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Efficient Compressor Testing on Railways with A Mobile Application

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Abstract

The aim of the project is to develop an android application for the railways to maintain the daily process of taking readings of the air compressor and details of the air compressors. The number of smartphone users and mobile applications are growing rapidly. So, it is convenient and easy to develop the android application for taking the readings of the air compressors and the details of the air compressors in the mobile phones. This project is used to record its day-to-day readings in an efficient manner. This application fetches the details and readings of the air compressors and send a mail to the higher officials. This project helps to maintain all activities of the air compressors and also records its day-to-day readings. This project helps to reduce the manual work. This proposed app has been developed with an intention to make the user-friendly thus reducing the manual work. The system has been developed with advanced features. The objective of our project is to establish mobile application to maintain all the details of the air compressors.

Keywords: Mobile Application, Air Compressors, Railways, SKID.

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Introduction

The aim of the project is to develop an android application for railways and maintain for their daily process of air compressor details. The number of smart phone users and mobile applications are growing rapidly [1]. Mobile Phones are the part and partial of life now so that Project proposes develop mobile based application to take railway air compressor details, which deals with the SKID1 Compressor Information details, SKID 1 compressor testing information for every 30 min interval (Count of 4times) details, SKID 1 final reading details and SKID 1 calculated value details in mobile phone [2]. This project is used to record its day-to-day compressor reading details with efficient manner.

This application finds the compressor information and readings and sends E-mail to customer regarding compressor information [3]. This project helps to maintain all the activities of the railway compressor readings. This project is used to record its day-to-day compressor reading details. This project reduces the manual work [4].

This proposed app has been developed with an intention to make the user-friendly thus reducing the manual work [5]. The system has been developed with advanced features. The objective of our project is to establish mobile application to maintain all the details of Mobile App.

Literature Review

Eras et al [6] a fresh method based on a six-step local energy benchmarking methodology for evaluating the energy efficiency of compressed air systems. An energy management procedure is part of the approach to track and regulate electricity usage and maintain compressed air systems' energy performance over time. In order to compute energy performance indicators, energy baselines, and CUSUM charts, the process tracks the production and consumption of compressed at the plant and manufacturing section levels based on the real-time monitoring of pertinent data. In an example study, keeping an eye on compressed air consumption at the section level decreased demand by 11 to 47%. At the plant level, the amount of electricity used to manufacture compressed air decreased by an estimated 23%.

Arya et al [7] The pipeline network is essential to the transportation of gas and oil because of its low cost and safe operation. However, there is a substantial financial investment required for the building and upkeep of pipeline networks. Optimization has gained popularity in the oil and gas sector because it can lower pipeline expenses. In the pipeline industry, there are several optimization challenges at every level, from design to operation. Prior until now, the majority of studies have concentrated on developing effective algorithmic modifications to enhance particular aspects of search capabilities. Nevertheless, review articles—which are crucial for engineering solution providers—have not been published in large quantities. We propose an approach utilized to optimize pipeline operations in an effort to fill this gap in the paper. or higher profitability of the pipeline.

Kim et al [8] Ammonia's long-distance, end-to-end value chain was examined as an energy carrier. Energy losses are inevitable during the entire process of producing, storing, transporting, and using energy carriers. The overall energy efficiency of the value chain can be improved by merging the more efficient sub-process. It was assumed in this study that renewable ammonia from an offshore environment might be transported over vast distances. Both a thorough examination of the entire value chain and a detailed analysis of each subprocess were completed. Comparative investigation revealed that the energy last transferred could vary depending on the state of ammonia synthesis, the kind of transport ship, and seawater cooling in the value chain.

de Castro-Cros et al [9] research, the performance of an IGT following significant maintenance was examined using two different autoencoder variants. Multiple sensors spaced along the compressor were employed to take measurements, and the data used to analyze IGT conditions were environmental factors. After major maintenance, the industrial gas turbine compressor's condition assessment showed that there had been significant changes in its operation point. This suggests that the internal operating models needed to be updated to reflect the new operational mode and that autoencoder-based models were useful for feature extraction. The results demonstrated how this autoencoder approach can aid in defining an indicator of the compressor behavior in long-term performance, even though processing performance was not affected.

