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Implementation of I.T.S (Intelligent Transport System) Testing Equipment

Lavanya N Jayakar[a], Vishwanath Hulagur[b] & Praveenayya B[c]

[a]*PG Scholar, Department of E&C, The Oxford College of Engineering, Bangalore, India.*
[b]*Asst Manager, Processing Department, TATA Marcopolo, Dharwad, India.*
[c]*Asst Engineer, Processing Department, TATA Marcopolo, Dharwad, India.*

ABSTRACT

Evaluation and validation is considered as an important part of the project development process, and be considered in each phase: strategy formulation, detailed planning, system design, system implementation, data gathering, data study, and reporting of results. It is the consistent contemplation of how well project goals and objectives are being achieved. The primary purpose of evaluation is to cause changes in the project so that it ultimately meets goals and objectives. At the same time validation measures involves modeling flow to predict faults that might show the way to invalid verification or expansion of a product, service, or system. The most effective evaluations occur when goals and objectives are explicitly stated, are measurable, and validated all parties involved. Thus this project involves the implementation of Intelligent Transport System Test Rig, which evaluates and validates the product for any hardware manufacturing defects that could, otherwise, adversely affect the product's correct performance.

Keywords - *I.T.S Test Rig, Validation process for I.T.S, I.T.S Testing, Pre-requisite Test for I.T.S, I.T.S checking procedure, I.T.S Testing.*

1. INTRODUCTION

The transport system integrates various elements like roads, vehicles, traffic signals, message signs etc. There are serious concerns about the detrimental impact of transport on human health and the environment. Of all, the three main concerns dominating the designing of vehicles and transport systems are reductions in crash injuries, emissions and congestion on roads. Over the past decade advances in computer systems and communication technology has made an efficient effort to remove the depressing externalities of motor vehicle transport. Intelligent Transportation Systems (ITS) is one such technology that deals with issues mentioned above.

Intelligent executive of traffic flows and making commuters more well-versed about traffic and road status can reduce the downbeat impact of congestion, though cannot solve it altogether. This is the idea behind Intelligent Transport Systems (I.T.S). Thus improved concert of urban bus service through functioning of intelligent transport system could essentially make a payment to improve environment in Indian cities by shifting mobility from private mode of transport in the direction of more efficient environmental friendly and safe travel modes.

Transportation services are mostly run by publicly owned State Transport Undertakings (STUs) or Municipal Transport Undertakings (MTUs). MoUD (A Govt body) will give spec on behalf of STU's and it's called Urban Bus Specification. Jawaharlal Nehru National Urban Renewal Mission (JnNURM) is an immense city-modernization scheme launched by the Government of India under Ministry of Urban Development which defines the upgrading of urban bus service through implementation of I.T.S. The JnNURM phase 1 bus specification was defined with the objective to "create cost-effectively productive, efficient, equitable and responsive cities." The JnNURM phase 2 buses are revised specifications of phase 1in the year 2008 with the objective to "create and maintain safe, affordable, rapid, comfortable, reliable and available public transport in cities in India". Thus the implementation of I.T.S was defined in JnNURM phase 2 buses. Based on the understanding, the Ministry took feedback from various stakeholders and formulated an 'Urban Bus Committee" in March 2012 to address issues of changing mobility from private mode of transport towards more efficient environmental friendly and safe travel modes.

The committee revised urban bus specifications to achieve regularity in the bus manufacturing industry with negligible variants. Everyone who wants to supply buses should comply with this specification. One amongst the urban bus specification is implementation of I.T.S

The proposed I.T.S project implementation specification includes core components such as: Vehicle Tracking System, Real Time Passenger Information System and Central Control Station. Core technologies include Geographical Positioning System (GPS), Electronic Display Systems, and Information & Communication Technologies.

These advanced expediency and safety kind must be planned to tolerate faults to ensure the safety of the driver, passengers, and surrounding people and objects such as pedestrians and other vehicles. Typically a systematic safety analysis is conducted offline, with the vehicle not being operational, to evaluate both the severity and likelihood of the consequences of possible faults of the system.

Failure identification goes beyond fault recognition by providing complete information on the underlying cause of a system failure. Failure diagnosis is distinguished from fault detection in that detection aims mainly to determine that some fault occurred, while failure analysis might reveal what kind of fault occurred, what component(s) is/are accountable, and what caused the error. The effort on offline troubleshooting technique of I.T.S has seemed to reduce the number of warranty claims, part replacement, and reworking time on the same system.

