steel shells. They are designed to carry various goods exerting a bottom pressure due to its weight and a wall pressure since usually granular goods are stored. As additional loads a wind load and earthquake shall be considered. However, mainly due to the high internal surface of the grains, an oxydation process may lead to a sudden explosion. The question is now if such a load can be carried by the silo shell. Therefore, a model is presented how the time-pressure-history of the explosion pressure can be estimated. Subsequently, the pressure is applied to the silo shell, and a large deformation analysis is performed to calculate both the strain and stress state as well as to estimate the local damage by an approved damage indicator, see (Fischer, F.D., Kolednik, O., Shan, G., Rammerstorfer, F.G.: A Note on Calibration of Ductile Failure Damage Indicators, Int. J. Fracture, 73, 345-357, 1995). Specific emphasis is laid on the proper modelling of the welded connections taking into account a residual stress state as well as imperfections as cracks in the heat affected zone parallel to the weld seem. In addition fracture mechanics test have been performed for welded specimens to test in detail the ductile crack propagation until fracture. Simulations of these test are also performed, specifically to calibrate the material data on crack propagation. As a conclusion an engineering approach is suggested how to estimate the load carrying capacity (the burst load) of a silo due to dust explosion.

Über die Vortragenden

F.D. Fischer, Dr. Dipl.-Ing., seit 1983 Professor am Institut für Mechanik, Montanuniversität Leoben, Arbeitsgebiete: Erdbebenbeanspruchung von Tankbauwerken, Mikromechanik der Werkstoffe, Modellierung und Simulation von Werkstoffsystemen, ca. 450 Publikationen, 2005 Verleihung des Erwin Schrödinger-Preises der Akademie der Wissenschaften, Leitung von zwei Christian Doppler Laboratorien, Key researcher des Material Center Leoben GmbH

M. Wasicek, Dr. Dipl.-Ing., 1968 bis 1972 Statiker und Konstrukteur im Stahlbau der Voest Alpine Linz, 1972 bis 1978 Projektingenieur im Industriebau der Voest Alpine Linz, 1978 bis 1998 Professor in der Höheren technischen Lehranstalt Linz (Fachgebiete: Statik, Stahlbau, Holzbau, Betonbau), Ingenieurkonsulent für Bauwesen, 1999 bis 2003 Doktoratsstudent an der Montanuniversität Leoben, ab 2003 freiberuflicher wissenschaftlicher Post Doc am Institut für Mechanik in Kooperation mit dem Erich Schmid Institut der Akademie der Wissenschaften.

Gäste sind herzlich willkommen!