Gerald Liu and Munnannur [10] to act as a thorough reference for diesel engine development and design. It discusses the mechanisms of combustion and gas exchange, making significant allusions to fuel consumption and emissions. It also describes the design of different engine components, coolant and lubrication systems, and emission control and optimization strategies. The future of heavy-duty diesel engines, emission and combustion

control, noise and vibration control, and turbocharging and supercharging are a few of the subjects covered. Scholars and experts in this field will find this volume interesting.

Proposed Methodology

Rail App is the android app developed to store the readings of the air compressor using the MIT App inventor which helps to organize, automate and store the datas in the tinydb. The implementation of the android app helps the railway employees to enter the readings effectively. It also helps in the calculation and mail the readings and details of the air compressor to the higher officials through the automation process. The main motive of this android app is to provide a easy way to take readings and it is a effective way to fetch the readings in the database.

This app reduces the manual work of testing engineer to take the reading of the compressor readings as hand written. The readings may change when the tester handover the hand written reports to higher officials, thus this application helps to avoid the changes in the readings while we save the readings in the database.

Background Study

The present system is manual system like people physically test the air compressors and enter the details and readings of the air compressor in paper. The details in paper may damage after a long period and cannot be retrieved. And mainly employee may face difficulty about the time consumption for the work done by person for entering the details one by one. Everything is done manually so it is difficult for employee to maintain all the records manually and could not able to retrieve the information for later use.

Disadvantages

- Time consuming.
- The major drawback is not secured.
- There is possibility of missing of the readings**.**
- Repetitive tasks to take the readings.
- Process delay.
- Miscommunication.
- Duplication of the data readings.
- Requires high cost.

Proposed System

RAIL APP project make easy for employee to fill the details and more secured in maintain the report by making the paper work as digitalization. Those details can be retrieved easily whenever needed. Instead of entering all the details manually, we can use the mobile application to make the reports and it make easier for employee. By using this project less time consumption and there will be no wastage of more reports.

RAIL APP helps the tester to take readings through mobile phone. For that we developed SKID1 (test1, test2, test3, test4, final test and calculation page) with a help of MIT App Inventor. It takes the readings of compressor and store it in a database for future use. To calculate the readings, it fetches the readings from a database and the calculated readings are automatically send to the power BI team to automate the mail to the higher officials.

Advantages

- The mobile app is more user friendly.
- The system works with high speed and accuracy.
- It handles bulk amount of data.
- Cost effective platform.
- Quick and easy to develop the android application.
- Faster deployment.
- Target multiple platforms.
- Versatility and Scalability.
- Enhanced security.
- Customization.
- Retrieval of data is possible.

Modules

- SKID 1 Compressor Information
- TEST 1 process
- TEST 2 process
- TEST 3 process
- TEST 4 process
- Final test process
- Calculation process.

Skid 1 Compressor Information

This module helps users to take readings easily in this application. SKID 1 compressor information fields are mandatory since it is required for them to view compressor information. In the compressor information form, the user has to fill the compressor information such as select date, FAB NO, MOTOR SERIAL NO, MOTOR MAKE and SAVE. All the details are stored in the tiny DB.

Test 1 Process

This module is fully based on testing the readings. In the test1 process fields are parameters, ranges and actuals. In the parameters column fields are Ambient temp, motor casing, crankcase, pipe to intercooler, pipe from intercooler, pipe to aftercooler, pipe from aftercooler, delivery air, air leak. In the ranges column fields actualtemp,40+amb(max),84*max(max),118+amb(max),50+amb(max),140+amb(max) 23+amb(max),20+amb(max), No leak and save.

Test 2 Process

This module is fully based on testing the readings. In the test1 process fields are parameters, ranges and actuals. In the parameters column fields are Ambient temp, motor casing, crankcase, pipe to intercooler, pipe from intercooler, pipe to aftercooler, pipe from aftercooler, delivery air, air leak. In therangescolumnfields. actualtemp,40+amb(max),84*max(max),118+amb(max),50+amb(max),140+amb(max)23+amb(max),20+amb(max), No leak and save.

Test 3 Process

This module is fully based on testing the readings. In the test1 process fields are parameters, ranges and actuals. In the parameters column fields are Ambient temp, motor casing, crankcase, pipe to intercooler, pipe from intercooler, pipe to aftercooler, pipe from aftercooler, delivery air, air leak. In the ranges column fields actualtemp,40+amb(max),84*max(max),118+amb(max),50+amb(max),140+amb(max)23+amb(max),20+amb(max), No leak and save.

