

CNH RFID Tagging System for Round Baler

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Problem Statement:

Case New Holland has a tagging system for square balers, and CNH is interested in the design of a RFID tagging system that is capable of placing tags on both net wrapped and twine tied round balers. Information including moisture when harvested, date of harvest, amount of chemicals used on the product during growth, as well as other farming techniques, can be stored on the RFID tag and be readable for up to 1 year and from distances of 2 meters regardless where the tag is on the bale.

Background:

Initial research doesn't show any system on the market that can tag a large round bale. Different companies have produced products for large and small square balers but never a round baler. Square bale tags are generally attached to the twine. Round balers use both twine and net wrap, making this solution problematic. Initial testing of RFID tags showed them to be readable from the opposite side of the bales.



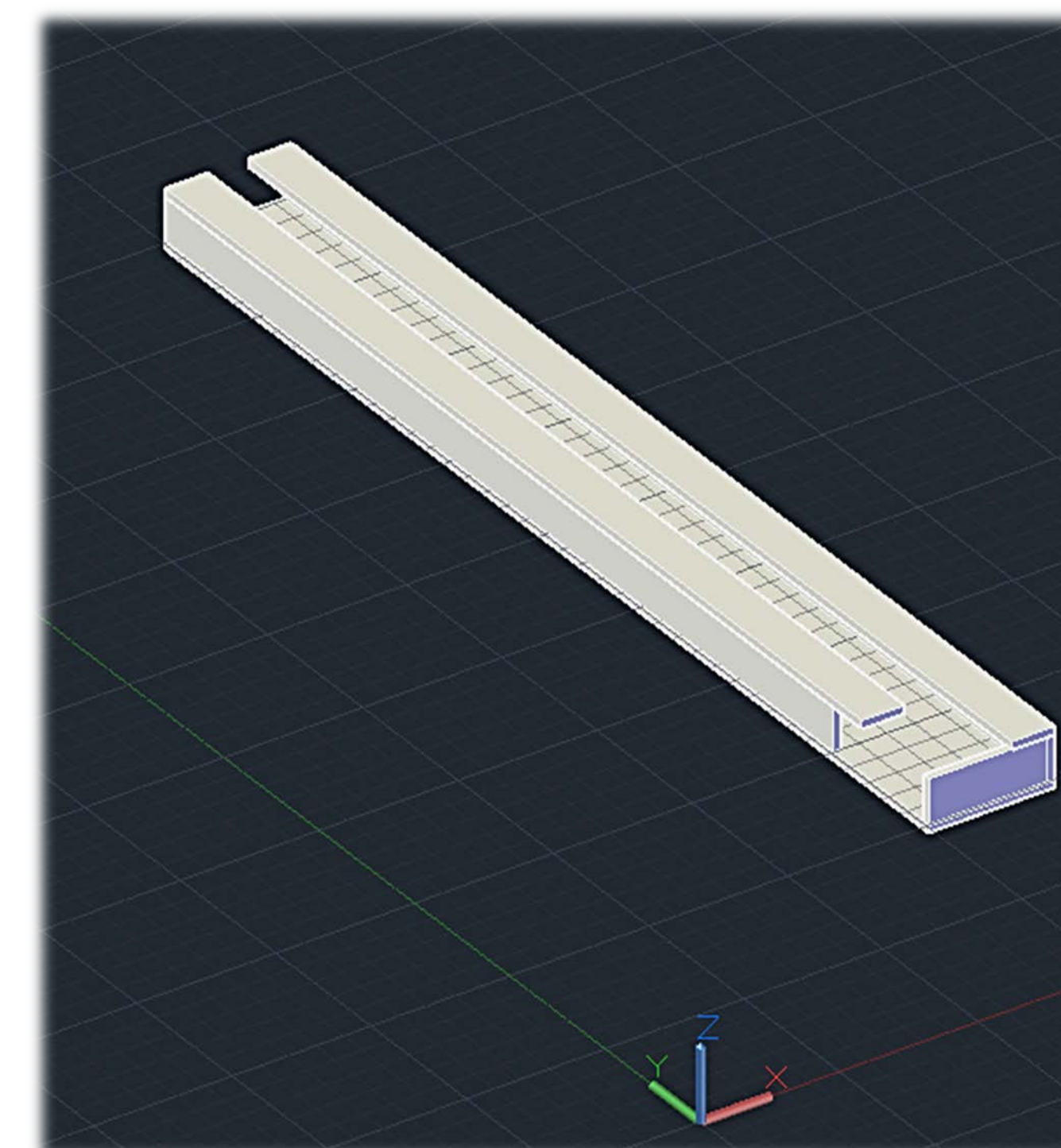
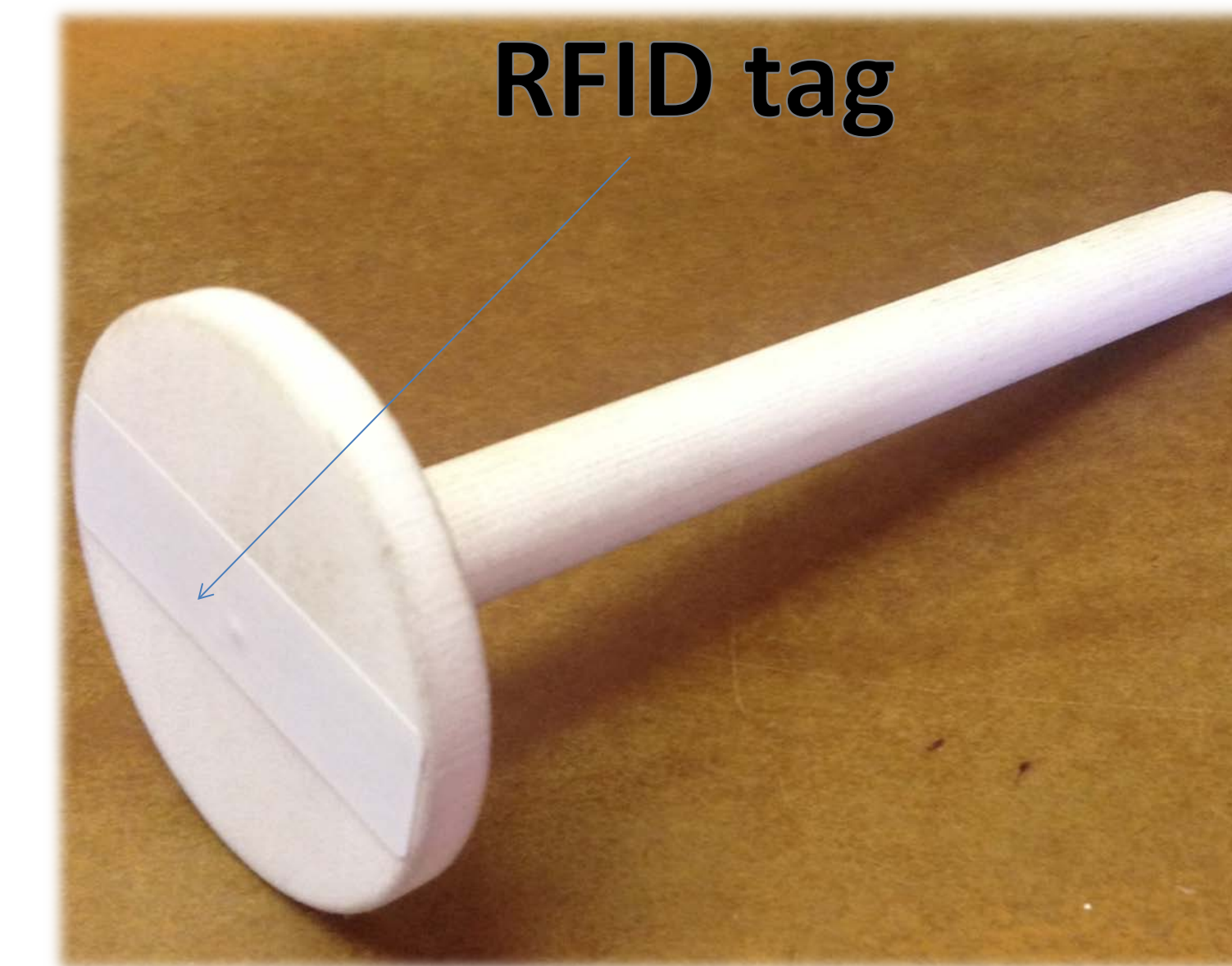
Round Bale

