Instant Fuel Payment - An Application of RFID

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Abstract: **This paper focuses on an electronic fuel payment at petrol pump using radio frequency identification (RFID) technology. The proposed RFID system uses tags that are mounted on the windshields of vehicles, through which info embedded on the tags are read by RFID readers.The proposed system eliminates the need for motorist and petrol pump authorities to perform fuel payment and fuel payment collection respectively.Data info exchanged between the motorists and petrol pump authorities. It enables more efficient fuel payment collection and traffic management at petrol pump.**

Keywords: **tags, reader, antenna, barcode, radio frequency**

1. INTRODUCTION

A. What is RFID

Radio Frequency Identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag which is also called as RFID tag or label attached to an object through a reader for the purpose of identifying and tracking the object .Some RFID tags can be read from several meters away and beyond the line of sight of the reader. RFID can be used in many applications. A tag can be affixed to any object and used to track and manage inventory, assets, people, etc. For example, it can be affixed to cars, computer equipment, books, mobile phones, etc. The Healthcare industry has used RFID to reduce counting, looking for things and auditing items. Many financial institutions use RFID to track key assets and automate compliance.

B .RFID tags

RFID tags can be either passive, active or battery assisted passive. Passive RFID does not use a battery, while an active has an on-board battery that always broadcasts its signal. A battery assisted passive (BAP) has a small battery on board that is activated when in the presence of a RFID reader.

RFID technology is grouped under the term Automatic Identification(Auto ID).AutoID technologies are a way of controlling information and material flow. The RFID

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technology is a means of gathering data about a certain item without the need of touching or seeing the data carrier through the use of electromagnetic waves.

2. RFID AND BARCODE

A high level comparison :

RFID technology is similar to the bar code identification system that we see in the retail stores every day; however one big difference between RFID and barcode is that RFID does not rely on the line-of-sight reading that bar code scanning requires.

RFID eliminates the need for line-of-sight reading that bar coding depends on. Also, RFID scanning can be done at greater distances than bar code scanning. High frequency RFID systems (850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz) offer transmission ranges of more than 90 feet, although wavelengths in the 2.4 GHz range are absorbed by water (the human body) and therefore has limitations. RFID is used in the retail industry for product tags, and will soon join, and perhaps replace, bar coding as a way to track, control, and manage the flow of goods across their life cycle.

The primary benefits of RFID technology over standard bar-coding are:

- Information stored on the tag can be updated on demand
- Huge data storage capacity
- Instantaneous data identification
- Data collection from multiple items (hundreds of tags per second)
- Small surface area requirement
- Longer read range; line-of-sight not required

Fig.1

TABLE 1

	BarCode	RFID
Line of sight requirement	Required	Not required
Number of items that can be scanned	One	Many
Automation and accuracy	Manual read errors	Fully automate And highly accurate
Identification	Only series and type	Unique item level
Data storage	Limited codes	Up to several KB data

3. WHY RFID IS IMPORTANT

It is believed that RFID technology will play two major roles. It will provide a means of unique object identification at low cost, which will enable it to transform supply chains and reduce their costs dramatically. Secondly, it will be used in combination with other sensing and network technologies to track objects and physical environments for purposes beyond supply-chain management, resulting in an electronic infrastructure that is intelligent and aware of its physical environment. Such an infrastructure can help increase visibility and control over physical world events that plague business decision making today. It is superior to barcode scanning in terms of speed, parallel processing and simplicity and not human intervention is required.

A. Applications of RFID :

1)Asset tracking

RFID is useful in static or in-motion asset tracking.User can instantly determine the general location of tagged assets.

2) People Tracking:

People tracking system are used just as asset tracking system. Hospitals and jails are most general tracking required places. Hospital uses RFID tags for tracking their special patients. In emergency patient and other essential equipment can easily track. It will be mainly very useful in mental care hospitals where doctors can track each and every activity of the patient. Hospitals also use these RFID tags for locating and tracking all the activities of the newly born babies.

