Integrated Production Management System

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Abstract — *The aim of my paper is to automate the process of whole assembly plants by contributing for speeding up the production, qualitative and cost-efficient units. Interfacing IPMS with PLC (Programmable Logic Controller) the automobile manufacturing plant will be able to achieve control over the production line in order to keep check on the quality of the product. IPMS System is the Customization to SAP booking System. It is used for real time production booking by the use of mobile data acquisition devices for faster & accurate data capture & improved productivity. The development of IPMS and interfacing with PLC is to overcome the disadvantages of SAP booking like Mistakes during booking by manual entry and improving the productivity. Hence by creating this system it would be helpful for the manufacturing plant to work more accurately and efficiently.*

Keywords— IPMS- Integrated Production Management System, PLC- Programmable Logic Controller, SAP- System Application and Production

I. INTRODUCTION

Integrated Production Management System (IPMS) is that the prime innovative project of the Tata Motors Ltd within the field of technology. IPMS handle the entire life cycle ranging from acquisition until delivery. IPMS will be simply integrated with existing IT systems with ease. Like inventory check, production plan, order tracking and costing.

Integrated Production Management System is custom-made system employed in manufactory. IPMS will offer the proper info at the proper time and show the producing top dog "how the present condition on the plant floor is optimized to enhance production output". IPMS has been designed to possess management over multiple parts of the assembly method. Example: Inputs, personnel, machineries, quality check and support services.

II. LITERATURE SURVEY

A. Related Work:

[1] According to the proposed theory in [1] an in depth analysis around an online business application existent in three SAP (System Application and product in knowledge Processing) UI (client interfaces) advances: net Dynpro (WD) ABAP (Advanced Business Application Programming), Floor plan Manager (FPM) and client Relationship Management (CRM) Web client UI. This study is equally acknowledged: each concerning application accomplishment, and in addition as way because the no inheritable, forepart time showed to the end- consumer. The application is targeted around SAP information tables and also the estimations performed to a mass the forepart time to the consumer square measure created for an equivalent inquiry within the information with the help of web person communications protocol Watch instrument.

[2] According to this paper taking the choice attributes, as well as order variety, product variety, person hour and comprehensive analysis under consideration, the choice tree model of separate production and manufacture has been given. And C4.5 algorithmic program has been accustomed construct the choice tree recursively during a top-down manner, during which the top node is that the root node, every internal node denotes associate attribute check, every branch represents associate outcome of the check, and every leaf node represents categories. Then RFC (Remote operate Call) has been accustomed extract information from SAP(Systems Applications and merchandise in information Processing) R/3 system to decision-making information, and DTs (Data Transformation Service) accustomed extract information from MES to help the system for the decision-making info, which might provide helpful information resource for data processing.

[3] The paper manages a problem of wasteful WLAN connecter of remote cell phones and a likelihood to require care of this issue by a prebuffering of selected antiquities. The basics area unit during a model of data prebuffering based mostly framework improvement for locating and following shoppers within the structures. The created skeleton joins the ideas of space and consumer following as an augmentation for an additional knowledge framework. The schema utilizes a WLAN system foundation to let a cellular phone focus its indoor position. Consumer space is employed for data prebuffering and pushing knowledge from server to client's personal digital assistant. Thus the WLAN technology is utilized in the Production.

III. SYSTEM ANALYSIS AND DESIGN

A. Existing System:

SAP Production Booking[7]: Presently SAP Production Booking is handled manually. Only VC number of each vehicle is maintained. This Process consumes lot time, energy. There is no automation the processes are carried out manually. This is a critical process which needs to be carried out with at care. Hence automation of the system is required for steady performance, where central repository of data can be maintained. Automation would result in paperless work, less efforts and better performance.

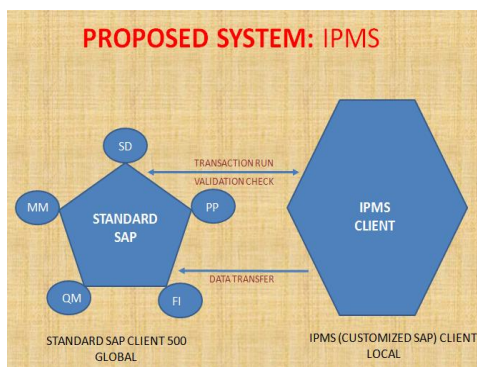#### B. Proposed System: Integrated Production Management System

Fig 1. Proposed System: IPMS

Integrated Production Management System [8] in the Fig. 1 is the Customization to SAP booking System. It is used for Real time Production booking by Use of Mobile data acquisition devices for faster and accurate data capture and improved productivity. The development of IPMS is to overcome the disadvantages of SAP booking like Errors during booking by manual entry, System errors: If there is

no enough stock in the system the process still continues without any check. This system runs in a different SAP client (600) and data from this is interfaced with main SAP client (500) at regular intervals. IPMS is also used for Genealogy and in keeping track of the inventory.

