IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ADVANCED MANUFACTURING INFORMATION SYSTEM (AMIS)

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Abstract: A main limitation to achieve increase in production efficiency is unknown Costs & time required within a factory. By implementation of Advanced Manufacturing Information System (AMIS) a wide view of manufacturing process and increase in efficiency by analyzing the production site & data collection is possible. AMIS can be installed in factory for analysing any manufacturing process. It include ability to monitor floor of manufacturing line. The Programmable Logic Controller(PLC) is mainly responsible for collecting raw information with respect to different job orders issued to manufacturing department. This system calculates performance loss of any equipment by Overall Equipment Efficiency (OEE). AMIS provides online product wise production status of each stage of manufacturing and analyzed performance of each stage by providing the OEE. The system brings flexibility and visibility to production process along with reducing uncertainties.

Index Terms **- Monitoring system, PLC, E-factory, HMI, smart factory**

I. INTRODUCTION

Advanced manufacturing information system (AMIS) aims for smart manufacturing within factories. Mainly the system is aiming to provide efficient, configurable information to enable real-time decision making for a manufacturing line. In every factory, management can easily increase production efficiency by analyzing the production site & data collection.

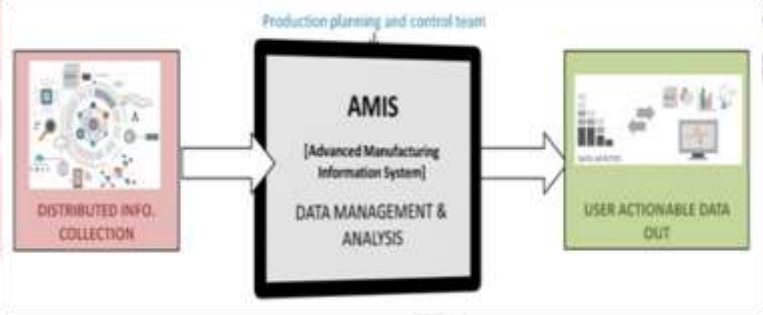

Figure 1 Conceptual Block diagram

AMIS is PLC based Monitoring system for identifying the need of improvements in a factory automation by keeping track of each and every product which is manufactured in a factory. This raw information is collected with respect to different job orders issued to manufacturing department by PLC. After calculation the data is displayed on monitor which provide the Overall Equipment efficiency(OEE). The OEE provides an accurate picture of how effectively your manufacturing process is running. As shown in fig.1 the distributed information can be Employee information, Shift information[1st/ 2nd/ 3rd /General], Production information[General/ Prototype/ Maintenance], Date and time information [Cycle time, Tact time, etc.], Particular machine parameter settings[Solder paste type, Stencil ID, etc.], Barcode serial no., approval of PCB Etc.

After data management and analysis Actionable data is in form of Online product wise production status, Online production breakdown info by GSM system Etc. which causes better co-ordination between current management requirement for production and line managers.

In the context of intelligent manufacturing, it is important to establish the new features in factory to achieve advanced manufacturing based on network technologies and manufacturing data. Due to the different characteristics of manufacturing field and information field, there are still many technical problems to be solved in order to accelerate the path of smart factory.

The main goals of this paper are to monitor the existing production line in real time, AMIS develop a system which offers a wide view of manufacturing industry, also system analyze manufacturing process by efficient, configurable information to provide accurate picture of manufacturing process by providing OEE and other performance parameters.