Constraints:

- The direct user requires a procedure to apply the tags to the round bales at the end of the baling process.
- The tags should be securely fastened to a round bale and will be readable for at least 1 year and of a distance of 1-2 meters.
- The tagging system is specially for RFID tags which can be read by the RFID scanners.
- CNH will supply the information and the RFID encoding hardware.

Key Components:

Tag Probe:
The 6 inches probe has a flat 1 inch radius round top, where we can attach the RFID tag. The cylinder part of the probe is 0.5 inch in diameter. Several experiments were made to generate the size of the tag probe. The RFID tag is from Alien Technology of Miamisburg, Ohio. The tag can be read at a distance of 1 to 2 meters.



Holder:
The style of the RFID tag makes this holder design most favorable. It allows the heads to be touching each other, but the other end to be free to move around. The bottom is made so that it will advance one tag into position to be placed into the next bale when working.

Injector:
The hydraulic system has one cylinder powered by tractor hydraulics. We made brackets to mount the cylinder and to make sure the cylinder will not move in any direction.



Alternative Solutions:

1. Place the tag in the wrapping of the bales, but that is exposed to weather and moist conditions that could make the tag unreadable
2. Insert the tag into the very center of the bale but that will be challenging with a variable size baler to find the center
3. Tag both flat sides of the bale. This could be costly and would require more refills of tags per job.

Final Decision:

Our solution is to plug a single tag into the bale on one flat side. The whole system is attached to the baler near the gate of the baler. The power is from the hydraulic system. The injector goes out as the gate opens, and pushes the tag into the bale. The whole system is arranged at the lower side of the baler. The cylinder is driven by the tractor hydraulics. It cycles as the gate opens and will be in initial retracted position before the gate closes. The initial design includes storage for 100 tags/pins on the baler.

Future Impact:

With this design, CHN can install the RFID tags into round bales by adding only a holder and one cylinder. By applying the tagging system, the direct users would be able to record and manage the details for both hay bales and corn stalk bales after harvesting.

Budget:

| Item | Quantity | Cost |
|---------------------------|--------------------|----------------|
| Hydraulic line | 2 | \$80 |
| Hydraulic Cylinder | 1 | \$150 |
| RFID tag | 100 | \$49.9 |
| Probe | 100 | CNH |
| Flat Bar Steel | 20 ft ² | \$34.6 |
| RFID reader | 1 | CNH |
| Total for 100 tags | | \$314.5 |

Sponsor:

Case New Holland: Kevin Richman
Kevin Smith
John Posselius

Instructor:

Technical Mentor: Dr. Dennis Buckmaster
Course Instructors: Dr. Bernie Engel
Dr. Bob Stwalley