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“Experimental Investigations on the dust explosion risk of Mixers”

Introduction

Mixers are used in different branches such as chemistry and pharmacy, food as well as power plant and construction. So far, branch-spreading the explosion-protection execution of Mixers assumes a filling level of 70% minimum for safe operation. This assumption has been postulated as a sufficient explosion protection measure on the basis of the operational experience of a few experts in the 7th decade of the last century.

The latest pilot-tries at a horizontal mixer, however, show that at this mixer type, a generation of explosive mixtures is possible at a filling level of 70% and therefore the explosion protection concept published so far has to be doubted. In the scope of the research project, the mixers are examined regarding their design details, effecting the explosion protection. The possible air-/dust mixtures as well as the relevant sources of ignition are determined and their effectiveness regarding the operated dusts is evaluated. The protection concepts are examined by purposefully chosen explosion tests where e.g. the filling level, the materials and sources of ignition are varied. Possible coherences between the geometry of the mixer, the filling level, the explosion characteristics of dusts and the features of the sources of ignition to the release of explosions. At the same time, the explosion tests are simulated on the computer.

Results / Conclusions

The results of the current research project should be implemented into the BGR 104 as examples for the protection of Mixers and serve as a basis for practically applied explosion protection concepts at Mixers, as they can be used by operator as well as manufacturers.

This is a contribution for the member companies operating such Mixers to execute the risk evaluation in accordance with BetrSichV on a safe basis and to give the necessary proof for the safe operation on the basis of well-experienced explosion protection measures.

At the same time, these companies are dependent on the possibility that they can purchase equipment and protection systems to be operated in hazardous areas, which are put into the market in accordance to the "equipment and product safety law", machinery regulation and European Directive 94/9/EC. By these results of the research project, the manufacturers of the mixers are put into the position to define the intended use of their equipment more clearly. This supports the operator of the mixers by the determination of the boundary conditions for the safe operation.

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