2. PROPOSED METHOLOGY

Test rig is defined as "an apparatus used for assessing the performance of a piece of mechanical or electrical equipment". This project deals with the implementation of I.T.S Test Rig, the main objective of which is to test and validate the I.T.S to ensure that I.T.S is defect free before installation into the buses (vehicles) and thereby increasing the production rate, by reducing the re-work time spent on faulty systems. The methodology being used for the implementation of I.T.S test Rig is 'Identification of defect free system component (I.T.S) by QC (quality control) technique'.

For example, consider a sheet metal with a hole of certain diameter as defined in drawings for the implementation into bus. This sheet metal needs to be tested and the testing parameters include its material, thickness, length, height and the diameter of the hole as per the drawings. The length and width of the sheet metal is tested for correctness using measuring tape, the thickness and hole diameter is tested using vernier calipers. If any of these parameters does not meet the specification as defined in the drawings then it is rejected because it may cause functional or operational issues further in production or end product would be not working properly.

In order to maintain or enhance the quality of the products; manufacturers use two techniques, quality control and quality assurance. These two practices make ensure that the end product or the service meets the quality requirements and standards defined for the product or the service. All the measuring instruments primarily are used to measure different parameters; but the same measuring instruments are then used for the purpose of 'Quality control' as can be seen in the example mentioned above. Thus 'Quality' has become an important factor of the product or service. With the high market competition, quality has become the market differentiator for almost all products and services.

The I.T.S being an electronic system, the parameters to be tested or checked are the electrical parameters, which cannot be measured using any measuring instruments. Thus this project deals with the implementation of Test Rig (Testing equipment) which tests various electrical parameters and checks for defect free component.

One of the Quality Control technique used in this project is 'Histogram' technique. It's a form of QC technique which graphically summarizes and displays the distribution of process or data set. The main objective of the project is to increase the production rate by reducing the rework time spent on the defected system components (I.T.S), thus this methodology is used here for the implementation of I.T.S Test.

3. ANALYSIS

Intelligent Transport System as a whole is considered as the integration of all the above listed components. Thus each of these components is tested one after the other to make sure that the I.T.S is defect free. The concept design depicts the implementation of test rig to test of I.T.S components: Single Control Unit (SCU), Bus Driver Control (BDC), Destination board, Camera, GPS, Speakers and Mic

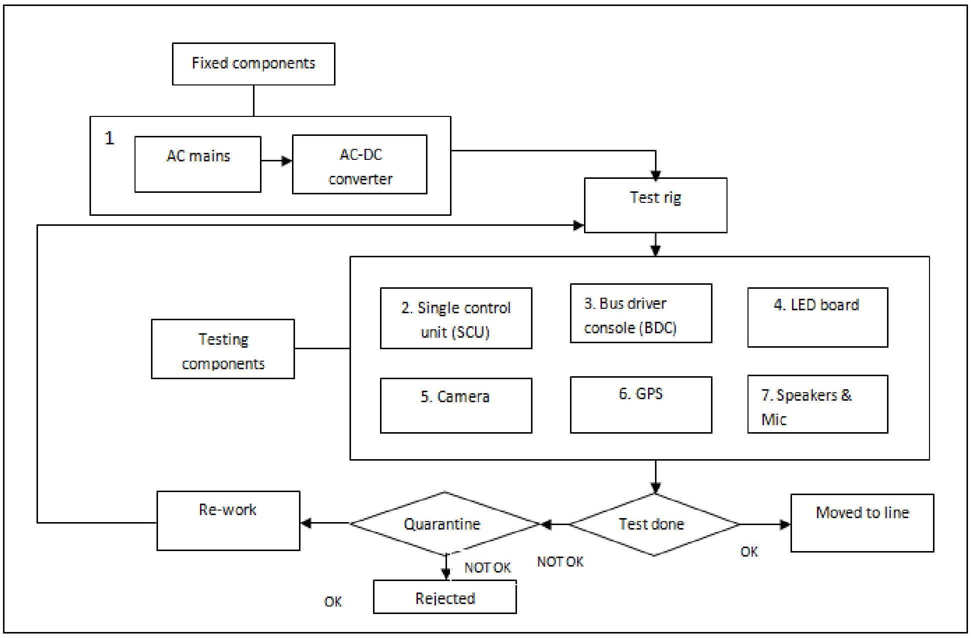

Fig 3.1: Concept Design

The Test Rig implemented is such that it brings out any defect in each of I.T.S component listed above and also quarantines only the defected component thus avoiding the misconception of the whole system being under defect or failure after the installation into the buses. Important thing to be considered in the implementation of Test Rig is that, the system is usually powered up by the DC power supply provided by the vehicles (bus) battery system. But the Test Rig being implemented to test the successful working of I.T.S before installation into the bus, the power supply is provided by the AC mains. Proper measure is undertaken to convert the AC power supply to DC power supply and hence providing it to the I.T.S.

