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ESSEN

CASE STUDY

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MARUTI SUZUKI

Automobile industry major implements RFID-based PALLET AND INVENTORY MANAGEMENT SYSTEM

PLC integration and real-time inventory of panels at each machine in the Press Shop through on-screen grid

Automated pallet identification and loading alarm

Accurate management of manufactured and rejected panels

Automated tracking from warehouse to shop floor and real-time stock status reports

INSIDE:

Key Requirements
Solution
Implementation
Working
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Links

TECHNOLOGY

Solution:
EPC Gen2 compliant pallet and inventory tracking solution

Tag Type:
Metallica™ UHF Passive

Reader/Antenna:
Xtenna Hybrid™
Xtenna Proximity™

Method:
Multiple Tracking via Integrated Reader/Antenna modules

Integration Platform:
RFID Middleware:
Xtenna™ WebToolkit
Xtenna™ Studio
Application: Essen RFID's Pallet & Inventory Management System
Database: Oracle 9i
SQL Server 2005 Exp. ed.

Tag Manufacturer/Supplier:
Essen RFID, with US based chip inlay

Reader/Antenna Manufacturer:
Essen RFID, with US based module

Systems Integrator:
Essen RFID

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Xtenna™ Integrated RFID Antenna/Reader

CASE STUDY

KEY REQUIREMENTS:

Maruti Suzuki India Limited is a vehicle manufacturing company and a market leader in the car segment in India. All vehicle parts are manufactured and assembled in the company's production unit at Gurgaon in northern India. Vehicle panels are manufactured in the Press Shop and kept on pallets to be stored in the warehouse. When they are requisitioned, the required inventory goes from the warehouse to the welding workshop (Weld Shop). The company needed an automated inventory management system that kept record of manufactured inventory, rejected inventory and efficiently tracked pallets leaving the warehouse.

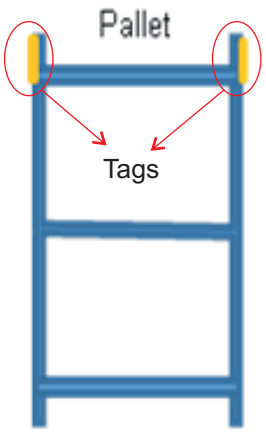
Main challenges in implementation:

- Capturing real-time inventory of panels at the Press Shop with the highest accuracy and status information of minimum inventory level required.
- Efficiently keeping track of inventory going from the Press Shop to the warehouse and from the warehouse to the Weld Shop.
- Capturing real-time stock status at the Weld Shop.
- Ensuring that the pallets are always loaded with the correct panels.
- In the existing manual process, it was quite strenuous to keep track of all manufactured inventory as well as rejected inventory.
- Ensuring maintenance of optimum inventory levels.

SOLUTION:

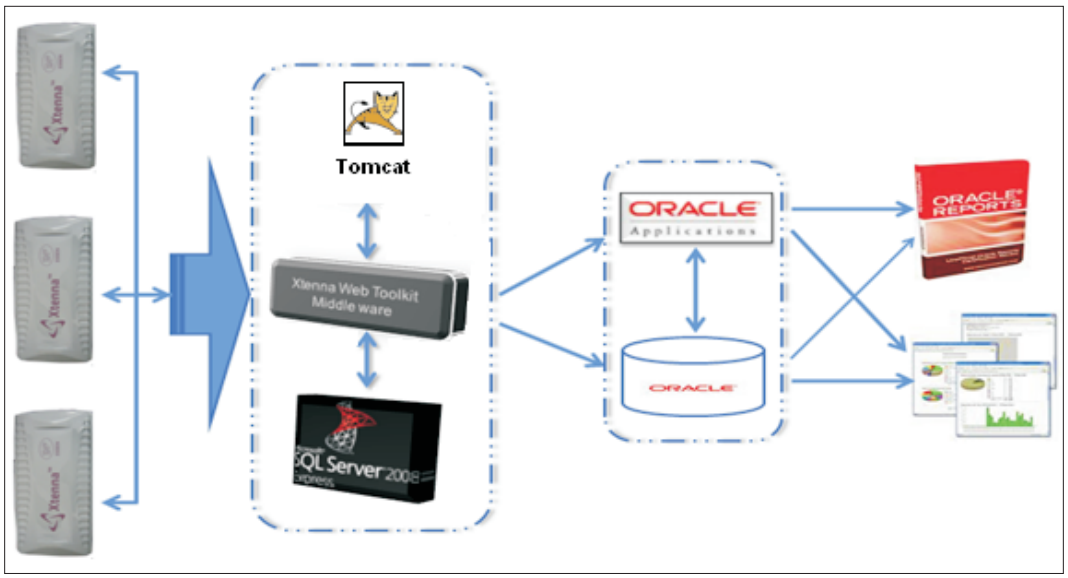
Essen RFID offered a solution for tracking pallets as well as managing manufactured inventory and rejects through RFID. The technology efficiently tracks pallets and also keeps track of rejected panels. It deploys Xtenna Proximity™ to register information and Xtenna Hybrid™ to track pallets going from the warehouse to the Weld Shop.

It uses MS SQL Server at the Client machine, while Oracle is used at the central database. The Pallet Tracking System is developed using .Net Framework, Java JDK and Tomcat.



