

Automatic Feedrate Control



History

- Research in other countries has shown potential benefits
- Aftermarket systems have been sold in the US, but never gained popularity

HarvestSmart

What is HarvestSmart Feedrate Control?

HarvestSmart adjusts the combine ground speed.

1. Maintains a constant flow of material through the machine.
2. Maximizes productivity.
3. Reduces operator stress.

HarvestSmart will not....

1. Look ahead and see crop changes.
2. Reactive not proactive.
3. 'Adjust' the separator.
4. Perform well when combine is header limited.

HarvestSmart

How does it work?

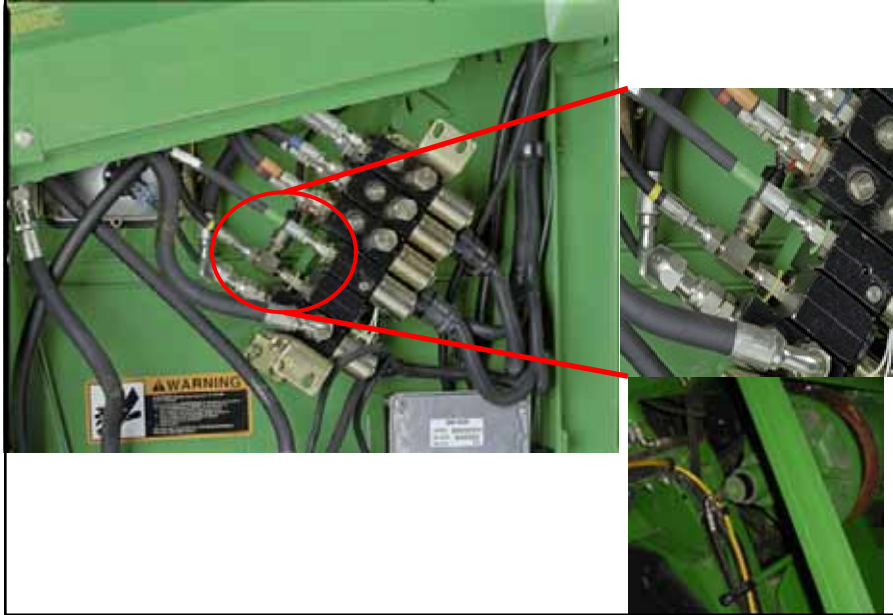
HarvestSmart uses three major inputs to adjust ground speed.

1. Rotor variable drive pressure (rotor load)
2. Engine load.
3. Grain Loss Monitor.

Operates in one of two modes.

1. 'SMART' mode
 - Control based on grain loss and material throughput
2. 'CAPACITY' mode
 - Control based on material throughput

HarvestSmart



HarvestSmart



Drive by Wire



Evaluation Project

- Soft white wheat was harvested on July 27-29, 2004 near Murtaugh, Idaho
- Five experienced operators

Combine

- John Deere 9860 STS combine
- 36 foot wide draper header
- GreenStar yield mapping system
- AutoTrac with SF2 correction

Operating Characteristics

- 130 bu/ac irrigated wheat
- Baling straw
- Straw chopper disconnected
- Low cutting height

Plot Layout

- Three treatments
 - Standard
 - Auto Feedrate
 - Auto Feedrate/Auto Steer
- Four to six passes in each treatment
- At least 1000 feet long

Results

- Based on material flow rate and ground speed
 - Average
 - Variation

Material Flow Rate

Operator	AT/HS	HS	Standard	Average
1	1149.3	1159.9	1117.6	1140.2
2	1074.0	1086.8	1001.2	1052.7
3	1137.6	1084.2	954.5	1048.8
4	1353.2	1330.7	1354.8	1345.8
5	1336.7	1418.2	1345.1	1365.5
Average	1182.7	1192.0	1129.9	1165.3

Speed

Operator	AT/HS	HS	Standard	Average
1	3.0	2.9	2.5	2.7
2	1.7	1.8	1.6	1.7
3	1.9	1.8	1.4	1.7
4	2.8	2.5	2.2	2.4
5	2.5	2.6	2.2	2.4
Average	2.3	2.3	2.0	2.2

Feedrate Variation

Operator	AT/HS	HS	Standard
1	197.7	167.9	139.6
2	179.2	194.0	149.2
3	137.6	210.0	167.0
4	210.8	137.9	156.3
5	225.2	176.0	193.1

Speed Variation

Operator	AT/HS	HS	Standard
1	0.62	0.48	0.35
2	0.29	0.38	0.33
3	0.38	0.40	0.21
4	0.41	0.30	0.20
5	0.46	0.40	0.26

Conclusions

- Automatic feedrate control increased
 - material capacity 5.5% across all operators.
 - Speed by 0.3 mph
- You can take speed and convert to field capacity

Other Observations

- Differences in operator characteristics
- Harsh conditions
- Control Algorithm
- AutoTrac system