The Test Rig shows the working and not working components correctly, which makes the isolation the faulty component easy. The Test Rig also gives space for the re-work of the faulty component if possible otherwise the defected component is rejected and replaced with whole new system.

The ease of checking the components with the Test Rig is increased with time as the workers working with the I.T.S system becomes more familiar with the testing methods and the identification of the defects. Hence the number of I.T.S components being checked or tested is also increased.

4. RESULT AND DISCUSSIONS

The methodology used for the implementation of this project is identifying the defect free components by one of the Quality Control method that is check list technique. From analysis it is clear that the Quality of Intelligent Transport System is kept on track to achieve high performance and better utilisation of the system. The quality being major factor with regards to industrial competition, high quality of the system is maintained by isolating the defect component using the Test Rig.

The record is maintained for each of the system being tested, with a check on the components that are found to be defected and the components that are defect free. Based on the record maintained, the analysis on the successful implementation of I.T.S test Rig is made. The analysis is made on weekly basis, and the week record is checked for the number of components being tested and number of components that are found to be defected among them. The methodology used for the implementation of this project is identifying the defect free components by one of the Quality Control method that is check list technique. From analysis it is clear that the Quality of Intelligent Transport System is kept on track to achieve high performance and better utilisation of the system.

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KPIT STATUS						
Sl.N	Date	KPIT kit part.no	TMML part n	SCU Sl.No	Defect description & its part no	Remark
1	05.03.2015	6046	319042001001	PCPL-141031KC1.5I006046	No defect found	All components tested & found ok
2	05.03.2015	6298	319042001001	PCPL-141031KC1.5I006298	BDC display flickering observed.BDC Sl.No-TJF1436V0750	BDC will be rejected & sent back to the supplier
3	05.03.2015	6069	319042001001	PCPL-141031KC1.5I006069	Rear camera not working.Sl.No-1301114 Camera harness continuity not ok.Sl.No-10144781	Rear Camera & harness will be rejected& sent back to the supplie
4	05.03.2015	6012	319042001001	PCPL-141031KC1.5I006012	SCU programming not done correctly for routing	Programming correction done by t supplier
5	05.03.2015	6061	319042001001	PCPL-141031KC1.5I006061	SCU programming not done correctly for routing	Programming correction done by t supplier
6	05.03.2015	6052	319042001001	PCPL-141031KC1.5I006052	No defect found	All components tested & found ok
7	05.03.2015	6286	319042001001	PCPL-141031KC1.5I006286	No defect found	All components tested & found ok

Fig 4.1: Daily records of the results of Test Rig.

As per record of two months, it is observed that on an average 10-15 components are being tested using the I.T.S Test Rig thus counting up to 65-135 per week. Thus a total of 486 components where tested starting from the date 05.03.2015 to 18.04.2015 which counts up to 5 weeks approximately. The total defected components from these 486 components are 26 and thus the total number of defect free components counts to 460. The following table details about the number of components tested every week and number of components that are found ok and not ok. This analysis on the test results gives an opportunity to improve the strategy planning for the production. As per the methodology defined for this project implementation, it keeps control of the Quality of the system thus enhancing the overall functionality of the end product.

Another important thing observed form the data analysis of test output is that not only the no. of defects found week by week reduced but also the number of components being tested is found to be increased. This is because of the training experience with the I.T.S Test Rig; this also helps to identify the defect more accurately and helps in sustenance of the project implementation.

DURATION	NO. OF COMPONENTS	NO. OF DEFECT COMPONENTS	PERCENTAGEOF DEECTED COMPONENTS
1st week	68	8	11.76
2nd week	77	4	5.24
3rd week	77	6	7.82
4th week	118	2	1.74
5th week	138	3	2.17

Table 4.1: Analysis Results of I.T.S Test Rig.