Test 4 Process

This module is fully based on testing the readings. In the test1 process fields are parameters, ranges and actuals. In the parameters column fields are Ambient temp, motor casing, crankcase, pipe to intercooler, pipe from intercooler, pipe to aftercooler, pipe from aftercooler, delivery air, air leak. In the ranges column fields actualtemp,40+amb(max),84*max(max),118+amb(max),50+amb(max),140+amb(max)23+amb(max),20+amb(max)

Final Test Process

In the final process fields are barometric pressure, ambient dry bulb temperature, ambient wet bulb temperature, air inlet temperature, nozzle inlet pressure, nozzle exit pressure, temperature before nozzle, compressor shaft speed, voltage, load current, actual,980+4% (941 to 1019),415+10% (375.5 to 456.5) and 33 (max) and SAVE.

Calculation Process

In the calculation process fields are power input to motor Kw, free air delivery. lpm, volumetric efficiency, %, shaft power, kw, specific power consumption, pressure ratio(o2m.o1m), actual, 1745 lpm, mom.70,0.1433 and Send MAIL.

System Configuration

Software Details

MIT App Inventor is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology**.** It allows newcomers to computer programming to

create application software (apps) for two operating systems : Android, and iOS, which, as of 8 July 2019, is in final beta testing. It is free and open- source software released under dual licensing: a Creative Commons Attribution Share A like 3.0 Unported license, and an Apache License 2.0 for the source code. App Inventor also supports the use of cloud data via its Cloud DB component and written in Java, Swift, Objective- C, Kawa, Scheme, Javascript. It uses a graphical user interface (GUI) very similar to the programming languages Scratch (programming language) and the Star Logo, which allows users to drag and drop visual objects to create an application that can run on Android devices, while an App-Inventor Companion (the program that allows the app to run and debug on) that works on iOS running devices are still under development. In creating App Inventor, Google drew upon significant prior research in educational computing, and work done within Google on online development environments.

Computer and Operating System Requirements

- Macintosh (with Intel processor): Mac OS X 10.10+
- Macintosh (with Apple Silicon): macOS 12+
- Windows: Windows 7+
- GNU/Linux: Ubuntu 8+, Debian 5+

Browser Requirements

- Mozilla Firefox 54 or higher
- Apple Safari 11 or higher
- Google Chrome 55 or higher. App Inventor does not support Microsoft Internet Explorer. Windows users should use Chrome or Firefox.

Result and Discussion

The input design of the system was developed using the MIT App Inventor tool.It is an open-source app-building platform that allows users to drag-and-drop visual objects to create an application that can run on the Android system as a means of democratizing mobile app development.

It serves a specific purpose effectively such as storing, recording, and retrieving the information. The section ensures a proper completion of Input to the System with accuracy. It is easy to fill and straightforward. It focuses on the user's attention, consistency, and simplicity. The Input section has been discussed below module wise to understand the system development and design in detail in Fig 1.

