Document Design EE 492

Iowa State University

Honeywell FM&T KCP

Acknowledgements

Our group would like to thank those who have helped us so far in formulating our wireless transmission system design. This of course means our advisor and source of knowledge, Dr. Aleksander Doganzic. We would also like to thank the graduate student who has assisted us in enhancing our knowledge of the topic and purchasing of our components: Renliang Gu.

Abstract
The area of Ultrasonic Testing is a very promising advancement in the field of engineering. The focus of our senior design project was to create a system that could wirelessly transmit and receive all the necessary information for the testing of a centrifuge at Honeywell FM&T in Kansas City. This involved learning a great deal about ultrasonic probes as well as wireless signal communications. It also happens to be a great deal of work for us to learn how to successfully take two components that must communicate with each other that weren't purchased together.

Project Overview
Honeywell FM&T is experiencing issues with their current centrifuge system as they have very expensive equipment located inside of a centrifuge that they wish to remove, this has sense been changed. Honeywell has decided that the ability to leave the equipment inside the centrifuge will be okay. They currently have their Sandia National Laboratories working on this, as well as the Kansas City Plant working on it as well. They are looking into the idea of a wired signal acquisition signal but due to noise they have asked us to improve the system using wireless transmitting of the signal. We had planned to correct this system by simulating the data required and then transmitting it wirelessly to a computer system running LabView to interpret and create the necessary excel and graphs for storage. This project overview has sense changed with the addition of an addition component and the adjustment of our system. We are now using the software provided by the systems to communicate with the testing probes and the computer. Our system will also include a MatLab GUI to monitor the signals at all times.

