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Evaluation Report 101

SED Model 902 Seeder Monitor

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

SED MODEL 902 SEEDER MONITOR

MANUFACTURER AND DISTRIBUTOR:

SED Systems Ltd.
Box 1464
Saskatoon, Sask.
S7K 3P7

RETAIL PRICE:

$390.00 (June, 1978, f.o.b. Humboldt with six sensors, wiring harness and breakaway connector).

SUMMARY AND CONCLUSIONS

The SED model 902 seeder monitor was suitable for monitoring the flow of fertilizer or large and small seeds from the grain drill to the ground.

The control box channel lights were bright enough to alarm the operator providing the control panel was not positioned in direct sunlight. The audible channel alarm was loud enough to be heard above the tractor noise.

The monitor was very sensitive to the impact of the falling grain particles and it could measure the flow of the smaller seeds such as rapeseed.

The mixing of chemicals such as Lindasan or Gamasan with the rapeseed resulted in a buildup of the powders on the sensor heads and caused the system to give a false alarm.

The response time of the monitor was almost instantaneous with the alarm sounding within two seconds after the stoppage in seed flow.

The monitor could be installed in about three hours on a multiple grain drill hookup. Final placement of the sensors in the path of the seed flow was easy for wheat and barley but difficult for the smaller grains such as rapeseed. Quick pull-apart connectors facilitated unhooking of the tractor or individual drill units.

The operator's manual was complete regarding installation, operation and adjustment of the monitor.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Improving the quality control during manufacture of the control box circuitry.

Chief Engineer -- E. O. Nyborg
Senior Engineer -- L. G. Smith
Project Engineer -- G. E. Frehlich

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The Seed Monitor evaluated was produced in January 1977 and was the 70th unit off the production line. Like any new product, and particularly the first Monitor in the SED Agricultural Electronics line, it has been subject to "experience prompted" improvements in the manufacturing process. The specific problem relates to the occasional movement of an electronic component during the automatic soldering process. Upon inspection, the component would look correct and test properly. This problem was detected and corrected after approximately 200 units were manufactured. All monitors in stock were retested and reinspected and the manufacturing procedure was modified. Because the product is new, sufficient data to determine its reliability is not yet available. However, another SED product subjected to similar manufacturing quality control procedure is experiencing a very favorable measured Mean Time Between Failure (MTBF) of 183,427 hours. In other words it will take over 20 years for half the electronic units to have some type of failure. This is based on 56 million hours accumulated service.

MANUFACTURER'S ADDITIONAL COMMENTS

1. It is our opinion that SED provides the highest quality Agricultural Electronics products available to the farmer and in all cases stands behind the performance of its products.