IMPLEMENTATION:

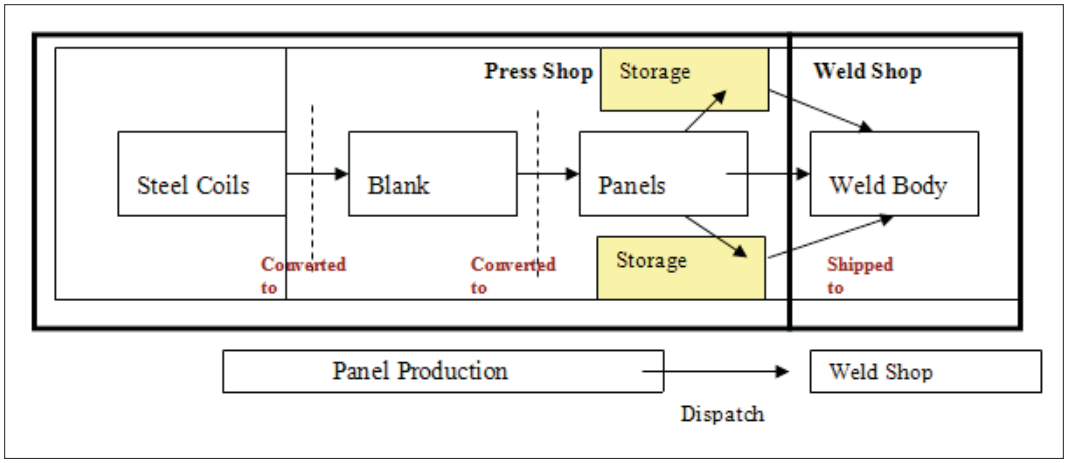
METALLICA™ RFID tags are affixed on both sides of a pallet. Xtenna Hybrid™ antenna-readers are mounted at the exit gate of the Press Shop and the entry/exit gates of the warehouse. One Xtenna Proximity™ reader is used for registering the tags in the database and one Xtenna Proximity™ reader is configured at each PLC machine in the Press Shop.



WORKING:

Process Flow:

Vehicle panels are manufactured following a standard process at the Press Shop. Coiled Steel is cut into "Blanks" of sheet metal of required size. These are subsequently stamped to produce the desired form on the sheet metal, known as "Panels". The pressing operation is as follows:



The panels after conversion are sent to storage and then sent to the Weld Shops for the next process. Forklifts are utilized for this dispatch purpose.

Step 1:

1. Registration of pallets into the database.
2. Mapping of registered pallet with PE code and quantity capacity of pallet.

Step 2:

3. The registered and mapped pallet is brought near the Xtenna Proximity™ at the PLC machine.

4. Xtenna Proximity™ confirms that the correct panel has been brought to the PLC machine by confirming the PE code with the PLC.
5. When the pallet has been loaded to 95% capacity, an alarm is triggered to the PLC machine and the count is entered and matched along with that of reworked and repaired panels.

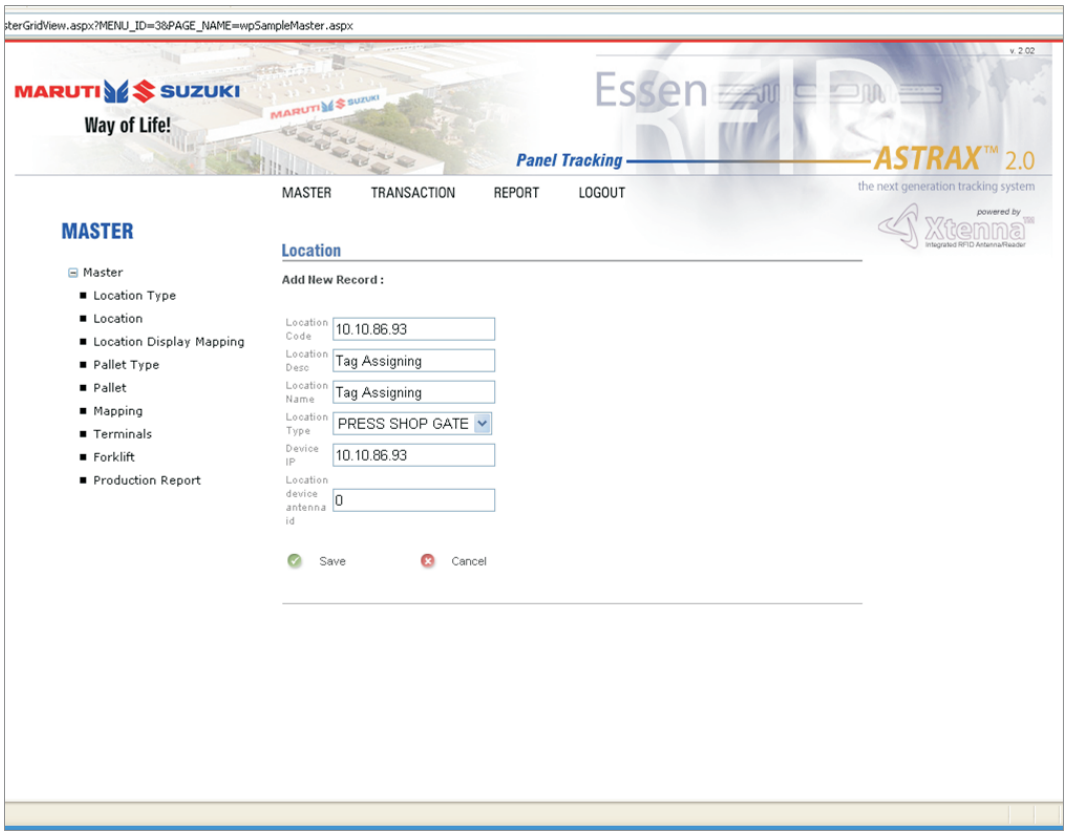
Step 3:

6. Loaded pallet is moved from the Press Shop to the Weld Shop via forklift and the Press Shop inventory is updated.

Registration and Tagging:

During registration, the required data is entered into the Master Forms of the Pallet & Inventory Tracking application:

Location Master: This configures the various Xtenna™ reader devices to their respective Press Shop and Weld Shop locations.



Panel Master: Panels are semi-finished parts of various shapes that go into forming the vehicle. The Panel Master contains data pertaining to these various panels.

Pallet Type Master: Various pallet types are used depending on the kind of panel they will be carrying and transporting within the factory premises. This pallet type data is saved into the Pallet Type Master.