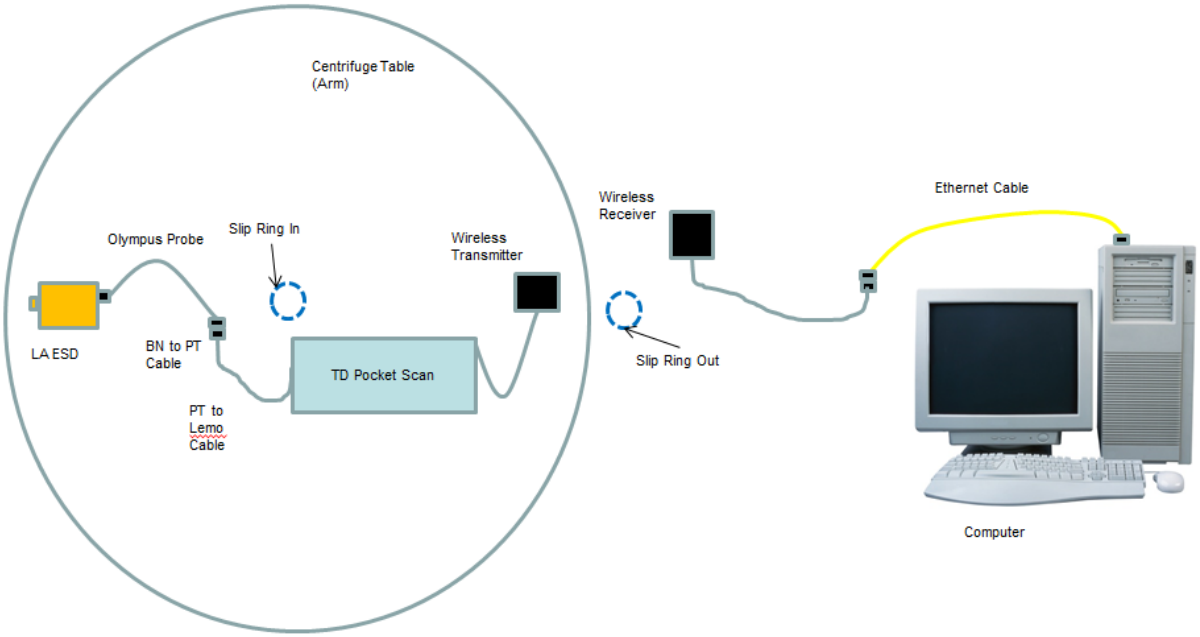
Specifications and Deliverables

Concept Sketch of Design Plan

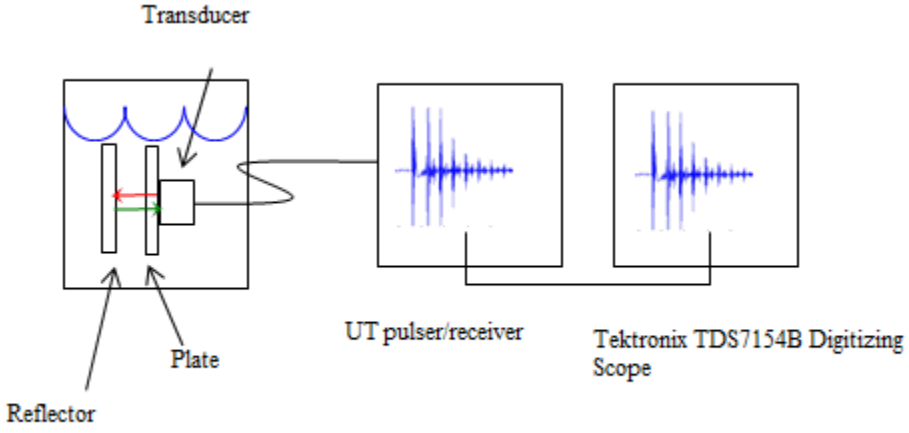
The design of our system is in our mind a relatively simple design as we are simply trying to make it work. Below is a mockup of what our system. The design begins with a computer running AGR Scan 19.0 to control the TD-PS 45 Pocketscan. Our system will then gather the data back to the computer and output the adjusted signal from the TD Pocket Scan. Our system will also allow for the ability to remotely monitor the signal by way of a MatLab GUI.

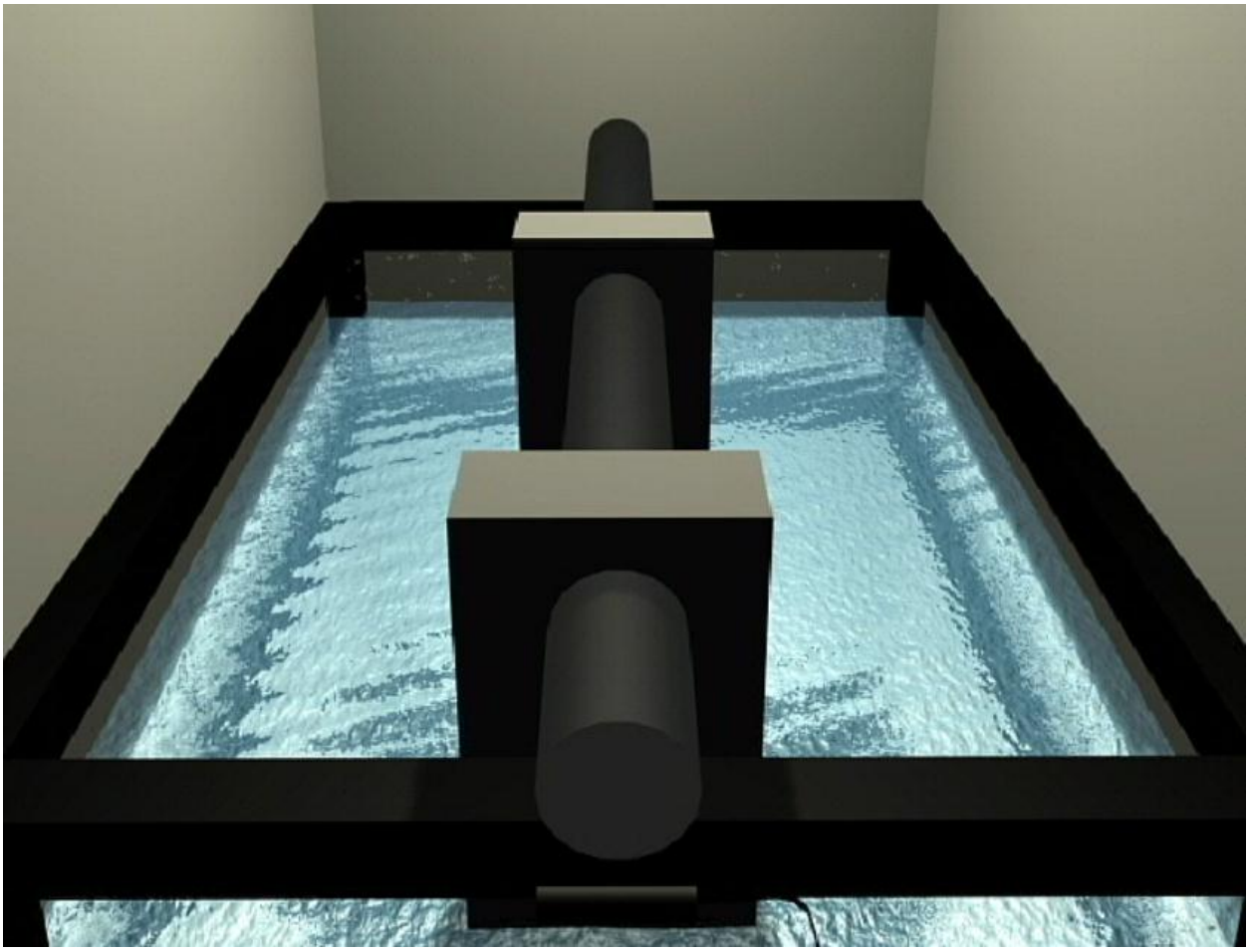
Kansas City Plant
National Security Asset

