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Lecture on SEA (India) Technical Meet

Thermal Hazards & Process Safety

Mr. G. Swaminathan, Scientist, Cell for Industrial Safety & Risk Analysis, Central Leather Research Institute, Adyar, Chennai, delivered a lecture at the technical meet of SEA (INDIA) in Chennai on February 23. Dr. M. Lakshmanan, President, presided. The points, made by Mr. Swaminathan in his lecture, are given below:

Industrial level exothermic chemical reactions and thermally unstable chemical compounds continue to be areas of intense research. Lack of adequate knowledge of the exothermicity of reactions and runaway reaction chemistry at plant level operations has caused casualties and material loss. Nevertheless, through recent advances in the field of microcalorimetric techniques, even hazardous runaway reaction potential could not only be identified but also quantified.

There are ways of identifying the exothermic chemical reactions and endothermic compounds, which are of concern in a chemical industry. The causes of these could be traced to the chemical structure promoting either instability or susceptibility to other reactions, endothermicity, decomposition energy and affinity between different compounds. In general, compounds which have double and triple bonds, pyrophoric, self-detonating, metal powders and metal hydrides, alkali metals, propellants etc. are highly reactive. Reactive Hazard Index and software like CHETAH and CRUISE, NFPA ratings on reactivity and flammability help to identify the above-mentioned thermal and reactivity hazards to, a limited extent.

There are hazardous unit processes like nitration, halogenation and combustion and unit operations like distillation, size reduction etc. which have to be screened with great care. The kinetics of a reaction has a major role to play and right from reactant and product characteristics to material of construction of the reactor can pose problems to the engineer in scaling up a chemical reaction system.

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