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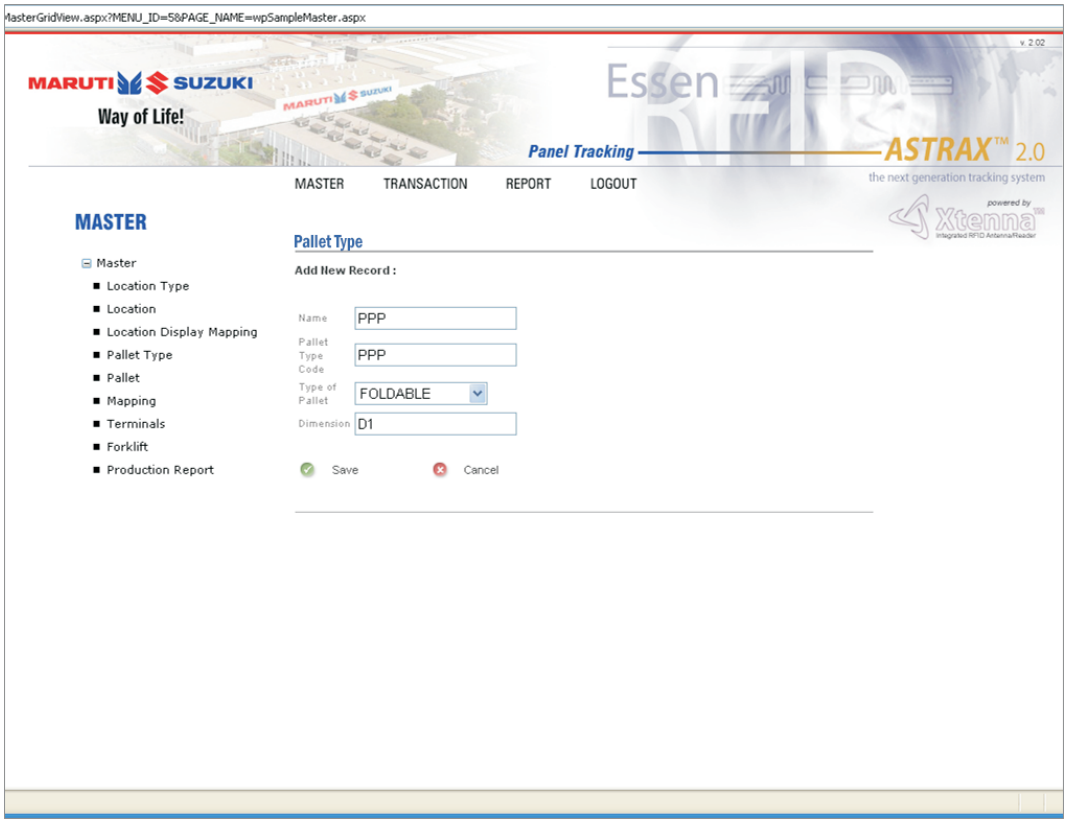
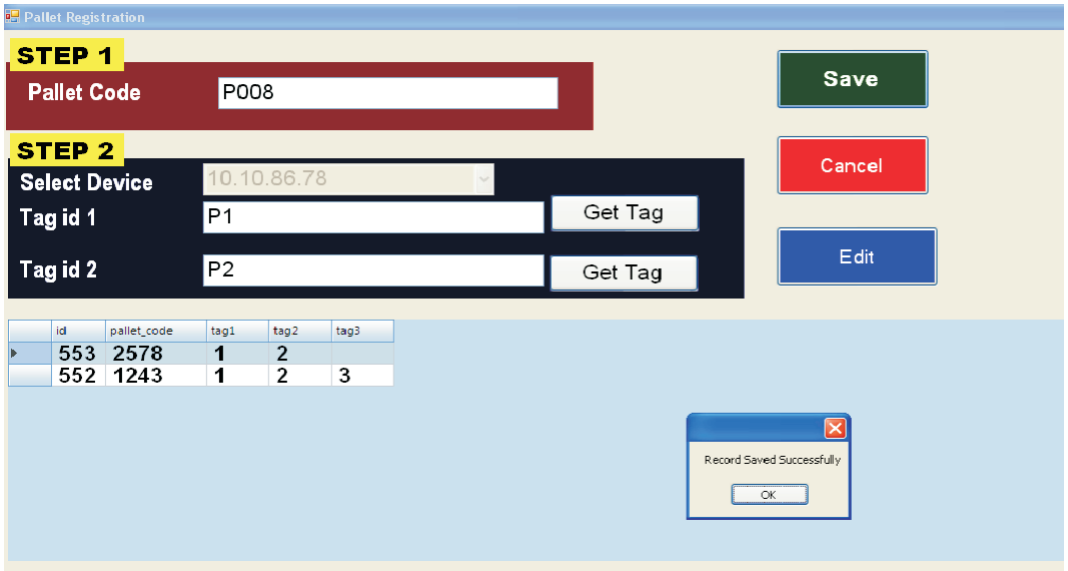


Pallet Master: During registration, a METALLICA™ tag is affixed on both sides of a pallet. Each pallet therefore has two tags affixed on it. The tags and their pallet are registered into the database through the Xtenna Proximity™ reader. While registration, the type of pallet is selected along with its loading capacity of the type of panels it will be carrying. When this mapping is done, each individual pallet gets assigned with a unique Pallet Code, which is a combination of Pallet Type and the Number for that type, e.g. Pallet Type: X02, No. within Type: 001. Hence, Pallet Code: X02001.