3) Document tracking:

This is most common problem. Availability of large amount of data and documents brings lots of problem in document management system. An RFID document-tracking system saves time and money by substantially reducing:

- Time spent searching for lost document
- The financial and legal impact associated with losing documents.

4) Government Library:

 Many government libraries use barcode and electromagnetic strips to track various assets. RFID technology uses for reading these barcodes unlike the self-barcode reader RFID powered barcode reader can read multiple items simultaneously. This reduces queues and increases the number of customers using self-check, which in turn will reduce the staff necessary at the circulation desks.

5) Manufacturing & Aerospace:

RFID technology provides an easy way to manage a huge and laborious manufacturing process. It offers all the benefits of small production parts to batch, processes and manufacturing. This type of process helps in better analysis, reduce and eliminate bottlenecks, reduced time in locating parts and products and production process based sensors can be installed to alert any anomalies. Aerospace industry and Department of Defense have a lot to gain from RFID integration into their production and process lines. Boeing and airbus, according to the direction of US Federal Aviation Administration, make Mandatory to put an appropriate tracking mechanism to track the aircraft parts.

4. THE PROPOSED SYSTEM
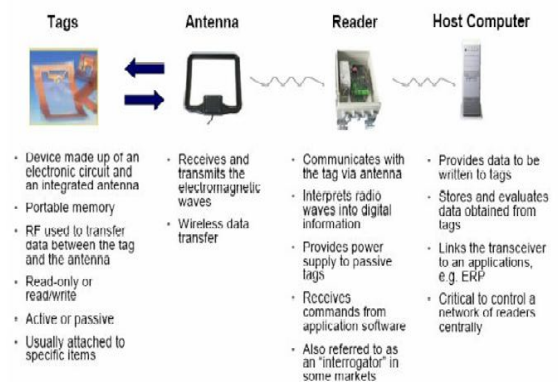
The concept is based upon existing petrol pumps.Human interaction is not required for the collection of the cash at petrol pump.Vehicles will be given a passive tags in the form of a sticker which could be affixed on the windshield.Each time the vehicle enters the petrol pump,the tag will be read and information will be transmitted to the main computer.Vehicle owners also have the chance to choose either a prepaid or a postapid tag.At the entrance point ,the system will record the user's information with their preferred method(i.e prepaid or postpaid).Then at the exit point,the system will calculate the amount payable for the filled fuel and deduct the

payment directly from the tag if it is prepaid.If the balance is not sufficient the vehicle is allowed to leave but SMS or email will be sent to the vehicle's owner.If the owner is failed to pay the excessive amount ,the tag will be barred.In case of postpaid tag the system will calculate the amount payable for the filled fuel and add the amount in to the account and at the end of the month bill will be sent to the vehicle owner.

Using this system all problems related to manual fuel payment collection will be eliminated,there by achieving a higher efficiency rate per transaction . This is because this system requires no human interaction that could lead to cheating and human errors.

The proposed system also considers the size issue.All the system requires is a tag the size of a sticker,which could be affixed on the windshield.In this system ,the tag used is capable of withstanding all kinds of weather.In this proposed system precaution has to taken when the fuel is filled in the vehicle.Entry gate and exit gate where RFID readers are present should be at the safer distance from the place at the petrol pump where the petrol is filled in the vehicle.
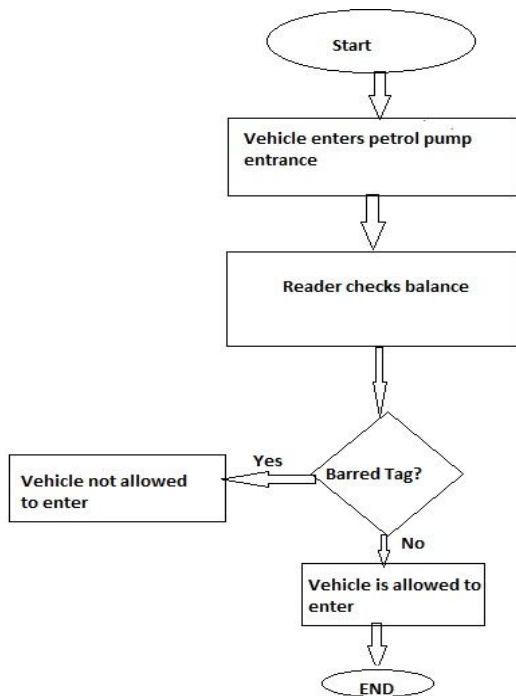