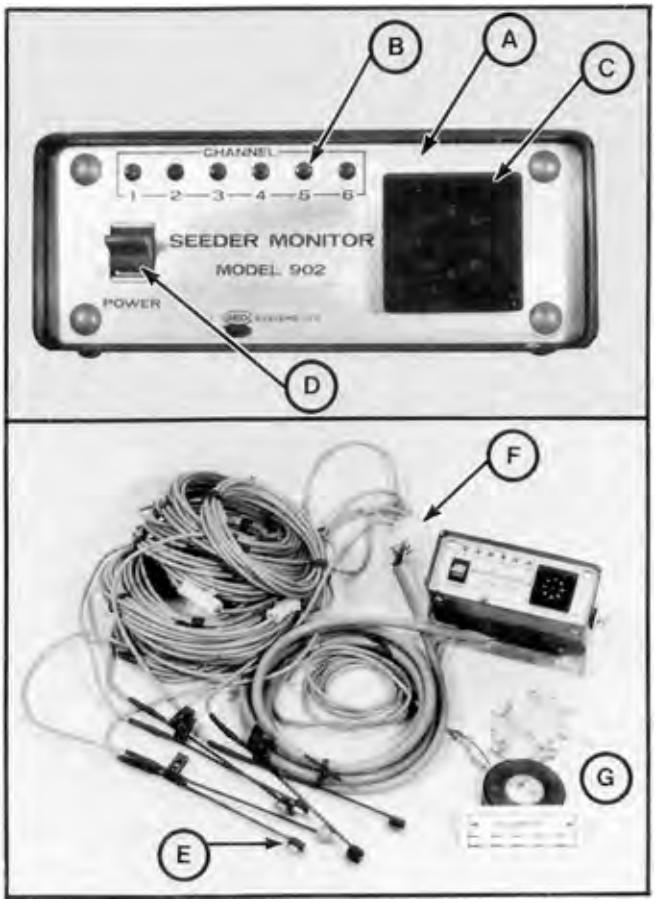

FIGURE 1. SED Seeder Monitor: (A) Control Box, (B) Channel Warning Lights, (C) Buzzer, (D) On-Off Switch, (E) Indicator Light, (F) Sensors, (G) Pull-Apart Connector, (H) Mounting Hardware.

GENERAL DESCRIPTION

The SED model 902 seeder monitor is installed on a grain drill to signal the operator of a stoppage in the flow of seed or fertilizer from the drill box to the ground. The monitor is powered by the tractor electrical system and will operate on either a positive or negative ground circuit. The standard control box will monitor from three to six separate seed or fertilizer runs.

The SED monitor consists of a control box which mounts at the operator's station and six impact sensitive sensors. The sensors are placed in the path of the seed or fertilizer flow and detect the falling seeds or fertilizer particles as they strike the sensor faces. Failure of a particle to strike the sensor face at least once every second activates the alarm. The monitor includes cables, pull-apart connectors, mounting hardware and instructions.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The SED model 902 seeder monitor was operated for 105 hours while monitoring seed flow through a grain drill.

The monitor was evaluated for ease of installation, ease of operation and adjustment, quality of work and suitability of the operator's manual.

RESULTS AND DISCUSSION

EASE OF INSTALLATION

Installation Time: The SED model 902 seeder monitor was easily installed on a three unit press drill in about three hours. Installation instructions provided were clear and well illustrated.

Control Box: The control box (FIGURE 1) was mounted at a suitable location in the tractor cab. The control box face should not be positioned in direct sunlight to provide clear viewing of the

channel lights. The control box attaches with two screws and is wired directly into the tractor electrical system.

Sensors: The senors are attached to the seed cups and the sensor head is positioned directly in the path of the seed or fertilizer flow. To mount the sensors, the sensor arm is bent to the proper shape,' a hole is drilled into the seed cup and the sensor is attached using the bolts provided (FIGURE 2). The sensor arms are easily bent without breaking and are rigid enough to retain their shape. It is important to place the sensor head so it will not contact the side of the seed cup.

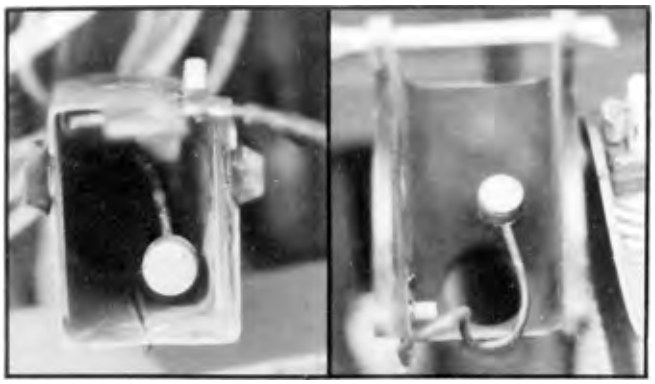

FIGURE 2. Sensor Mounting in the Seed Cups.

Wiring Harness: The wiring harness included a sufficient number of plastic clamps, screws and a roll of tape for securing cables away from pinch points and moving parts. Small pull-apart connections were used at the control box and on four of the six sensors to permit easy removal of the control box or the individual drill units. The two sensors without connectors were too short to reach the nearest drill unit and had to be lengthened. A main pull apart connector was used to permit unhitching of the tractor.

EASE OF OPERATION AND ADJUSTMENT

Once the sensors were placed in the path of the material flow, no other adjustments were required. When seeding smaller seeds such as rapeseed, the placement of the sensors in the seed flow was difficult especially when the sensors were mounted on completely enclosed seed cups. The open viewing seed cups of some drills simplified the final positioning of the sensor heads.