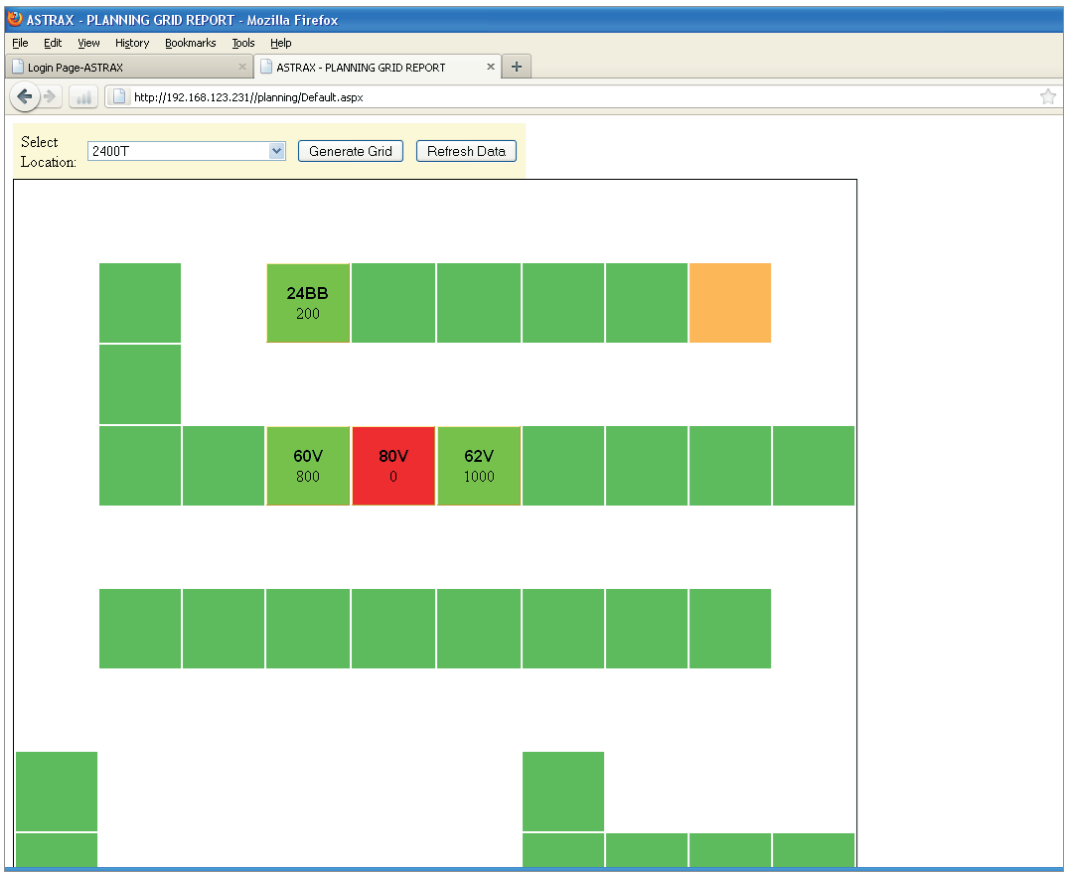


Planning Grid:

1. Using the Pallet & Inventory Tracking System, the supervisor can view the perpetual inventory of panels being produced from a particular machine.
2. This function shows the real-time inventory of the panels.
3. The system already has data entered indicating the level at which panel quantity is considered Critical (critically low). When panel quantity turns critical, the Press Shop stock indicates danger level.
4. This Planning Grid sheet displays placeholders on it, each of which indicates the Press Shop stock quantity of its respective PE Code. The default colour is Green. As available quantity reduces, the colour turns Orange, then Yellow, and finally Red, in ratio of progression between available panels and the critical quantity level. Red colour indicates that the danger mark of critical quantity level has been reached.

Example:

On 2000T machine, the available panels quantity for PE Code 80V is currently 0 (zero), whereas actual requirement is 6000. Since the available quantity is critically low (currently, zero), the area depicted in the planning grid for 80V is red, indicating danger level.