IV. METHOD

The most well structured and robust data model and complete details of transaction history enables us to design the whole automated system required. In any automotive industry scheduling the processes appropriately is the most important tool for design and engineering, which can have large impact on the production. In manufacturing plant fig the goal is to minimize the amount of time taken i.e production time and most importantly the cost by proper staffing and using proper equipments. The aim is to maximize the efficiency of the production operation and reduction in the costs. IPMS can significantly improve the quality, maintain systematic order and efficiency of the business.IPMS can lead to better outputs that benefit the company, such as customer service and manufacturing.

Chassis main menu has five sub modules fig. 2 , they are:
- A. Chassis Creation.
- B. Chassis Class.
- C. Production Booking Fig 3.
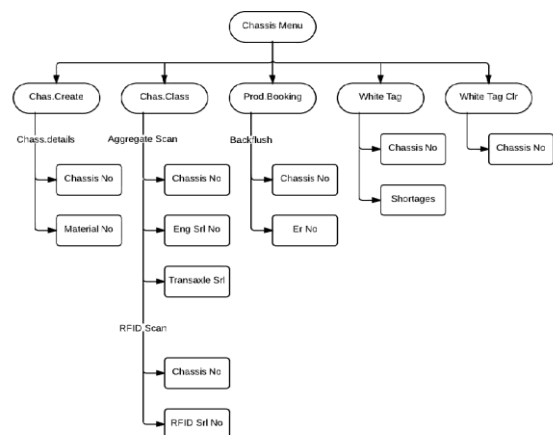- D. White Tag and White Tag Clear.

Fig 2. IPMS modules

A. Chassis Creation:
In this chassis creation section, it consists of the chassis details that has been manufactured in the production plant. This program is used to create equipment **for category type 'C'(Chassis) using RF** screens. User will scan the Barcode of the equipment & material using Radio Frequency Device.

i. Chassis Serial No:

This field fig 7.12 will be entered by the user at the shop floor. It is the 17 alphanumeric character field. The format for chassis serial number that used in the plant is as follows E.g. MATXXXXXXEXDXXXXX. MA or else ME code is the Indian code for the vehicles MAT is the standard format. From 4th place to 9th place it consists of 6 digit number which represents the different models or vehicles. The 10 place is for the Year code, in the above e.g. F represents the Year 2015. The 11th place is for the Production line code number. The 12th place is for the month code, D represents the April month. X represents digits.

ii. Material No

It is the 12 place alphanumeric character field. The ABFR in the below example is for the Ace zip white model. It is different for different colors of model like AHOR-Neon Rush, ABFR-Arctic white, AIHR-Icy blue, ABNR-Ruby red. E.g. XXXXXXXXXABFR

This module consists of options:

- Save: Chassis serial no & material number are saved in to the SAP system through scanner. Using wifi those data are transferred to the client 600 server.
- Clear: This option can be used to clear the entries from the dialogue box, with condition before the update process.
- Back: Back button take us to the Chassis menu screen.
- Update: Scanned chassis serial no & material number can be altered using this option.
- Delete: Particular selected chassis number can be removed using this option. The conditions for this will be explained later.
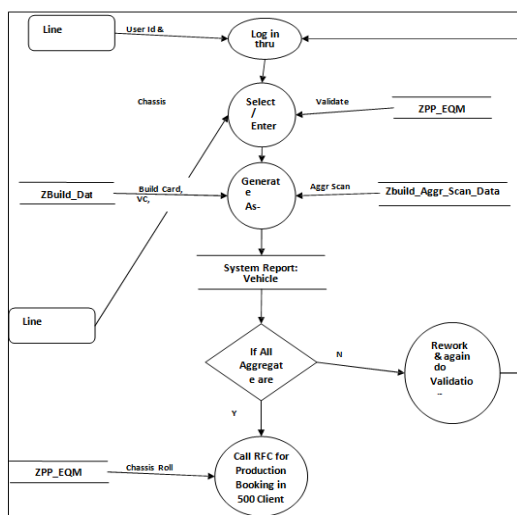

FIG 3.IPMS: Production Booking of Automobile

B. Chassis Class:

In this chassis class we are going to perform two types of scan. They are:

i. Aggregate Scan

As we know aggregate is a collection of items that are gathered together to form a total quantity. Here in this module, the chassis number of the vehicle is scanned, the chassis number of vehicle is linked with its engine number and transaxle number (gearbox number). Here the chassis number acts as the primary key(unique key). So the aggregation of chassis, engine and its gear box is done. In this program three types of checks are performed, they are:

Step 1: Perform Check_data.

Step 2: Perform Check_engine data.

