Fire Risks Associated with Combine Harvesters: Analysis of Machinery Critical Points

Val-Aguasca, J. P., Videgain-Marco, M., Martín-Ramos, P., Vidal-Cortés, M., Boné-Garasa, A., & García-Ramos, F. J. (2019). Fire risks associated with combine harvesters: analysis of machinery critical points. *Agronomy*, *9*(12), 877.

Combine harvesters are an important cause of fires worldwide. The purpose of this work has been to investigate the critical points associated with the risk of fire, identified through a survey distributed to combine owners in Aragon (Spain). Information was collected on the technical characteristics of the machines and, when appropriate, on the characteristics of the generated fires (crop, use of straw chopper, point in which the fire was originated, etc.). Based on the survey data, relationships between the characteristics of the machine and the ignition of a fire were analyzed, and the points of the harvester in which the fire originated were investigated. A statistically significant relationship of fire risk was only found with the number of hectares harvested, in such a way that the risk would be especially high for machines with more than 6000 accumulated ha. 32% of the fires were originated in the engine zone, compared with 31% in the cutting bar and 18% in the bearings and belts. The study was completed with on-site temperature measurements carried out on nine machines in 2018 and 2019, in which temperatures above 250 C were recorded in the exhaust manifold and in the cutting bar. These temperatures exceeded the ignition thresholds obtained in the flammability studies conducted for wheat residues collected from the harvesters.

Grain Combine Fires: A Loss Reduction Approach

Shutske, J. M., Field, W. E., & Chaplin, J. (1994). Grain combine fires: a loss reduction approach. *Applied Engineering in Agriculture*, *10*(2), 175-182.

Abstract. Grain combine and tractor fires in the U.S. cause over $10 million in annual property losses. Controlling machinery fires with fire detection and extinguishing hardware is one loss reduction approach. This study included the development and testing of a fully-automatic grain combine fire detection and dry chemical extinguishing system. The automatic system was tested on a variety of fire scenarios. The system performed well when crop residue and diesel fuel fires were detected soon after ignition. However, it was not fully effective after fires were allowed to burn for longer periods of time. Airflow through the engine compartment was found to be detrimental to extinguisher effectiveness. Resulting manual fire extinguisher selection and use recommendations included having at least one 4A:40BC (U.L. rating) or larger dry chemical fire extinguisher on every grain combine, mounting the extinguisher in a protected and accessible location, and shutting off the engine before attempting to extinguish any fire.

Combine Fires Events Under Hot Dry Harvest Conditions

Uilk, N. W. (2012). Combine Fires Events Under Hot Dry Harvest Conditions. In *2012 Dallas, Texas, July 29-August 1, 2012* (p. 1). American Society of Agricultural and Biological Engineers.

An ongoing problem for sunflower producers in the Dakota's is the concern of combine fires during harvest. Numerous farmers have lost both combines and crops to fires started during the harvesting process. The most recent harvest season produced a large outbreak of fires during soybean harvest in the Upper Midwest. Working with equipment dealerships, producers, state fire marshals, and climatologists, data are being aggregated regarding what regions of the Midwest experienced an outbreak of combine fires during the 2011 harvest season. Weather and crop conditions at the time of the fires will be examined. Total numbers of combine fires will be estimated from sample data, as will the total amount of damage sustained due to these fires. This research may help identify mechanisms leading to combine fires and may lead to modifications in both practices and machines with the goal of limiting the risk of fires during harvest