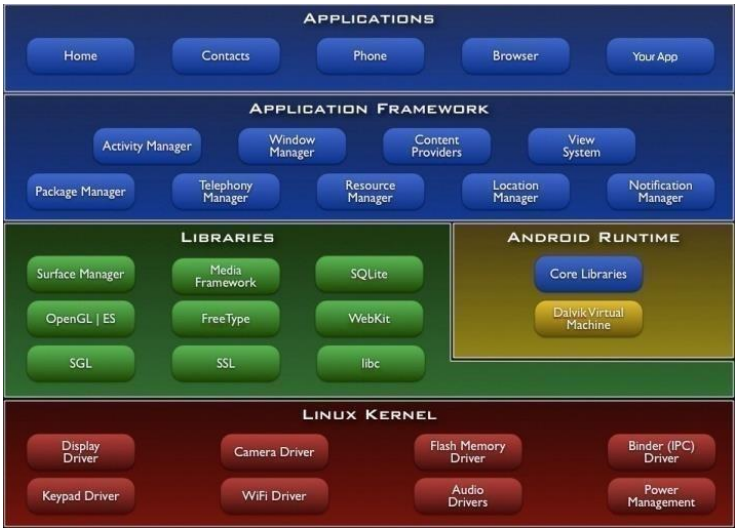


Fig. 1: Android Architecture Design

Input Design



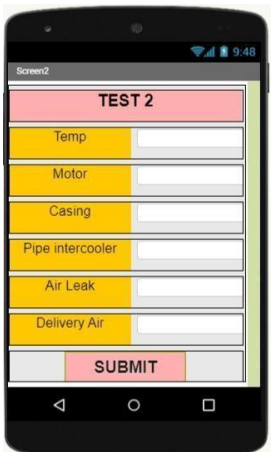
Fig. 2: Compressor Details Screen

Fig 2 represents the compressor details screen fetches the details of the air compressors and it is the login page.

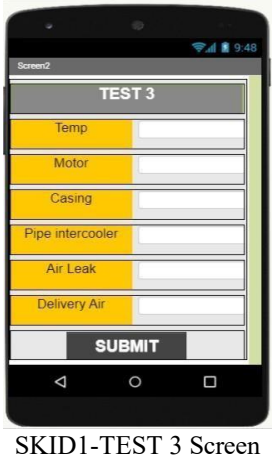
- Compressor name
- Date
- Compressor ID



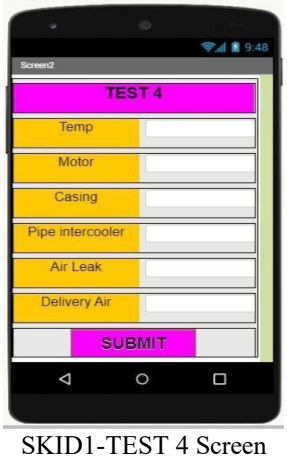
SKID1 -TEST1 screen



SKID1-TEST 2 Screen



SKID1-TEST 3 Screen



SKID1-TEST 4 Screen

Fig. 3: Skid Test For (1,2,3,4)

Fig 3 illustrates the results of SKID1-TEST1, TEST2, TEST3, TEST4 Screen fetches the readings from the air compressors and store it in the tiny dB database.

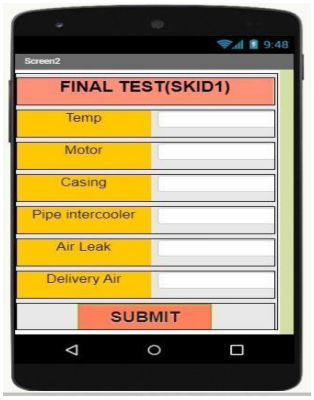


Fig. 4: Skid1-Final Test Screen

Fig 4 shows the SKID1-FINAL TEST Screen fetches the final readings of the air compressors and store it in the database.

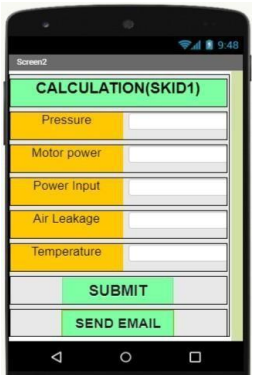


Fig. 5: Skid1-Calculation Screen

Fig 5 represents the SKID1-CALCULATION Screen helps to take the readings using the calculations and sends the email to the higher officials using the Automation process.

Output Design

Fig 6 & Fig7 describes the output design section deals with the serving in providing the most detailed view of the processed data and provides all the readings of the air compressor and automate the process of sending email to the higher officials.

