ChemMiser ™ - IMPROVED GRANULAR PESTICIDE APPLICATOR ROTOR

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Abstract

Cooperative development between Horstine Farmery Ltd., Rhone-Poulenc Ag Co. and John Deere Seeding Group has resulted in the commercial introduction of a new pesticide applicator rotor named ChemMiser ™ that improves granular chemical application efficiency. Extensive tests confirm good performance and durability of the new rotor. Performance tests of ChemMiser™ using a gypsum formulation simulant indicates that excessive row end rates can be reduced by 38% and loss of granules during equipment transport can be reduced by 91% as compared to performance with the standard pesticide rotor used on a John Deere MaxEmerge 2 planter. Similar responses have been observed with a clay formulation simulant typical of many other granular pesticides. Horstine Farmery currently offers the ChemMiser™ rotor as a replacement kit for the John Deere MaxEmerge 2 planter's standard pesticide applicator rotor. John Deere Seeding Group plans to start installing the new rotor design into new John Deere MaxEmerge 2 planters in June, 1996, as well as, offer replacement kits through John Deere's parts distribution network. The ChemMiser™ rotor concept is adaptable to other planter brands and models.

Introduction

In 1993, an engineer at Horstine Farmery Ltd., an ag chemical application equipment manufacturing company in England, conceived an improved granular pesticide applicator rotor that could improve the application efficiency of gravity flow granular applicators (GFA). GFA are commonly used on popular brands of row crop seed planters used for cotton, corn and peanuts in the United States. Horstine Farmery engineers have considerable expertise in granular pesticide application because of their experience with their premier product - Microband PDA™ which uses a positive displacement metering (PDA) unit. Horstine Farmery engineers felt that by applying some of the principles of their Microband PDA™ to the GFA common in the USA, that measurable benefits could be realized by growers. Ag chemical companies interested in product stewardship could also benefit. Through cooperative lab and field research in 1994 with the Application Technology Group of Rhone-Poulenc Ag Company in North Carolina, encouraging performance data was developed. This early success led to expansion of the development program in 1995 to test market the improved rotor with 20 growers during the planting of 22,000 acres. This test market of the improved rotor was targeted to John Deere MaxEmerge 2 owners because of the widespread popularity of this planter. Since grower acceptance for the improved rotor for the John Deere MaxEmerge 2 was high, representatives of Rhone-Poulenc Ag Co. contacted John Deere Seeding Group to share the information gathered during the project. A cooperative development program was then initiated in mid 1995 between Horstine Farmery, Rhone-Poulenc Ag Co. and the John Deere Seeding Group that led to the commercial introduction of the improved rotor that has the tradename - ChemMiser™.

Test Methods

Four types of tests were conducted during development of ChemMiser™: 1. Rate Uniformity, 2. Transport Loss, 3. Commercial Use and 4. Durability. Tests 1 and 2 establish the basic data that best illustrate the improvements in application efficiency typical with ChemMiser™. Test 1. - Rate Uniformity involves collecting the output of a calibrated granular applicator in 1 foot wide collection pans positioned on the ground underneath the pesticide drop tube on the seed planter. The planter was operated at a constant speed while driving along a 100 ft. course with pans positioned along the length of the course. At the row end, the planter was stopped over the last collection pan, which allowed quantification of possible excessive application rates. Test 2 -Transport Loss quantified the amount of granules that flowed through the metering unit while turning at row ends and while traveling between fields. Measurements were made by attaching small containers underneath the metering unit outlet and transporting the equipment over a measured distance on a farm road.

Tests 3 and 4 were designed to obtain real world performance and durability. Results of Test 3 and 4 were more qualitative with the exception of wear measurements that were taken in both tests. Commercial use by 20 cotton growers provided valuable results for Tests 3 and 4. John Deere Seeding Division conducted a more extensive version of Test 4 that measured the long term durability when using a clay formulation simulant and a gypsum formulation simulant. Simulated planting of at least 300 hours per formulation was conducted with the ChemMiser™ installed on a John Deere MaxEmerge 2 planter. Since 100 hours was considered to equal one year of use by a typical large grower, the combined duration for the two formulation simulants was 6 years.

Results and Discussion

Test 1 indicates that the rate uniformity along the simulated row was similar when comparing the ChemMiser ™ to the standard rotor for the John Deere MaxEmerge 2. However, at the row end the application rate collected underneath the applicator drop tube was 38 % less using the ChemMiser

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™ as compared to the standard rotor, indicating a significant reduction in above target rates at the row end. This improvement is based upon a simulated application using the following assumptions: Rate: 7 lb/ac (0.24gram/ft), Granule: Gypsum Simulant, Row Spacing: 40 inch, Speed: 4 MPH. When the planter was brought to a complete stop at the row end, the rate deposited with the standard rotor at the stop point was 2.72 grams/ft as compared to 1.68 gram/ft with the ChemMiser ™. Similar trends have been measured with clay formulation simulants.

During Test 2 -transport loss with gypsum simulant, 6.3 mg/ft of travel was collected with the standard John Deere MaxEmerge 2 rotor as compare to 0.56 mg/ft with the ChemMiser ™. This represents a 91% reduction in loss with the ChemMiser ™ versus the standard rotor. Similar trends were seen with clay formulation simulants.

During Test 3 - Commercial Use, grower acceptance with ChemMiser ™ was very good. Growers recognized the stewardship benefits when using ChemMiser ™. As might be expected, economic benefits were not easy to quantify by growers. As indicated in Test 1 and 2, improvements in application efficiency are measurable but since quantities are very small, typical growers are not equipped, nor have the time to measure these improvements. Growers did understand the principles of ChemMiser ™ and recognized qualitative improvements from the new design. Durability was good during commercial use. However, several recommendations for simplified construction and installation became apparent.

Test 4 -Durability trials conducted by John Deere Seeding Group confirmed that the original design for ChemMiser ™ was very durable, but also showed that simplified construction and installation techniques were desirable. Several changes were made to simplify installation and extend the rate range for the numerous calibration combinations that are possible with various ag chemicals and seeding rates. Durability was determined by measuring critical dimensions before and after use. Based upon these measurements, John Deere engineers determined that the ChemMiser ™ can maintain performance for 2 - 3 use seasons (assume 100 hours use/year), but should be replaced after that length of service.

Conclusion

ChemMiser ™ provides a simple modification that can be retrofitted into existing or new John Deere MaxEmerge 2 applicators. ChemMiser ™ performance results in significant reduction in row end rate increases and transport loss as compared to standard pesticide applicator rotors. Commercial introduction of the ChemMiser™ will provide economic benefits to growers and further improve product stewardship.

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