UT LA Piston Mass Tracking ISU Project Option 2 (New Approach)



The Kansas City Plant is operated and managed by Honeywell Federal Manufacturing & Technologies, LLC, for the NNSA.
National Nuclear Security Administration





Operating Environment

The goal of our project is using ultrasonic probe to test the moving mass during a centrifuge test. The centrifuge is a closed system and normal signals can be brought out through brushes. The probe can read through a 0.125 inch 304 stainless steel end cap and monitor the movement of a slug in the testing cylinder.

The operating environment of this project is in a closed cylinder where it is doing the centrifuge test. It will provide the analog sign of the slug during its rotating which is from 0 to 120rpm. This project will be simulated and tested using the above concept design.

Functional Requirements

In our projects we have some functional requirements. The first functional requirement is the probe. The probe our client used is Olympus probe XMS-310-B which is cost $813, and we can borrow the similar probe from center of Nondestructive Evaluation at Applied Sciences. These probes have been provided by Honeywell FM&T. The second functional requirement is the TD pocket scan. The cost of the TD pocket scan is $30,000 and our client wants us to keep it inside of the centrifuge. The third requirement is the

wireless. They want us to use wireless to transmit the signal by to the computers, which will be accomplished using WiFi.

Non-functional requirements

Our project has several non-functional requirements.

- Data rate of the wireless.

  We are looking for the Wi-Fi that can reach 300Mb/s, but it is too expensive. Then we try to get 2 or 3 Wi-Fi paralleled to transmit and receive data from the TD pocket scan.

- Listening to the Signal

  Our goal of our Matlab GUI is to listen to the signal wirelessly so that we can have constant monitoring of the signal with output of the signal in a graphical format.

Measurements

To test and verify the designs that we have proposed, there are several measurements we will use.

1. The Wi-Fi match test - to make sure that the Wi-Fi can respond to each other and reach the data rate which we are looking for.
2. Example data transmit and receive test – to make sure that ADC, MCU and Wi-Fi can connect and work well.

Resources

Material

Materials will be needed to construct a mechanism which we can use to simulate the setup Honeywell is testing. Aluminum or steel will need to be purchased to machine the device we are measuring with the probe and a hand cranked "centrifuge" to produce useful data.

Equipment

Honeywell FM&T will be providing us with the ultrasonic testing probes and the scanning system.

Software

TD Pocketscan's AGR 19.0, MatLab, the pcup c libraries to simulate signal reading, and the c programming language.

Project Schedule

Work Breakdown

These are the tasks that need to be accomplished in the following two semesters to complete the project successfully.

1) Research – Begin Understanding the System and How to Simulate it
2) Design of Project Website

3) Visit Honeywell Plant in Kansas City to Better Understand
4) Meet with CNDE to Discuss System Design and Probe Use
5) Design of System
6) Search and Purchase the Necessary WiFi
7) Connect the System for Wireless Testing Use
8) Append the Listening Feature of our System to our Testing set up
9) Testing the System and Programming Controllers
10) Repeated Design, Fabrication, and Testing for Creation of Optimal System
11) Statistical Analysis of Results to Verify our Design for Process Variations with Multiple Simulations of Probe

Summary

The project is to improve the current centrifuge testing system at Honeywell FM&T in Kansas City. The system must be created and simulated effectively to the liking and specifications of Honeywell. It should be a very interesting project to complete. We all continue to look forward to working with them as this is an excellent project for students in Electrical and Computer engineering to work with.