

Proposed Life Cycle Model for Implementing The RFID Technology In a Factory

Dr. Deepali Sawai

ABSTRACT

RFID stands for Radio Frequency Identification (RFID) which is an automatic identification technology to read the data from the tag which is attached to some object. Mechanical Engineering is one of the fields where it can be used widely and we can see various benefits coming out. In any production unit, there are many departments which are interacting with each other to manufacture the final product. From getting the order from the customer to its delivery RFID technology can be used to increase the co-ordination between the departments, improving decision making thus managing the time effectively.

There are many issues which need to be taken care of for implementing the technology like transponder & antenna together called reader. There are various kinds of readers, and tags. The cost of implementation mainly depends on these two. Its use depends on the application under consideration. If this selection along with location, environment is not considered properly, the implementation becomes unsuccessful.

This paper proposes a model for implementing the technology, phase wise in the production process of a manufacturing Industry.

Keywords: *RFID Technology, RFID Reader, RFID Encoder*

I. INTRODUCTION

RFID stands for radio frequency identification. Using RFID the digital data which is encoded in RFID tag is captured by a RFID reader using radio waves. The important characteristics of an RFID system is it does not require a line of sight to read its stored data. RFID lets you automatically collect product, place, time or transaction data without human intervention or

error. RFID can be used on any physical item with unique information in an embedded chip. The chip sends out an identification signal allowing it to communicate with reader devices and other products embedded with similar chips. The tag with RFID has a very small radio transmitter that is inactive until it receives a radio signal. When it does, it broadcasts one piece of information records it in a database and use it to identify and track every item. For implementation purpose, five things need to be taken care of, which are as follows:

1.2 Tags

There are many kind of tags with various characteristics. Tags can be read-only, read-write or a combination. Data transmission speed and range depends on the frequency used for the tags. There are common types of passive tags - Low Frequency (LF), High Frequency (HF) and Ultra High Frequency (UHF) RFID systems. In active systems, batteries typically are used to boost the effective operation range of the tag.

1.2 Data encryption

Usage of encryption algorithms to ensure security and integrity of the data passing between the tag and reader.

1.3 Readers and Decoders

Readers consist of transceiver and various shapes of antennas. The readers may be integrated into handheld terminals or they may be fixed and positioned at strategic points as per the application need. Readers may include one or more antennas for sending and receiving signals to and from tags and a processor for decoding the received signals and data.

1.4. Data transmission type

1. Director (Tech)
ATSS's Institute of Industrial and Computer Management
and Research (IICMR)

One of the issue for consideration is about the transmission of the collected data to the host computer whether it should be through normal interfaces cables or wireless.

1.5. Smart label Printers/Encoders

These are like traditional printers but they also have RFID encoders and readers embedded inside. Before the label is printed the RFID data is encoded on the tag, data for encoding is selected by application design and automatically managed by system software. After encoding the tag is read to confirm data accuracy. The label is then fed forward for printing.

II. NEED OF STUDY

If we think of RFID applications only imagination is the limit for its use. In the age of Internet of Things (IoT), RFID can be used at hotels, hospitals, retail stores, for asset Management, libraries , Schools, Colleges, embedded in important documents. One can see benefits coming out through increased productivity, security.

2.1 Survey of work done

RFID Technology in India
 In India, at present RFID technology is mainly used in super markets or molls, in colleges for students identification or in libraries, in vehicle parking in large companies, asset tracking , in automating supply chain in production unit or in animal tagging . This is very limited use as compared to it’s use in foreign countries, but it’s likely to grow in future since the prices of the products are coming down very fast.

2.2 RFID Technology and the future

What will be the future look like when the refrigerator or medicine cabinet keeps track of its contents; items “reporting” when they are stolen, Police scan the contents of a vehicle without needing to open it , Governments embedding RFID tags in the fibers of paper currency to allow money to carry its own history by recording information about where it has been. RFID technology in supermarkets will allow consumers to walk into a store, select

products whose packages are embedded with small RFID codes, and exit the store without ever going through a checkout line or signing their name on a dotted line.

