
Enterprise-Level Industrial Fire Risk Modeling and Analysis for Automobile Manufacturing Facilities

by

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at 10:00 am in 1515 HH Dow

Chair: Arvind Atreya, Professor, Mechanical Engineering

Committee Member: Armen Zakarian, Associate Professor, Industrial and Manufacturing Systems Engineering – UM-Dearborn

Committee Member: Roman Kapuscinski, Associate Professor, Ross School of Business

Committee Member: Debra Elkins, Research Program Manager, General Motors R & D Center

Abstract:

The risk to automotive manufacturing operations from fire is significant, and methods are desired to quantify this risk in terms of the probability and severity of fires in the manufacturing enterprise, including suppliers. Obtaining such knowledge about fire risk can influence capital spending on fire prevention and protection and other strategic decisions at the enterprise level.

A performance-based approach is presented that will permit rapid and consistent evaluation of different fire risk mitigation options and support risk-based decision-making for industrial fire protection investments. Quantitative risk information such as fire frequency and severity data, collected globally from General Motors manufacturing locations, is used to develop structured analytical models to quantify risk, evaluate risk reduction alternatives, and perform economic cost/benefit analyses. A bottom-up approach is used to aggregate risk data to the enterprise level. These strategies will help address fire protection issues at joint ventures and other global locations subject to alternate fire protection standards. A pilot study to demonstrate the methodology with an example from an automotive paint shop is presented. Findings from this case study indicate that the capital expense of installing roof-level sprinklers in addition to process-level sprinklers is warranted by the significant reduction in the risk value over the life of the paint shop.

This methodology provides globally applicable, enterprise-scale quantitative fire risk analysis models that leverage existing fire event statistical data and support strategic business case decisions for fire protection improvements.