Step 3: Perform Check_Transaxle_data.

As three dialogue boxes are present in this window, the system raises the error if any blank field is left blank, a **message will be displayed "Enter values in all the fields".** The specific format is given for chassis number, engine number, transaxle number. If wrong values are entered a **message "Enter correct values" will be displayed.**

i. RFID Scan

For each of the chassis number that have been created in first module is given an RFID number. Chassis in all module acts as the primary key. This program is developed for chassis backflush for the plant. User scans the chassis number or enter manually using RF device and enter chassis no if chassis is for export.

B. Production Booking

In this phase Export Registration number (ER no) for the vehicle is assigned. Here in this stage the status of the **chassis is checked. If status is "roll" it means that the** production booking is already done successfully.

C. White Tag & White Tag Clear

After the vehicle comes out of the Final assembly line, it is driven on its own power to Vehicle Testing area. If any defects found then the chassis number of that vehicle is tagged as White Tag. Once the defect is overcome it is tagged as white tag clear. The status of vehicle is changed from ROLL to WTAG when defect found, and back to ROLL when defect cleared.

V. TEST CASES

A set of take a look at cases designed to exercise each internal logic and external necessities is intended and documented, expected results are outlined and actual results are recorded.

A. Chassis Creation
TABLE 1

TEST CASE SCENARIO FOR CHASSIS CREATION

Module Name	Test Case ID	Test Name	Test Case Description	Test Step Description	Expected Result	Status
Chassis Create	IPMS_Chass isCreate_01	To Verify for main menu	Verify for main menu	Click on SAP Logon then net weaver window appears,select IPMS DEV option to get SAP Access.type ZRF in command line to get the Main Menu window.	Main menu for chassis creation should be displayed.	PASS
Chassis Create	IPMS_Chass isCreate_02	To verify for Chassis Creation.	Verify for Chassis Creation.	Click on Chassis creation button from the main menu to enter the chassis details	Chassis details window should be displayed.	PASS
Chassis Create	IPMS_Chass isCreate_03	To verify for Chassis Fields.	Verify for Chassis fields which includes: a)Chassis Serial No (which should be 17 digit number) b)Material No(which should be 15 digit number)	Place the barcode scanner over the chassis.	Barcode reader should scan both the values(chassis serial no and material no)	PASS

B. RFID Scan

Module Name	Test Case ID	Test Name	Test Case Description	Test Step Description	Expected Result	Status
RFID Scan	IPMS_RFID _01	To Verify for main menu	Verify for main menu	Click on chassis class in the main menu	Chassis classes window should be displayed.	Pass
RFID Scan	IPMS_RFID 02	To verify For RFID scan	Verify for RFID menu	Click on the RFID scan button	An RFID screen with Chassis and RFID srl block	Pass
RFID Scan	IPMS_RFID _03	To verify for Invalid entry	Verify for Chassis with RFID entry	Scan the values chassis num and RFID num	Invalid Entry Message displays	Pass
RFID Scan	IPMS_RFID _04	To verify for Valid entry	Verify Chassis with RFID entry	Scan the values chassis num and RFID num	Valid entry so save data	Pass

TABLE 2

TEST CASE SCENARIO FOR RFID SCAN

C. Production Booking
TABLE 3

Module Name	Test Case ID	Test Name	Test Case Description	Test Step Description	Expected Result	Status
Production Booking	IPMS_Prod. Book 01	To Verify for main menu	Verify for main menu	Click on chassis class in the main menu	Chassis main menu window should be displayed.	Pass
Production Booking	IPMS_Prod. Book 02	To enter into Prod Booking	Verify for Production booking menu	Click on the 3rd option production booking	Chassis serial num & ER num displayed	Pass
Production Booking	IPMS_Prod. Book 03	To check Invalid entry	Verify for Chassis num & ER num	Enter the valid chassis & ER num	Error message should be displayed	Pass
Production Booking	IPMS_Prod. Book 04	To check valid entry	Verify for Chassis num & ER num	Enter the valid chassis & ER num	Valid entry save the data	Pass

TEST CASE SCENARIO FOR PRODUCTION BOOKING

D. White Tag & White Tag Clear
TABLE 4

Module Name	Test Case ID	Test Name	Test Case Description	Test Step Description	Expected Result	Status
WTAG WTCL	IPMS_WT AG_WTCL _01	To Verify for main menu	Verify for main menu	Click on chassis class in the main menu	Chassis main menu window should be displayed.	Pass
WTAG WTCL	IPMS_WT AG_WTCL _02	To enter into White Tag & WhiteTag clear	Verify for defect & repair entry	Click on the 4th or 5th menu	If 4th menu enter into WTAG entry, If 5th menu enter into WTCL	Pass

TEST CASE SCENARIO FOR WTAG & WTCL

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