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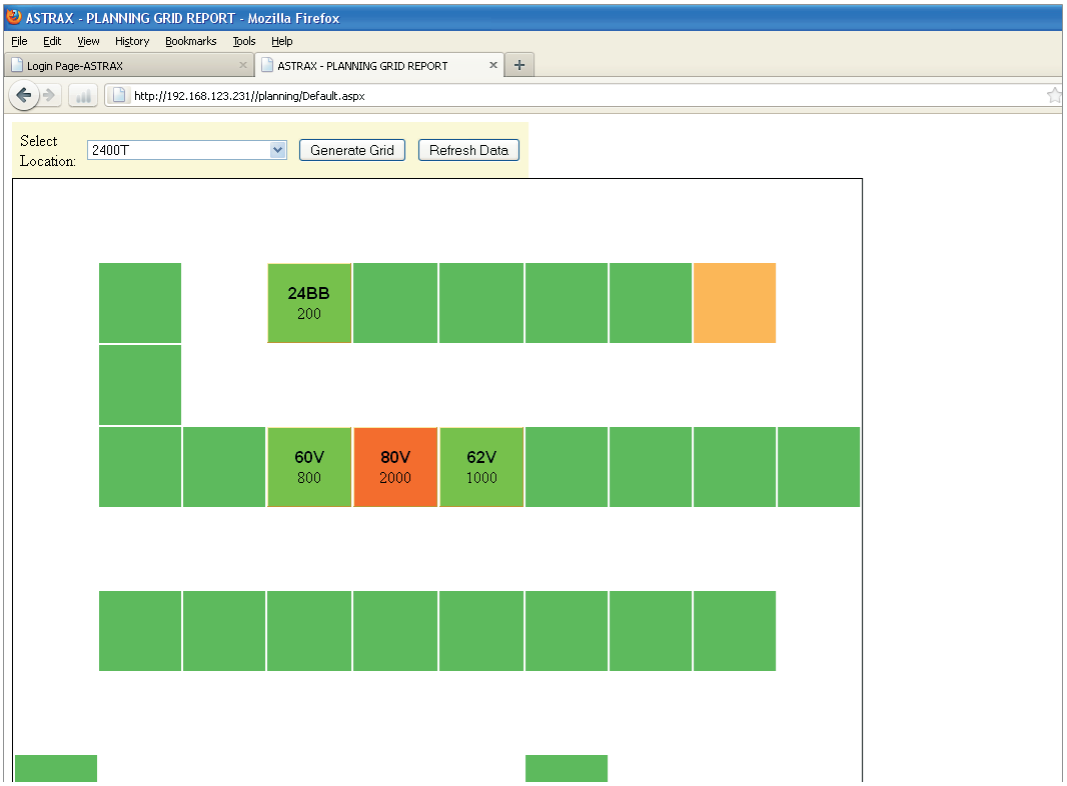
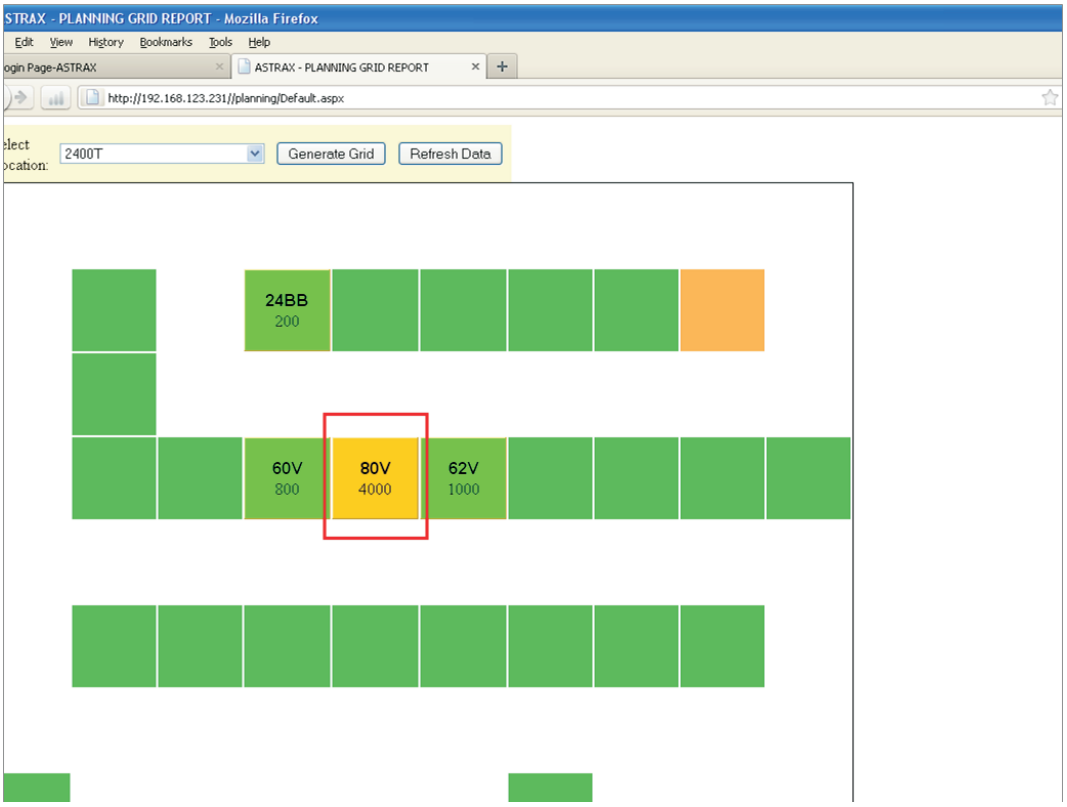
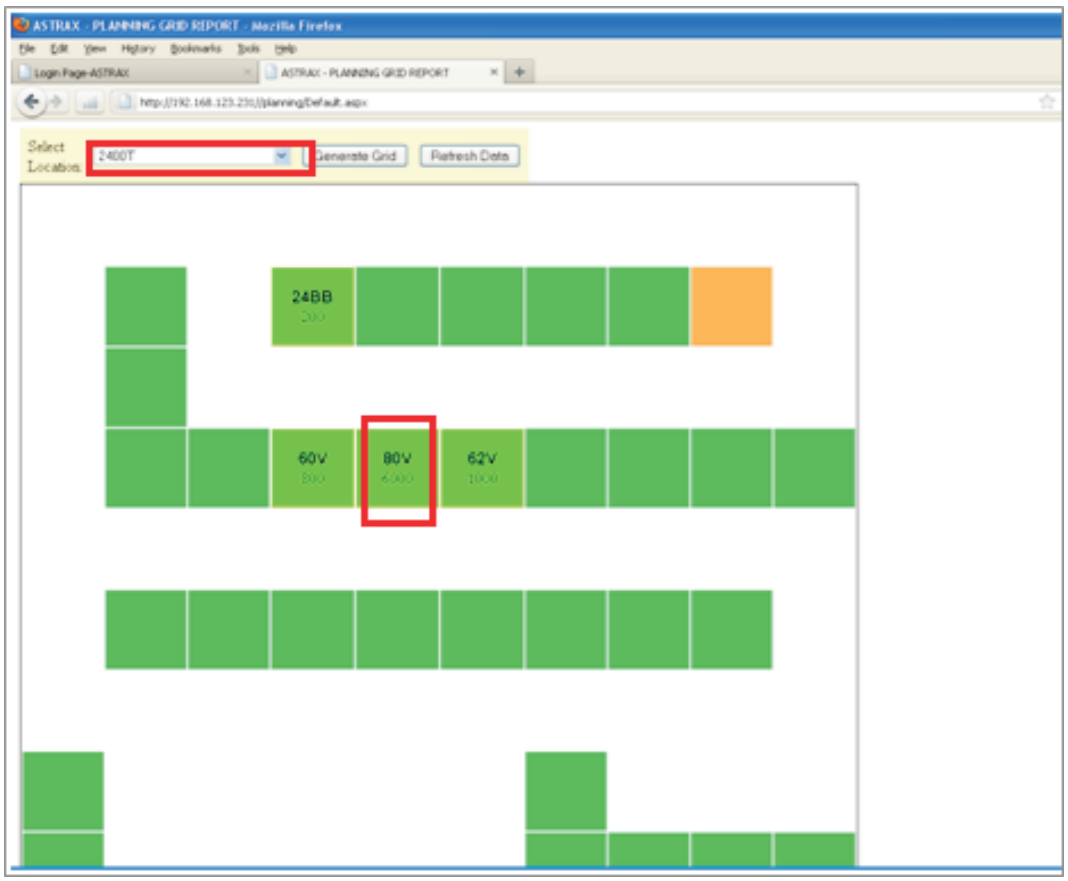
As the available quantity increases, the colour changes to orange.



