NEW CONCEPTS IN POTATO HARVESTING

L. F. Johnson, E. M. Bailey and C. L. Peterson

Potato growers in Washington and Idaho lose millions of dollars each year as a result of the potato bruises inflicted during the harvesting operation. Both states have for several years conducted research to find ways of reducing the bruise. During the 1973 Washington Potato Conference it was suggested that the Agricultural Engineers working on the bruise problem should pool their efforts and develop a "Low Damage Potato Harvester." A harvester incorporating ideas generated during the past several years of study which had potential for reducing harvester caused potato damage could jointly be designed and constructed.

As a result of this initial discussion contact was made with Thiokol Hall-way who expressed an interest in supporting the project financially and ultimately pledged $28,500 in materials, and other support for carrying on the work. Encouraged by industry support, a joint proposal for cooperative action was written which involved the University of Idaho, Washington State University, The Idaho Potato Commission, The Washington Potato Commission, and Thiokol Hall-way. The proposal was entitled, "Development of a Low Damage and High Efficiency Potato Harvester."

The automatic position control for the potato harvester boom, which is discussed in this paper as a part of the low damage harvester, was developed as a separate project by the Departments of Agricultural and Electrical Engineering at the University of Idaho and the Idaho Research Foundation.

Resumen

Dos cosechadoras de papa que ocasionan poco daño han sido diseñadas para su uso en Idaho y Washington. Las máquinas incorporan una serie de conceptos para reducir magulladuras. Entre estos están una cuchilla excavadora vibrante, control de velocidad independiente en cada cadena, una sección excavadora extra larga para minimizar el ángulo de ataque y el rodamiento hacia atrás, una distancia de caída reducida en los puntos de transferencia, un rodillo volteador auxiliar en el eje del cabezal de la cadena primaria y elevadora de costado, la cual dota al tubérculo con una trayectoria hacia abajo y no hacia arriba, un mando lateral de retomo en la cadena primaria para reducir las caídas, un cargador oscilante, eliminación de fugas desde el elevador lateral con la adición de una faja antideslizante para...
Review of Literature

Bruise damage has long been associated with harvester operation and design. Studies have been conducted by Hastings (1931), Werner (1931), Martin and Humphrey (1951), Hopkins (1956), Sparks (1957), Tavernetti and Zahara (1959), Larson (1962) and Hansen (1970) all of which relate bruise damage to the harvester.

Weaver et al. (1965) in Washington reduced bruise damage due to the drop into the truck by harvesting potatoes into water held in a water-tight bulk body. The use of water as a cushioning agent was later utilized by Johnson (1970) in the design of a ‘‘water’’ harvester. A water tank was used to transfer the tubers between the digger chain and the loading chain and also served to eliminate rocks and clean the tubers.

Johnson (1973) developed a vibrating blade which aided in reducing the damage at the digger section.

Comparisons of damage occurring in harvesters manufactured by different companies have been reported by Sparks (1954), Jorgenson and Preston (1970), and Peterson et al. (1973). The comparisons provided information which enabled the manufacturers to improve their machines and also provide information useful for improving their operation.

To develop the low damage harvester described in this paper, ideas and information were taken from all of the above sources.

Objectives

The objectives set up in the initial proposal for a low damage harvester were as follows:

1. To design a minimum damage potato harvester which incorporates the latest harvester improvements developed by the University of Idaho and Washington State University potato harvester researchers.

2. To test and evaluate the harvester under field conditions in both Idaho and Washington.

Development and Design

Personnel from each cooperating agency met together in an initial planning meeting to discuss concepts to be incorporated into the harvester. It was generally agreed that while new concepts were important they must be practical for use by the industry under today’s management practices.

Two harvesters were designed and built at the University of Idaho Aberdeen Experiment Station. One machine was designed for use under