Figure 4 :Petrol pump exit flowchart(postpaid)

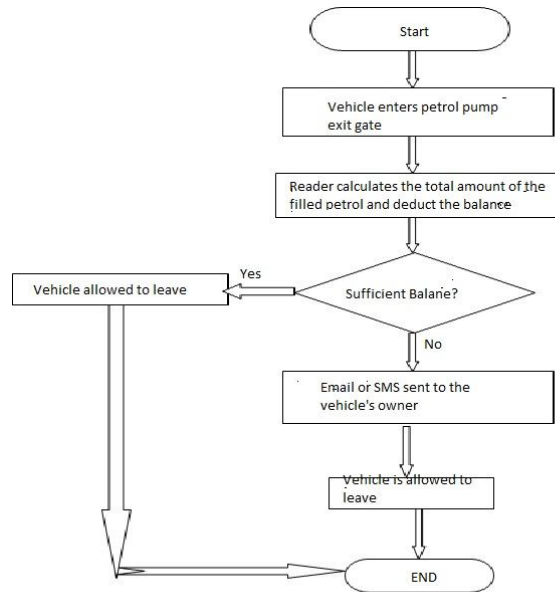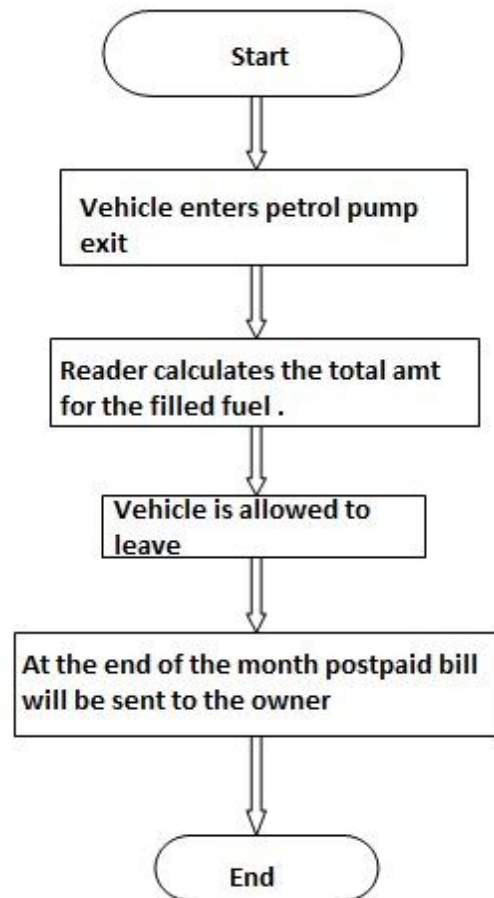Figure 2: Petrol pump entrance flow chart

(prepaid or postpaid)

Figure 3 :Petrol pump exit flowchart(prepaid)

5. CONCLUSION

In this paper we have discussed about electronic fuel payment system.The proposed electronic fuel payment system applies passive RFID technology.By doing so increased efficiency will be guaranteed since RFID is known as highly stable technology.With the elimination human interaction in the entire fuel payment collection process we can improve the efficiency of petrol pump and traffic abilities at petrol pump.

6. REFERENCES

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