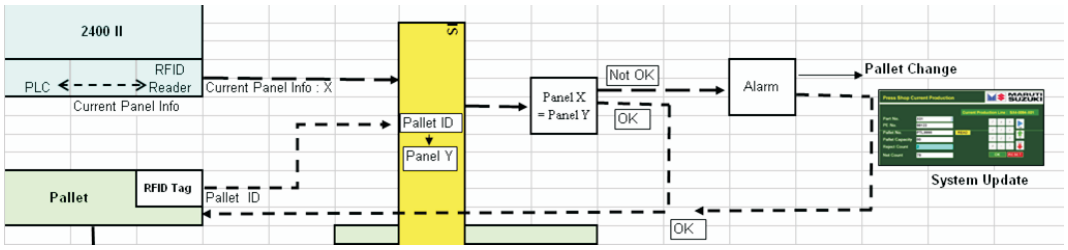
When the quantity available reaches nearer to the required quantity, the colour changes to yellow.



Once the available quantity is equal to or greater than the required quantity, the colour for that panel on the grid changes to green.



Pallet Identification:



1. Pallets are placed on the machine for filling with panels.
2. If more than one pallet appears in the list, the operator selects one pallet for the current filling.
3. The mounted RFID reader interacts with the PLC machine in order to fetch the information for the panels currently running in the Press Shop.
4. The reader sends a query to the Pallet Master in the database to fetch the corresponding panel data stored on that pallet. If the pallet is found compatible with the currently running panels, filling on that pallet would be allowed.

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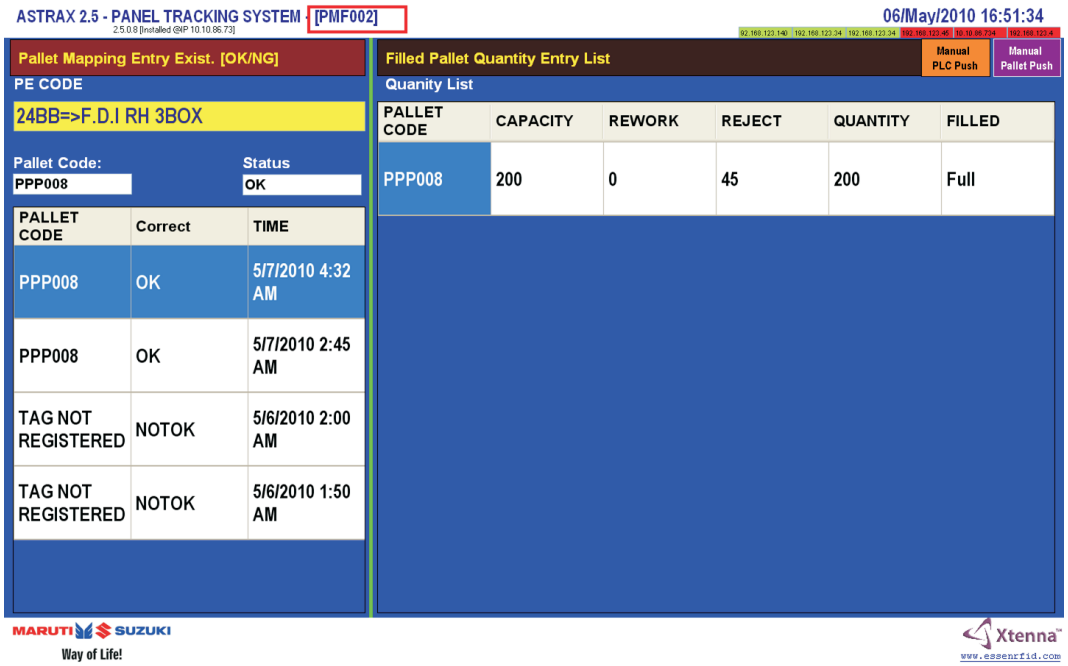
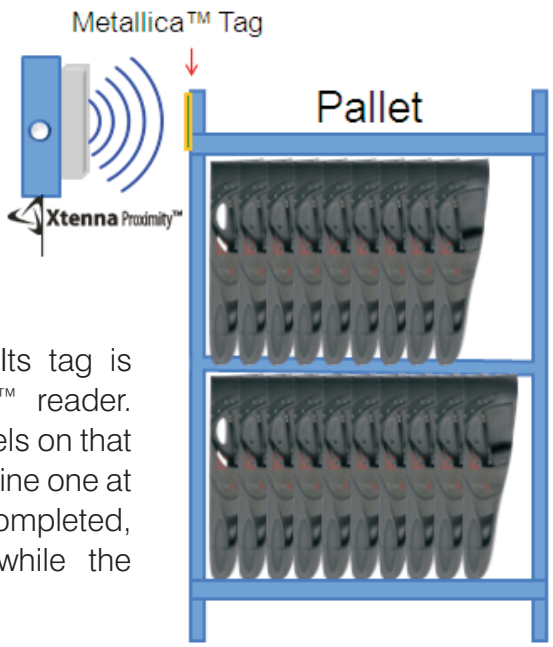


5. In case a wrong pallet is sensed, an alarm pops on the screen. The operator then removes the pallet, following which a list of available empty pallets is displayed.
6. In case the operator wishes to create a new pallet-panel relation at this stage, the process is allowed. However such cases, an exception is generated and a notification email is sent to the administrator to check this pallet-panel exception.

Filling Pallet with Panels:

The Press Shop unit contains PLC machines, which are used for pressing and manufacturing ready panels of various types for the vehicles in production.



