Radio frequency identification (RFID) smart corrosion coupon

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Main Objective

This project was awarded to Mary Kay O'Connor Process Safety Center to develop an economic, universal, non-intrusive, continuous, real-time wireless monitoring system to simplify the corrosion inspection process, improve the accuracy and effectiveness of the resources, and enhance the overall safety performance of pipeline systems.

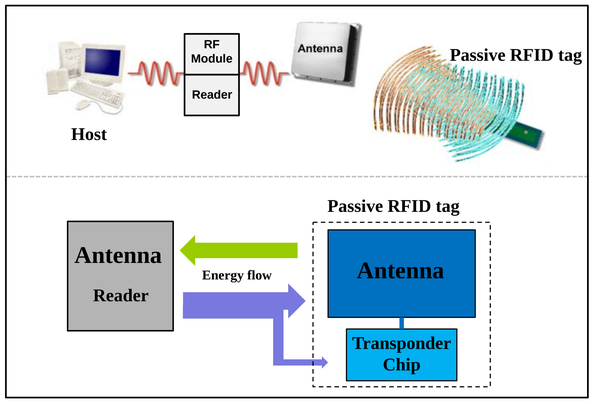

Figure 1. Schematic diagram of the working mechanism of a passive RFID tag

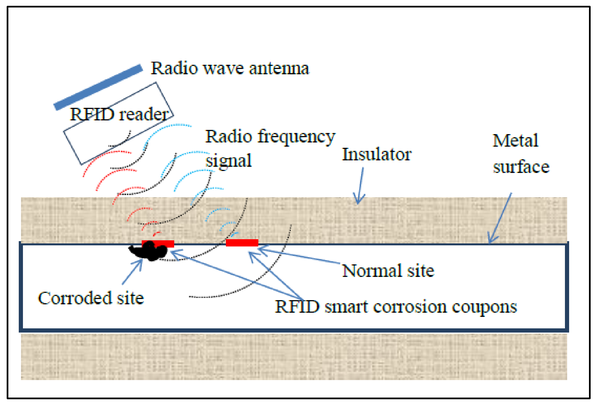

Figure 2. Conceptual representation of using (RFID) corrosion coupon

Project Approach/Scope

- RFID smart corrosion coupon design
- Explore potential applications for areas susceptible to corrosion
- Design laboratory corrosion testing methodology
  - Validation of RFID corrosion coupon
  - Corrosion rate tests
  - Well controlled corrosion process in a corrosion testing chamber

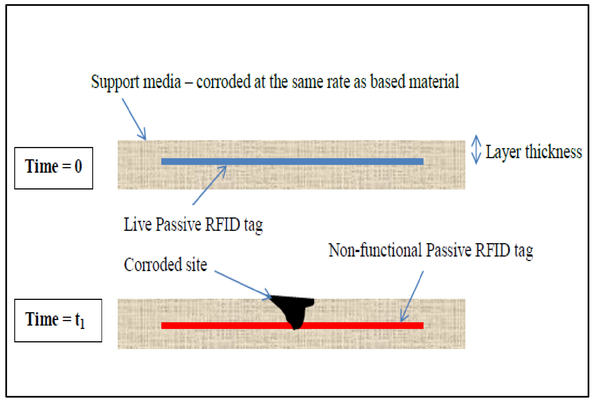

Figure 3. ON-OFF single layer RFID corrosion coupon

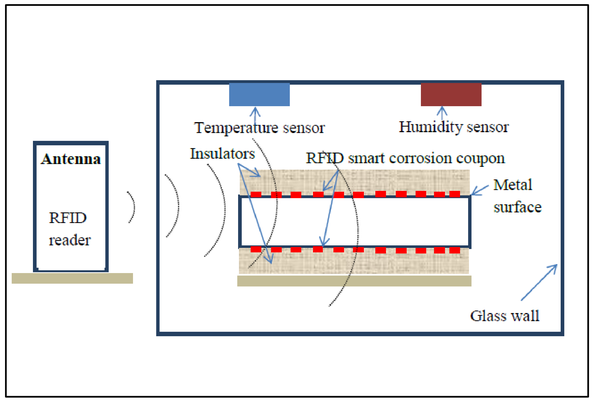

Figure 4. Corrosion testing chamber

Expected Results or Results To-Date

1. Environmental chamber constructed under ASTM B-117 standard
   - Temperature, humidity, salinity control
   - System graphical user interface
2. Preliminary tests
   - Evaluation of environmental chamber
   - RFID tag signal test
3. Validation of corrosion coupon (expected)
   - RFID coupon design
   - Effectiveness of different RFID corrosion coupons
4. Further modification of RFID coupon (expected)
   - Correlate the corrosion rate of the supporting material with that of pipeline material

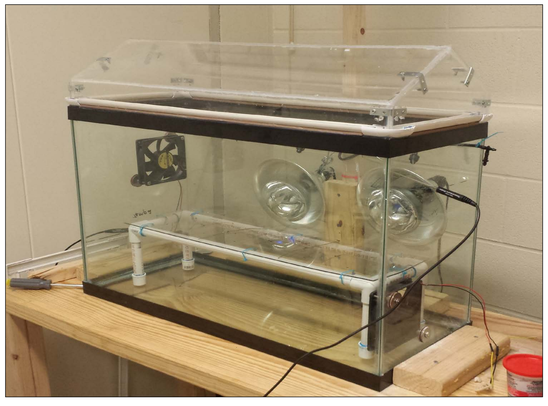

Figure 5. Corrosion testing chamber

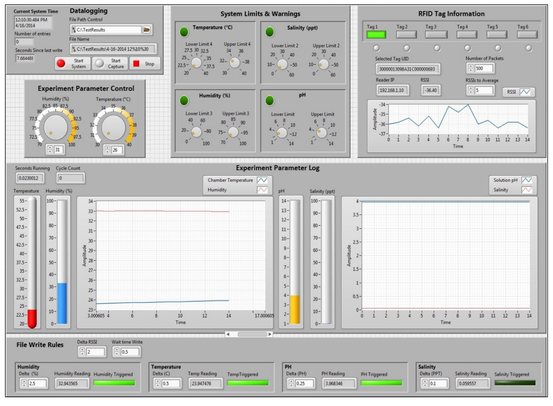

Figure 6. System graphical user interface

Acknowledgments

This project is funded by DOT/PHMSA Competitive Academic Agreement Program.

References

[1]. Fessler, R.R., Pipeline Corrosion, Final Report to U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Integrity Management Program, 2008.

[2]. ASTM International, ASTM B 117 - Salt Spray Testing Standard, 2011.

[3]. Finkenzeller, K., RFID Handbook, Third Edition, 2010, John Wiley & Sons, Ltd. ISBN 978-0-470-69506-7.

Public Project Page

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