In similar way in any production unit the technology can be used effectively to do the work efficiently. To implement this technology there are many points which need to be taken care of, else the implementation is not successful.

III. SUGGESTED MODEL

The paper talks about the implementation life cycle in any production unit. This paper suggests a model which will give all the details about the selection of tags, reader and other implementation details related to computers and network in step wise manner, what need to be considered at each stage while implementing.

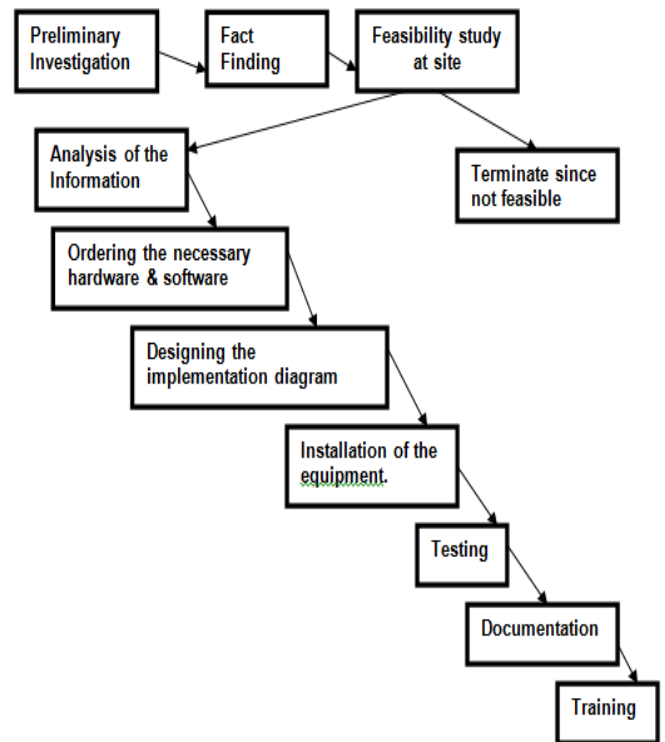


Fig 1. : Phases in the Life cycle model for implementing the RFID Technology

3.1. Preliminary Investigation

The very first stage would be Preliminary Investigation to check whether the

implementation is feasible in all respects – i.e. Economical, Technical and Social etc.

Technical: There are many factors where it becomes difficult to implement the RFID technology, where there are other electromagnetic fields in nearby area. Since RFID works on radio waves the field like that of mobile phone tower may interfere with each other and may not give the required results. So this feasibility has to be checked in the initial stage itself.

Social: There are many types of tags. The tags with memory can be used to store the information about the item or person, when it is used for the closed circle where the information is needed, there is no issue, but if any reader starts reading and sending the tagged information to the computer to process it surely would be objectionable. There is very less usage of the RFID technology in India till date, but in the IoT era, soon a time would come when there would be readers everywhere reading the information written in the tag, in these cases the privacy issue has to be taken care of. This problem can be solved by having some kind of encryption or encoding (and then decryption or decoding) technique.

Economical: The cost of the tags, readers and the software and the encryption – decryption mechanism which would be needed is very important to consider when we talk about the economic feasibility. The cost benefit analysis has to be done while checking the economical or financial feasibility of the implementation.

The feasibility study can be done with various fact finding techniques like interviews, circulating the questionnaire, doing the survey of the site of the factory under consideration. Preparing questions for questionnaire is therefore should be considered as the first step while going for the implementation.

Questionnaire: The questionnaire can be open-ended (descriptive) or closed ended (yes/ no type or with options), but closed ended would be preferred which would give the exact answer of the question under consideration in less time. The questions formed for various stakeholders would be different and so is the language used, for workers, the questionnaire may be designed in their local language or mother tongue if

possible to get the correct answers from the stakeholders like workers, guards of the factory.