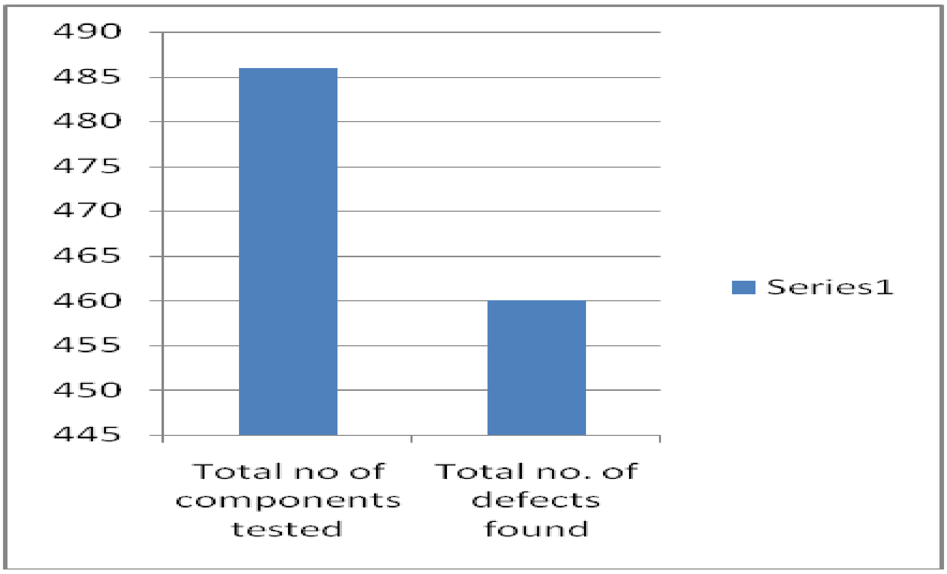

Fig 4.2: Total no. of I.T.S components tested and total no. of defect free components.

The Fig 4.2 shows the total number of I.T.S components being checked and the total number of components found to be defect free. The total number of each component that were found to be defected when tested with Test Rig is depicted in the following Fig 4.3

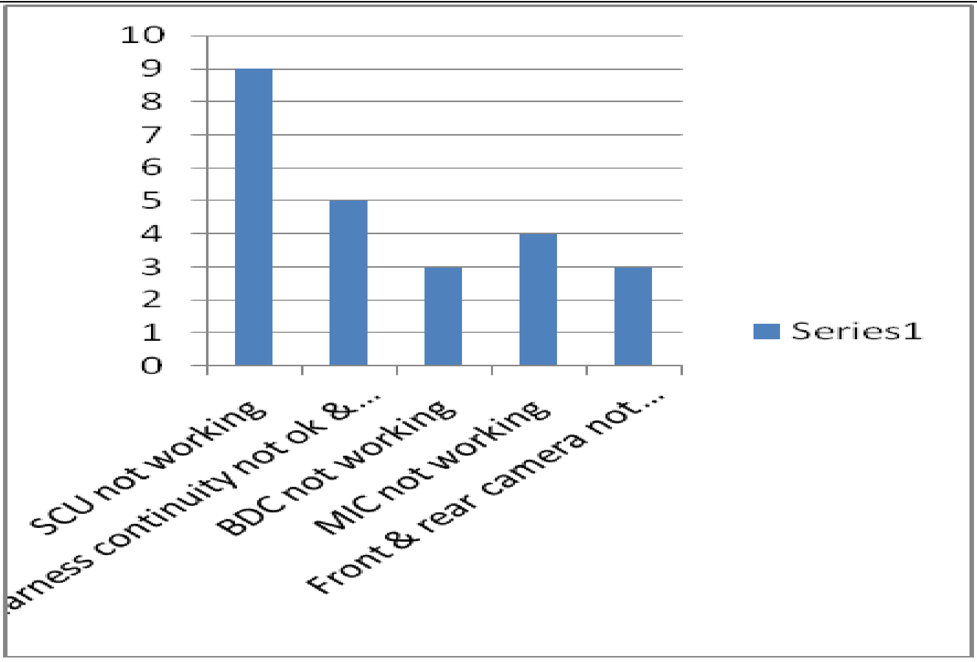

Fig 4.3: Types of defects detected

The Fig 4.3 shows the number of components tested on weekly basis and the number of components found to be defect. We can see that the number of defect components from 1st week to 5th week is found to decrease except for the third week where we see increase in the graph; however it is less compared to 1st week.

