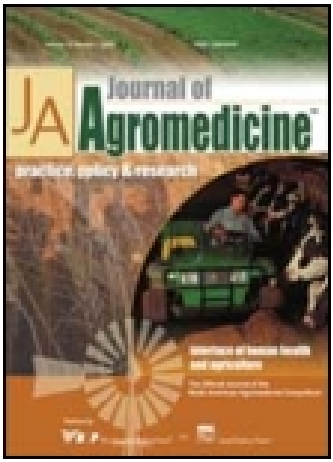

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ROPS Design for Pre-ROPS Tractors

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ROPS Design for Pre-ROPS Tractors

Paul D. Ayers, PhD

SUMMARY. Tractor overturns are the leading cause of agricultural fatalities in the United States. Many of these fatalities could be prevented if the tractor was equipped with a rollover protective structure (ROPS). Of the estimated 4.8 million tractors, 2.8 million are considered pre-ROPS tractors (tractors that were designed prior to ROPS availability).[1] This project involves the design, construction and testing of ROPS for pre-ROPS tractors. Testing was successfully conducted with Ford and John Deere pre-ROPS tractors. Current testing involves a Farmall pre-ROPS tractor.

The ASAE Standard S519 is utilized for the testing. Static longitudinal (rear), transverse (side) and vertical (top) tests are conducted in addition to field upset testing. Tractors are equipped with remote controls to perform side and rear field upset tests. Axle housing drawings have been obtained from the tractor manufacturer to assist the ROPS and axle mounting design process. Commercialization of the ROPS is in progress with a ROPS manufacturing company. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: getinfo@haworth.com]*

KEYWORDS. Tractor, safety, roll-over protective structure (ROPS)

INTRODUCTION

Tractor overturns are a major cause of agricultural worker deaths. These deaths and serious injuries may have been prevented if the tractors

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had been equipped with ROPS. Additional protection is assured if the operator wears a seat belt. Many tractors manufactured prior to 1970 did not have ROPS as an option and thus the axle mounts were not designed to structurally support a ROPS during an overturn. If guidelines can be developed to design and construct ROPS for these pre-ROPS tractors, then ROPS protection will be more readily available. The test results for this project provide the initial steps in generating these guidelines.

SPECIFIC AIMS

The specific aims of this project are to:

1. Identify and categorize pre-ROPS tractors in order to determine axle mount designs appropriate for ROPS design and testing, and
2. Design, construct and test a ROPS for three major axle housing categories identified. This includes conducting static and field upset ROPS testing in accordance with ASAE S519.

METHODS AND RESULTS

The ROPS design, construction and, static and field tests for the first major axle housing category have been completed for the initial axle category.[2] This axle housing category includes the Ford 8N/800 series tractors.

The second major axle housing category was selected and includes the axle design for the John Deere A, B, G, 50, 60, 70, 520, 620, 720, 530, 630, and 730 tractors. There were about 920,000 tractors with this axle category sold, and approximately 150,000 are still in operation. Axle housing drawings for these tractors have been obtained from Deere and Co. The design modification for the second major axle housing category is complete. A John Deere A rear axle housing has been obtained and was used for successful static ROPS testing (side, rear and vertical) based on ASAE S519.

A John Deere A tractor has been purchased and has been modified for field upset testing. The modification includes structural support, battery protection, gas tank redesign, pneumatic power source for starting, braking and clutching, and radio controls for remote operation. The ROPS for the John Deere A has been built and installed. The ROPS deflection measuring system has been installed. Succesful field upset testing was conducted in accordance to ASAE S519.

The third major axle housing category has been selected based on the available tractor databases and discussions with Saf-T-Cab (ROPS manufacturer). The axle category covers the Farmall H, M, Super H, Super M, 300, 400, 350, 450, 460. Although ROPS for some of these tractors are listed as being available through Saf-T-Cab, a more economical two-post design is needed for commercialization. This category of axle housing makes up a large number of tractors in operation (approximately 278,000). As of the writing of this paper, laboratory static tests are underway and a Farmall M tractor is being modified for radio control for field upset testing.

DISCUSSION

The results from this project indicate ROPS can be successfully mounted to pre-ROPS tractors to provide protection to the operator in the event of a tractor overturn. Many pre-ROPS tractor axle housings are similar so that one ROPS design and mounting configuration can be used for several tractor models.

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