Operation of the monitor required the operator to turn on the power switch. If the drills were functioning properly the channel lights were not visible. Flashing of the lights indicated a stoppage in seed flow. The control box could be converted for use with less than six sensors by using a simple lockout procedure.

QUALITY OF WORK

Sensitivity: The sensors were very sensitive to the impact of the falling seeds. The sensors were used to successfully monitor the flow of barley, wheat and rapeseed. The fall height of the grain, required to activate the sensors was dependent upon the weight of the grain particles. A smaller kernel such as rapeseed should fall from a height of at least 25 mm (1 in).

The sensitivity of the monitor was significantly reduced when seeding rapeseed that had been treated with Gamasan or Lindasan. After several hours of seeding the treated rapeseed, the powder would collect in high concentrations in the bottom of the drill box. This high concentration of powder, metered with the seed, produced a buildup on the sensor face as shown in FIGURE 3. This buildup reduced the seed impact on the sensors and activated a false alarm. The buildup occurred at more frequent intervals when linseed oil was added to the rapeseed-powder mixture. The oil was used to reduce the amount of dusting during mixing and to improve the sticking qualities of the powders. Buildup on the sensors occured only while seeding treated rapeseed.

FIGURE 3. Powder Buildup on Sensor Face.

Response Time: The SED monitor's alarm was activated within two seconds of a stoppage in seed flow. The monitor immediately indicated the disengagement of the seeding mechanism and even alarmed when the inside drill stopped seeding on a sharp corner.

Environmental Effects: The performance of the SED seeder monitor was not affected by the dust or moisture common to seeding operations.

POWER REQUIREMENTS

The SED seeder monitor drew a maximum current of 100 mA and could be attached to a 12 volt electrical system with either a positive or negative ground.

OPERATOR'S MANUAL

The operator's manual was complete and clearly explained the installation, operation and adjustment of the monitor.

DURABILITY RESULTS

The SED seeder monitor was operated for 105 hours while monitoring wheat, barley and rapeseed flow through a drill. The intent of the test was an evaluation of the functional performance of the monitor and an extended durability evaluation was not conducted. TABLE I outlines the failures that occurred during functional testing.

TABLE 1. MECHANICAL HISTORY

ITEM	OPERATING HOURS
Failure of the monitor's circuitry occurred and the control box was either replaced or repaired at	35, 47 hours and end of test.
One of the flexible sensor arms broke while being adjusted and the sensor was replaced at	35 hours.

DISCUSSION OF MECHANICAL PROBLEMS

Circuit Malfunctions: The three malfunctions of the control box circuitry indicate poor quality control during manufacture. It is recommended that the manufacturer improve this quality control.

Sensor Adjustment: The flexible sensor arm was broken due to the numerous adjustments required to place the sensor head in the path of the rapeseed flow.

APPENDIX I

SPECIFICATIONS

MAKE:	SED Seed Monitor
MODEL:	902
SERIAL NO.	67137
NUMBER OF CHANNELS:	6
CONTROL BOX:	
-- size	65 x 127 x 162 mm (2.5 x 5 x 6.4 in)
-- alarm system	buzzer followed by a flashing light
-- controls	on-off power switch
CONNECTORS:	pull-apart connectors at control box, between tractor and drills and between drill units.
SENSORS:	
-- type	impact sensitive piezoelectric heads
-- number	6
OPTIONS:	3 m (10 ft) tractor extension, 3 m (10 ft) sensor extension, 7.6 m (25 ft) sensor extension

APPENDIX II

METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversions may be used.

1 metre (m) = 1000 millimetres (mm) = 39.37 inches (in)

ALBERTA FARM MACHINERY RESEARCH CENTRE

3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 329-5562
http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html

Prairie Agricultural Machinery Institute
Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555

Test Stations:

P.O. Box 1060
Portage la Prairie, Manitoba, Canada R1N 3C5
Telephone: (204) 239-5445
Fax: (204) 239-7124

P.O. Box 1150
Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-5033
Fax: (306) 682-5080