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Applying Advanced FMEA Methods to Vehicle Fire Cause Determinations

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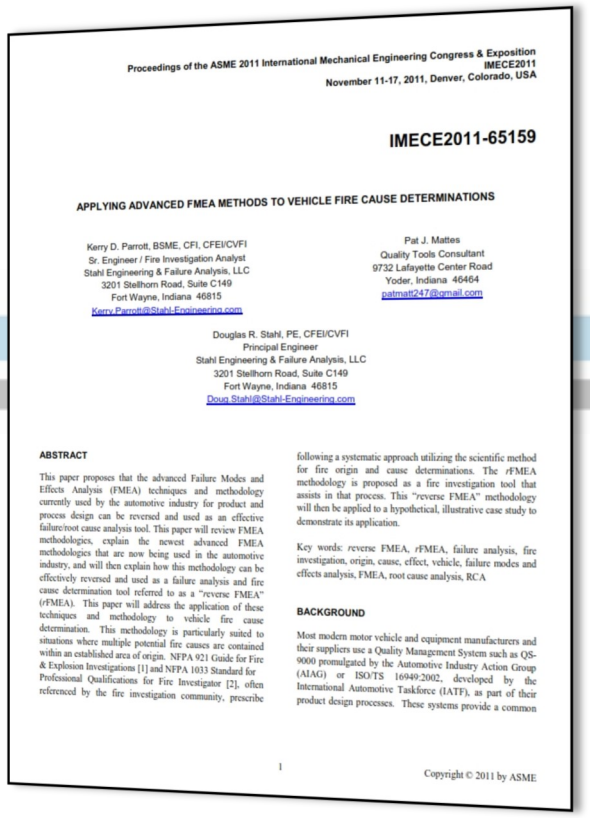

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APPLYING ADVANCED FMEA METHODS TO VEHICLE FIRE CAUSE DETERMINATIONS

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ABSTRACT

This paper proposes that the advanced Failure Modes and Effects Analysis (FMEA) techniques and methodology currently used by the automotive industry for product and process design can be reversed and used as an effective failure/root cause analysis tool. This paper will review FMEA methodologies, explain the newest advanced FMEA methodologies that are now being used in the automotive industry, and will then explain how this methodology can be effectively reversed and used as a failure analysis and fire cause determination tool referred to as a "reverse FMEA" (rFMEA). This paper will address the application of these techniques and methodology to vehicle fire cause determination. This methodology is particularly suited to situations where multiple potential fire causes are contained within an established area of origin. NFPA 921 Guide for Fire & Explosion Investigations [1] and NFPA 1033 Standard for Professional Qualifications for Fire Investigator [2], often referenced by the fire investigation community, prescribe following a systematic approach utilizing the scientific method for fire origin and cause determinations. The *r*FMEA methodology is proposed as a fire investigation tool that assists in that process. This "reverse FMEA" methodology will then be applied to a hypothetical, illustrative case study to demonstrate its application.

Key words: *r*everse FMEA, *r*FMEA, failure analysis, fire investigation, origin, cause, effect, vehicle, failure modes and effects analysis, FMEA, root cause analysis, RCA

BACKGROUND

Most modern motor vehicle and equipment manufacturers and their suppliers use a Quality Management System such as QS-9000 promulgated by the Automotive Industry Action Group (AIAG) or ISO/TS 16949:2002, developed by the International Automotive Taskforce (IATF), as part of their product design processes. These systems provide a common

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SYNOPSIS:

This publication proposes that the advanced Failure Modes and Effects Analysis (FMEA) techniques and methodology currently used by the automotive industry for product and process design can be reversed and used as an effective failure/root cause analysis tool.

The paper reviews FMEA methodologies and explains how they can be effectively reversed and used as a failure analysis and fire cause determination tool referred to as a "*reverse* FMEA" (*r*FMEA). This analysis addresses the application of these techniques and methodologies in vehicle fire cause determination. The *r*FMEA technique is particularly suited to situations where multiple potential fire causes are contained within an established area of origin. In this paper the "*reverse* FMEA" methodology then is applied to a hypothetical, illustrative case study to demonstrate its effectiveness.