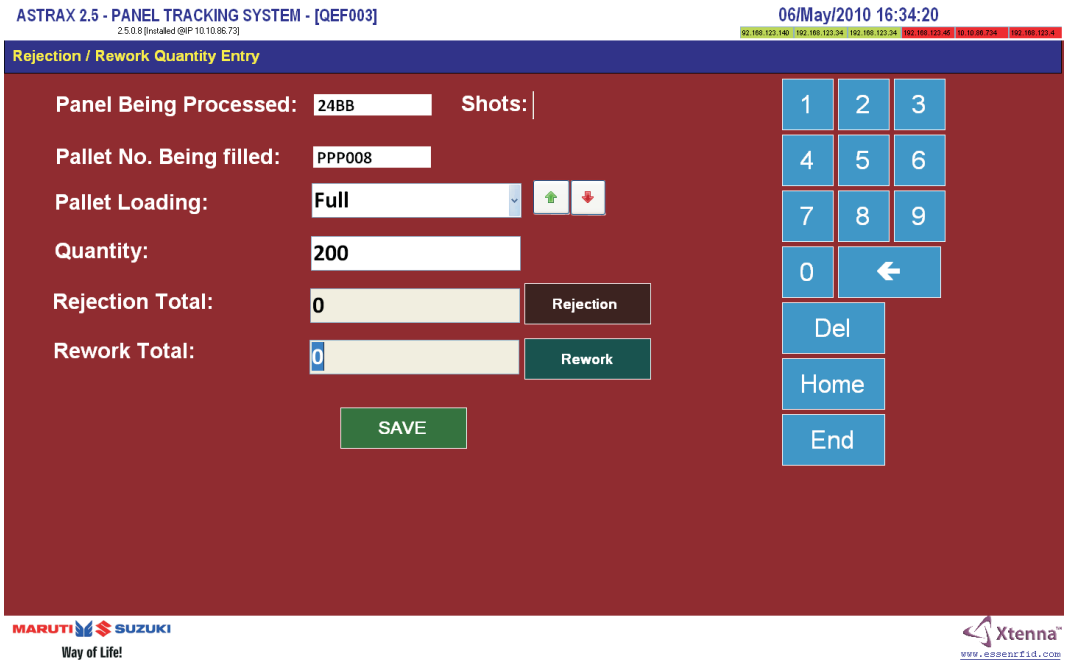
A tagged pallet that has already been registered in the database is brought near a PLC machine. Its tag is detected by the Xtenna Proximity™ reader. Once the pallet is detected, the panels on that pallet are fed into the pressing machine one at a time. After this process is completed, defective panels are separated while the others are placed back on the pallet.

Pallet details and quantity of panels are entered here via touch screen and an entry made into the database using the Xtenna Proximity™ device mounted on the PLC machine. If any pallets are rejected, then the reject count is also entered into the system.

Quantity Entry Screen:

Once the Pallet Current Status changes to Confirmation, the screen is ready for quantity entry. The operator enters the following details:

- Pallet Loading is either Full or Partial. If selected as Full, then the pallet's actual capacity is taken to be the default quantity. If the operator selects Partial, then he is allowed data entry in the Quantity field.
- The Rejection data field allows the operator to enter the number of pallets rejected during pallet filling.
- The Rework data field allows the operator to enter the number of pallets sent back for rework.



After quantity entry is completed and saved, the pallet is ready to be moved to the Weld Shop.

Accounting Screen:

The Accounting Screen appears once the PE Code has been changed. This screen displays all the details for the pallets that were under the previous PE Code, such as number of full pallets, number of partial pallets, total quantity, total PLC strokes, rejection/rework quantity, etc. The rejected panels count is manually entered into the system. In case this count is entered incorrectly, the system highlights a gap which has to be corrected by the administrator.

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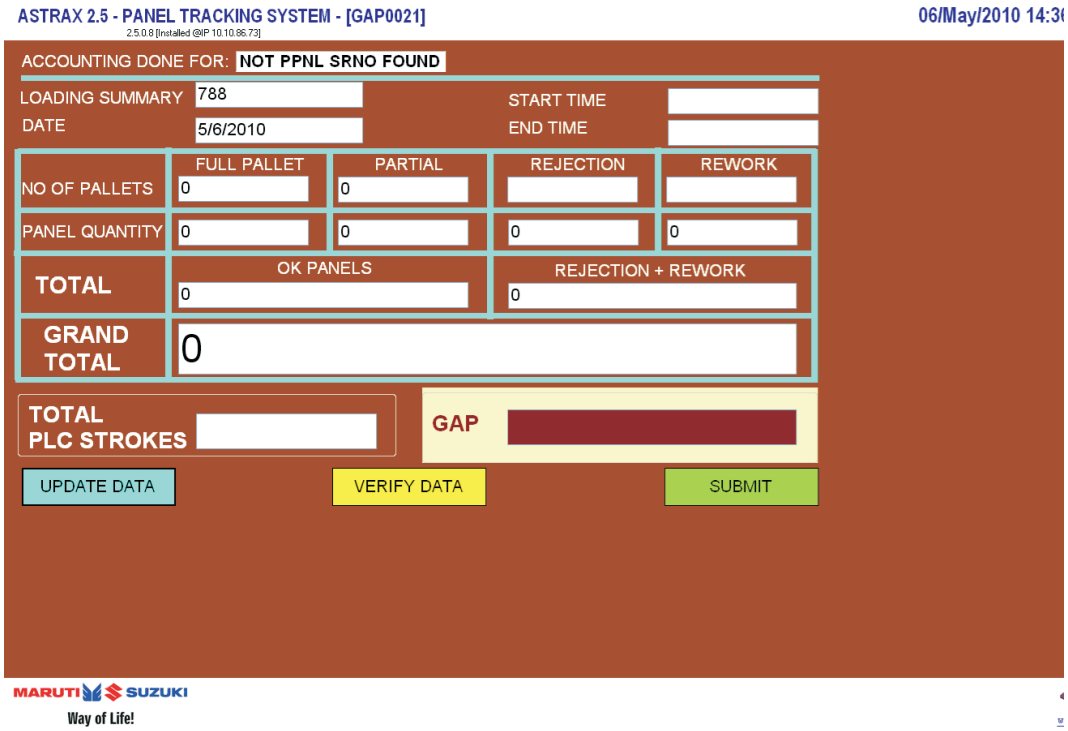
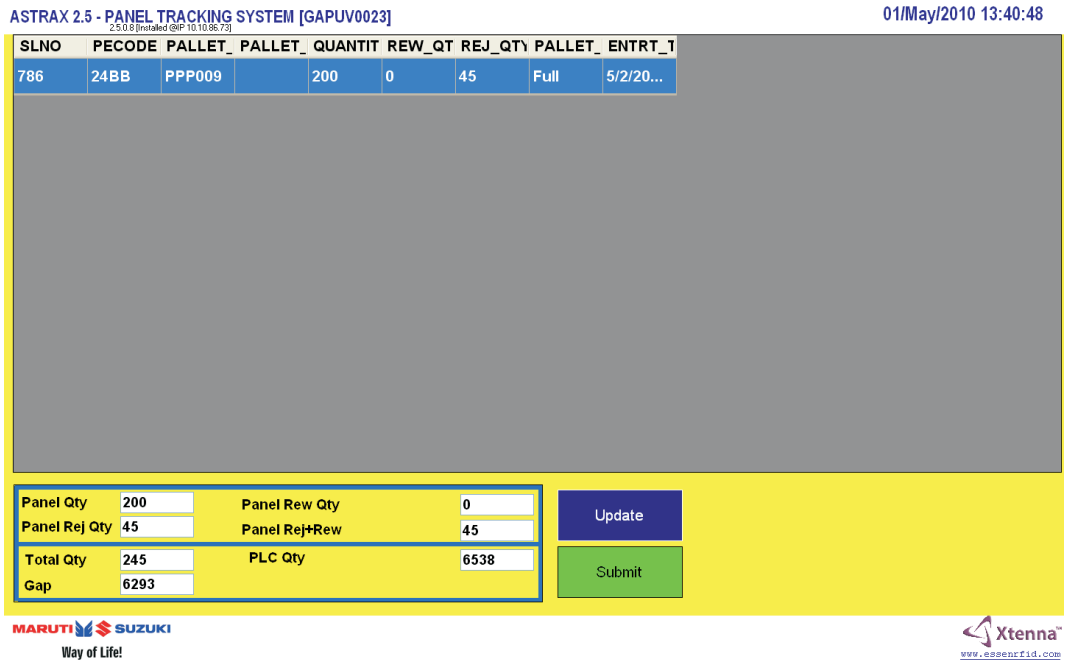
The accounting screen also has options for Account Data Verification and Account Data Updating.



