Inclusion of pressure hazards into NFPA 704 instability rating system

V.H. Carreto-Vázquez\textsuperscript{a}, I. Hernández\textsuperscript{a}, D. Ng\textsuperscript{a}, W.J. Rogers\textsuperscript{a} and M.S. Mannan\textsuperscript{a}

\textsuperscript{a} Mary Kay O'Connor Process Safety Center, Artie McFerrin Department of Chemical Engineering, 200 Jack E. Brown, College Station, TX 77843-3122, USA

ABSTRACT

The lack of awareness in identifying potential hazardous reactions is commonly cited as a cause of accidents. One major problem is the lack of consensus to assign appropriate reactivity hazards ratings. NFPA 704 instability rating system is widely used throughout the chemical industry. However, this system does not take into account pressure hazards. Inclusion of pressure hazards into the NFPA 704 instability rating will provide a more comprehensive rating system, which will characterize hazards that may arise not only from exothermic reactions, but also from endothermic decompositions with gas evolution. In this work we present a proposed method for developing a simple methodology to include pressure and pressure rates into the assignment of instability ratings. The current NFPA 704 instability rating number for the systems studied does not show a trend between the pressures and pressure rates generated with the assigned rating. Therefore, arbitrary threshold values were chosen to rank the substances according to the pressure and pressure rate generated. Results obtained from a variety of systems with endothermic decompositions show that their pressure and pressure rates have magnitudes comparable to systems that decompose exothermically. So far, this method has been applied only to a limited set of data. However, assignment of arbitrary values for normalized maximum pressures generated and pressure rates, taking as reference the values obtained for the thermal decomposition of cumene hydroperoxide and di-terbutyl peroxide appears to give reasonable limits for the rating chemicals based on their relative pressure hazards.

Keywords: NFPA 704 instability rating; Pressure hazards; Gas evolution; Endothermic decompositions