Interviews: Interviewing various stakeholders of the factory like workers, supervisors, managers / in-charge of various departments like Inventory/ stock, purchase, production, sales is necessary even if questionnaire is given because many times interviewer may need to explain or modify the question as if not getting the proper answer. The type of the interview can be open-ended or closed ended but closed ended would be preferred to get the exact answer. The interviews generally be used where the stakeholders may not understand the language of the questionnaire like in case of workers or guards or watchmen, who may not able to read or understand the meaning. But it also should be used for other stakeholders who are generally the decision makers.

Campus Survey for Implementation details: The complete study of the factory and all its departments along with the surrounding environment is must for the successful implementation. It has to be checked whether any kind of electromagnetic field is active in the nearby area which may cross interfere the RFID signals. Also whether the items which need to be tagged would be kept inside a covered area or outside, whether the tags would come in contact with heat, water, oil, any chemical or any liquid need to be checked.

3.2. Analysis of the Information.

This phase starts once the preliminary investigation is complete and its proved that the project is feasible for implementation else it should be abandoned. The analysis of the information would suggest data transmission speed and range required based on which type of tag to be used- active / passive, read only, write (with or without memory) LF, HF or UHF , type of reader – fixed or movable – handheld, the shape and size of antenna would be decided. Server which would operate in conjunction with required number of RFID reading devices and wired or wireless network devices also would be finalized.

3.3 Ordering the necessary hardware & software

Once the analysis is over, the hardware and software vendors would be invited to submit proposals for RFID systems to get the latest equipment available and associated cost estimates. The software can be tailor-made as per the factory requirement or can be readymade. After taking a trial of the software and hardware, on sight, the vendors and the products may be finalized and the order could be frozen.

3.4 Designing the implementation diagram

As per the analysis and the purchased equipment a diagram should be made which would give the details about the position of various readers', positions of computers and the server where the software is installed in the computer network and showing the flow of information of the tags through the network once it is detected.

3.5 Installation of the equipment

The computer network has to be designed and installed as per the implementation diagram. Once the tags and readers are purchased the fixed readers at the key positions are installed as per the implementation diagram. The items are tagged with proper type of tags as per the analysis.

3.6 Testing

Once implementation is done, the testing phase starts. The hardware equipment and software should be checked in synchronization.

3.7 Documentation

Documentation of the whole process should be made and should be kept available for all the stakeholders as and when required.

3.8 Training

Training of the whole implementation need to be given to all stakeholders along with the vendors if the material they provide need to be tagged in any case. The coding used in the software, the handling of the hardware equipment should be demonstrated.

3.9 Maintenance

Maintenance cannot be truly considered as a phase because it can be anytime throughout the life. Since hardware equipment is used, as new tags or readers with more features come into market, seeing the cost benefit analysis, they can be used in the system, If the old equipment is giving trouble in reading the tags, it may need to be checked. The computer network also needs to be maintained.

IV. CONCLUSION

RFID is a technology which can create wonders in any Factory if used and implemented correctly. It can be used in almost every department. In Purchase, QA department, to tag the material, Manufacturing department to understand the status of the product, it would be very easy to know the inventory position just by click of a button HR department to give Unique Id to every employee, In Office, for tagging the important documents, files, in Security department to tag every visitor and locate where he is moving in the factory. If all the phases of the proposed model are followed correctly by installing correct type of reader in correct key locations, using proper RFID tags,. It would be easier to make the whole business intelligent. In the couple of years from now, Internet of Things (IoT) is going to be a part of our everyday life. So getting ready by implementing the RFID technology is surely would benefit the Industries in future.

REFERENCES

- [1] RFID online Journal
- [2] Infrastructure support for RFID systems – Christian Floerkemeier
- [3] MoreRFiD – Digital Magazine
- [4] RFID4U Digital Magazine
- [5] CompTIA RFID+ Study guide by Patrick J. Sweeney
- [6] Software Engineering Practitioner's Approach by Roger Pressman