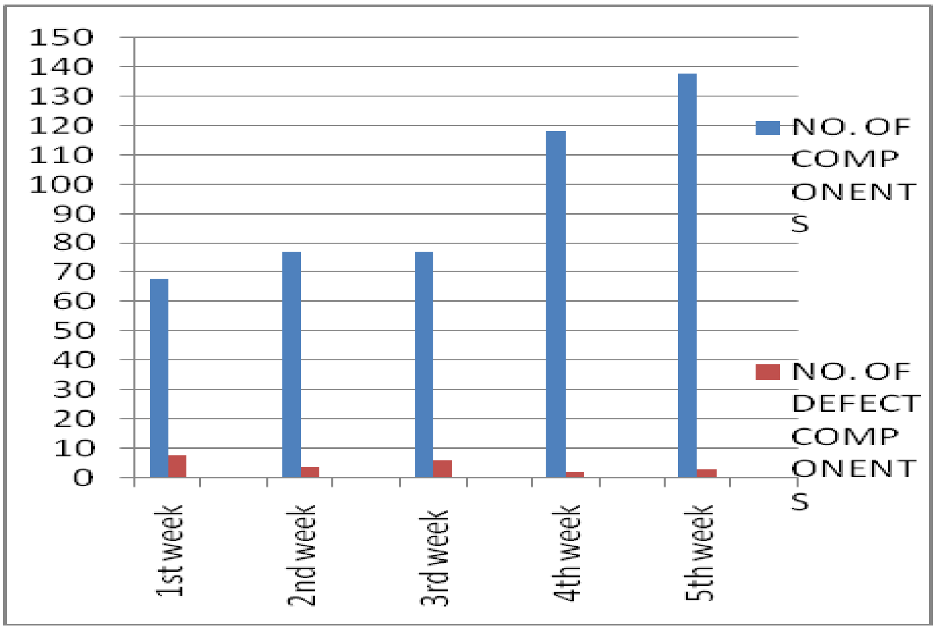

Fig 4.4: No. of components checked and no. of components found defect on weekly record basis

The decrease in the defected system on weekly basis record can be seen by percentage in the Fig 4.5 depicted below:

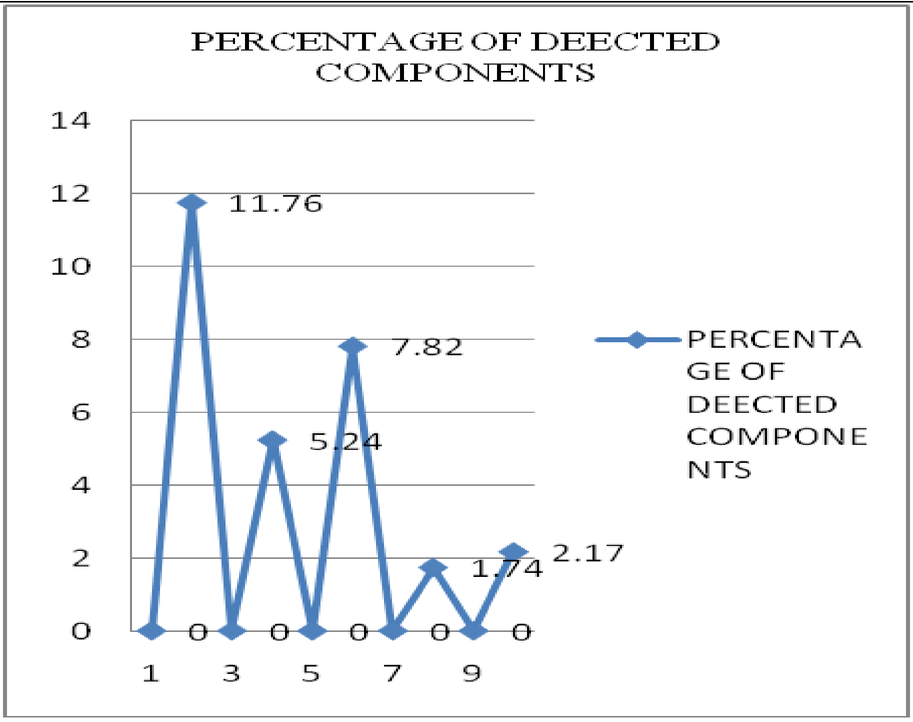

Fig 4.5: Percentage of defect components found on weekly record basis

5. CONCLUSION

The I.T.S Test Rig implemented on Quality Control methodology, tests each of the core components of Intelligent Transport System that is Single Control Unit (SCU), Bus Driver Console (BDC), LED Board, Camera, GPS, Speakers and Mic. The results shows that number of defected components has reduced by testing the I.T.S system before installation into buses, which is because of the fact that the Test Rig identifies which part/component is in fault and isolates it for re-work if possible otherwise rejects the component or the whole system based on the test results. Thus the I.T.S is ensured to be defect free while installing into the buses. And most of the time is saved because of testing the I.T.S system before installation into buses that is because it avoids the re-work time on the defected system after the installation into the buses, thus achieving the main objectives of the project.

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