Update Data Screen:

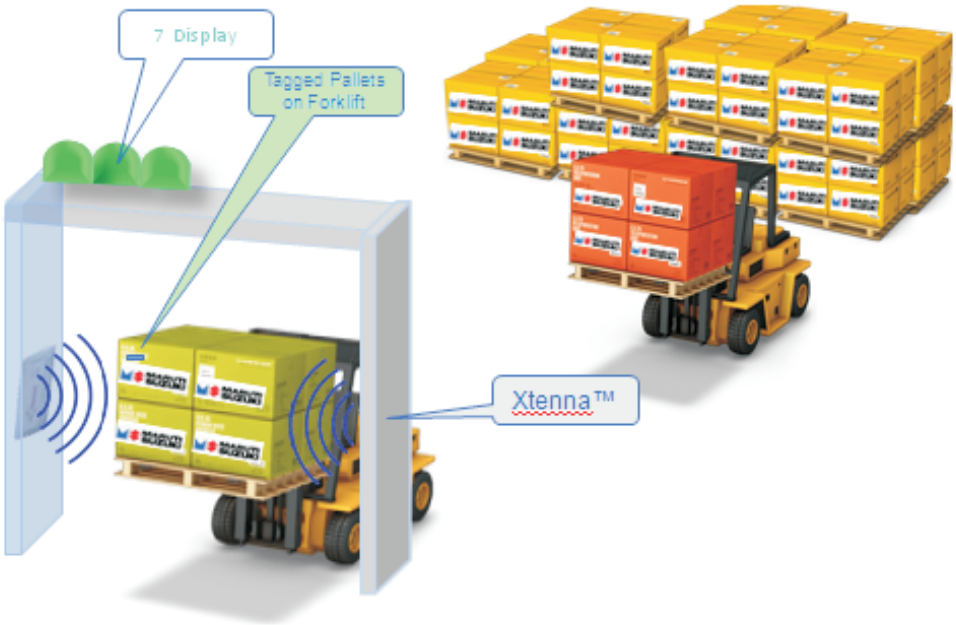
This screen enables modification of the Pallet Rejection/Rework Quantity and helps verify the gap between the Total PLC Strokes and the Grand Total.



Tracking Pallet Movement at the Press Shop Exit:

The processed pallets are then loaded on forklifts and either moved to the warehouse or directly to the Weld Shop. The Press Shop exit gate has Xtenna Hybrid™ antenna-readers mounted on it. When forklifts carrying outgoing pallets pass through the gate, the reader detects the tagged pallets and reads their tags. It captures pallet data and the panel count, and saves this information into the database.

In case of any rejections/returns from the Weld Shop, the operator manually enters the part number of the panels rejected and their quantity.



Reports:

The system generates the following web-based reports for status of real-time inventory:

a. Production Report
b. Rejection Report
c. Panel Stock Summary Report
d. Press Panel Stock Detail Report
e. Weld Panel Stock Detail Report

CASE STUDY

BENEFITS:

- Speedy and accurate management of panels manufactured and rejected.
- Correct panel loading on each pallet.
- Real-time information through planning grid of the total stock count and current production stock at each PLC machine in the Press Shop.
- Automatic tracking of pallets going from the Press Shop to the warehouse or to the Weld Shop.
- Real-time reporting functions available to the administrator.
- Optimization of inventory levels due to efficient automatic tracking.
- Reduction in cost and time taken for check-in and check-out of pallets entering and leaving the warehouse.

TECHNOLOGY:

Hardware:

Xtenna Proximity™

Xtenna Hybrid™

Tags:

METALLICA™

Software:

Xtenna WebToolkit™

Xtenna Studio™

REFERENCE EXAMPLE:

http://www.essenrfid.com/Mailer/manufacture-flash-demo.pdf