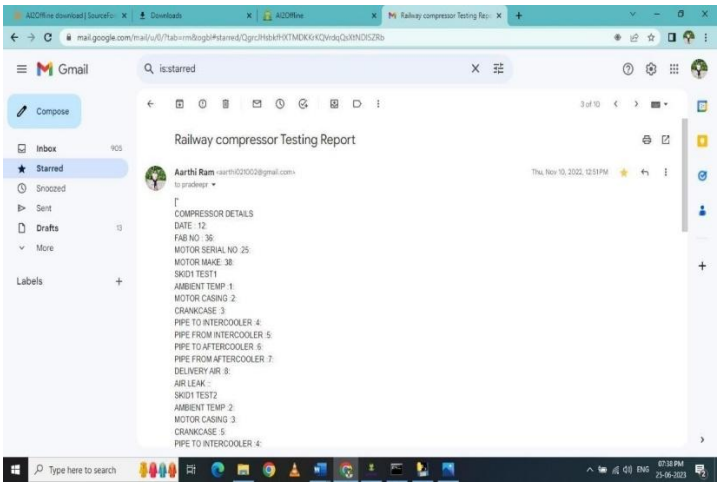


Fig. 6: The Email Section of the Rail Compressor Testing Report

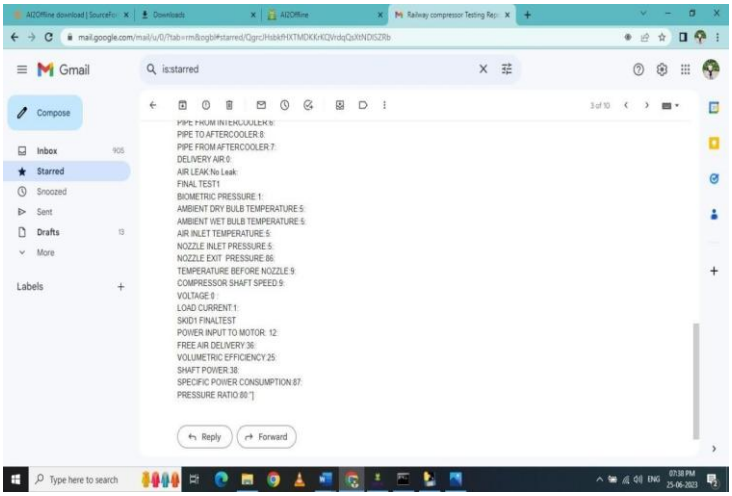


Fig. 7: The Email Section of the Rail App Automation Process

Conclusion

This android mobile app is for railway compressor details. This application reduces the manual work by taking readings and stored in database. Thus, the confusion in taking readings would be decrease. This railway compressor app successfully created for skid 1 and the errors were properly debugged. This application helps the tester to test the compressor in an efficient way. The calculation page will fetch the final test calculation and automatically send mail to the power BI team. Further enhancement can be made to the project, so that the app function is very attractive and useful manner than the present one.

Reference

Ramadhan, H., Wong, H., Milhim, A.B., & Sadjadi, H. (2023). Accelerated Degradation Test on Electric Scroll Compressor Using Controlled Continuous Liquid Slugging. In *Annual Conference of the PHM Society*, *15*(1), 1-6.

Lee, D., & Tsai, F.P. (2020). Air conditioning energy saving from cloud-based artificial intelligence: Case study of a split-type air conditioner. *Energies*, *13*(8), 1-25.

Singh, P. K., & Sarkar, P. (2023). An artificial neural network tool to support the decision making of designers for environmentally conscious product development. *Expert Systems with Applications, 212*, 118679.

Veloso, B., Ribeiro, R. P., Gama, J., & Pereira, P. M. (2022). The MetroPT dataset for predictive maintenance. *Scientific Data, 9(1),* 764.

Wang, H., Bi, H., Zhou, Y., & Li, C. (2020). Field measurements and numerical analysis of the energy consumption of urban rail vehicle air-conditioning systems. *Applied thermal engineering, 177*, 115497.

Eras, J. J. C., Gutiérrez, A. S., Santos, V. S., & Ulloa, M. J. C. (2020). Energy management of compressed air systems. Assessing the production and use of compressed air in industry. *Energy, 213,* 118662.

Arya, A.K., Jain, R., Yadav, S., Bisht, S., & Gautam, S. (2022). Recent trends in gas pipeline optimization. *Materials Today: Proceedings*, *57*, 1455-1461.

Kim, J., Huh, C., & Seo, Y. (2022). End-to-end value chain analysis of isolated renewable energy using hydrogen and ammonia energy carrier. *Energy Conversion and Management, 254*, 115247.

de Castro-Cros, M., Velasco, M., & Angulo, C. (2023). Analysis of gas turbine compressor performance after a major maintenance operation using an autoencoder architecture. *Sensors, 23(3),* 1236.

Gerald Liu, Z., & Munnannur, A. (2020). Future Diesel Engines. *Design and Development of Heavy-Duty Diesel Engines: A Handbook*, 887-914.