II. SYSTEM MODEL ARCHITECTURE

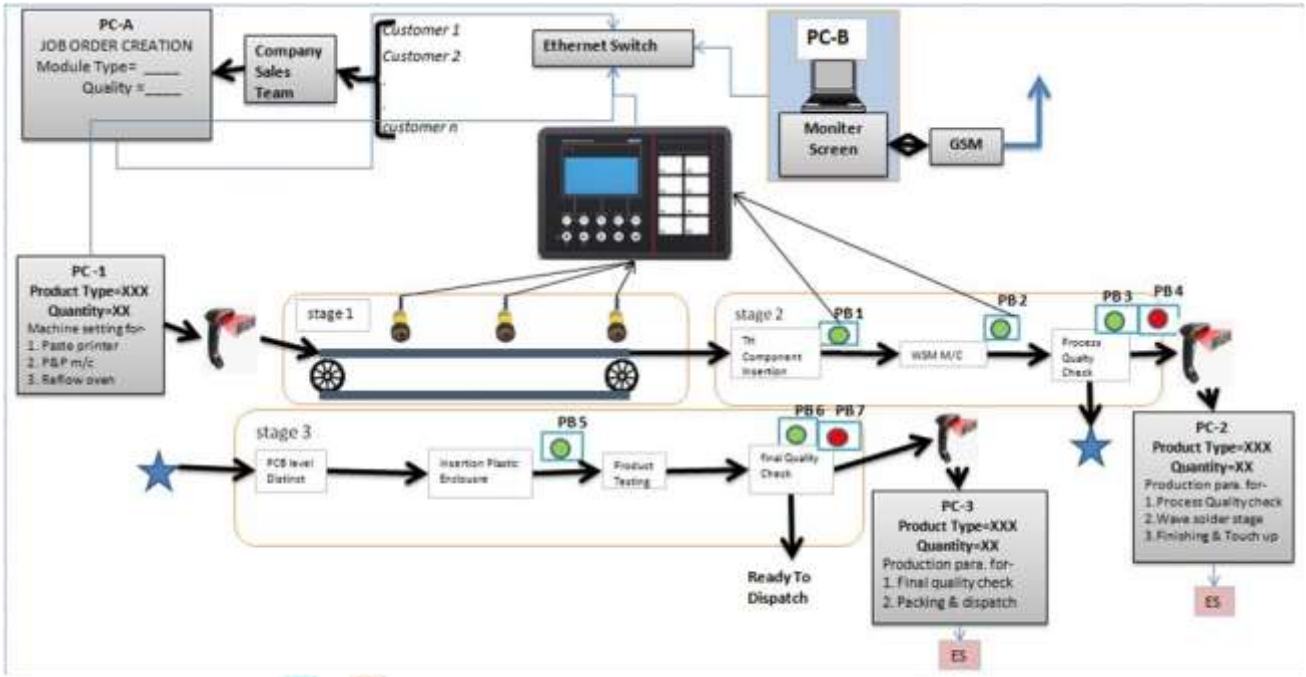

Figure 2 Block Diagram of the proposed system

Fig 2 shows various stages of an Electronics product manufacturing line like

STAGE1= SMT component assembly Line

STAGE2= Throughhole component assembly Line

STAGE3= Testing, Quality check & Packing

These three stages are performing their job as shown in fig 2. The barcode scanners and sensors are for detecting position of PCB passing via each stage. Push buttons at stage 2 & 3 are for counting number of PCB completed and rejected of that stage which are operated by operator. The collected information by barcode scanners, sensors, push buttons is analysed by server PC and the actionable data is provided with the Overall Equipment efficiency (OEE) which requires the Availability, Performance and Quality. These parameters calculated by monitoring the line of PCB manufacturing. The collected information includes Quantity targeted, Quantity completed, Operating Time, Planned Production Time, Total Count.

The sensors and push buttons are connected to PLC and it provides output to server PC through Ethernet switch. barcode scanners are connected to PC-1, PC-2 and PC-3 which is there for gathering the product serial no. about each stage. The OEE provides an accurate picture of how effectively your manufacturing process is running hence it is very important. The system is monitoring the complete manufacturing process and providing necessary analysis for increase in production efficiency. These parameters are calculated as follows.

III. RESULTS AND DISCUSSION

To effectively evaluate manufacturing system productivity and machine operations, different software used to combine discrete and continuous parameters in real time environment. This novel approach using real-time monitoring and assess manufacturing performance.

3.1 Hardware:

The fig. 3 shows the top view of hardware. The setup consist of three sensors placed below the conveyor belt, seven push buttons connected to PLC, which is used to track each manufactured PCB and also to analyze OEE of manufacturing process. The conveyor belt start rotating when motors at its both side turns on. HMI of PLC show the real time PCB count, operating time and planned production time of each stage.

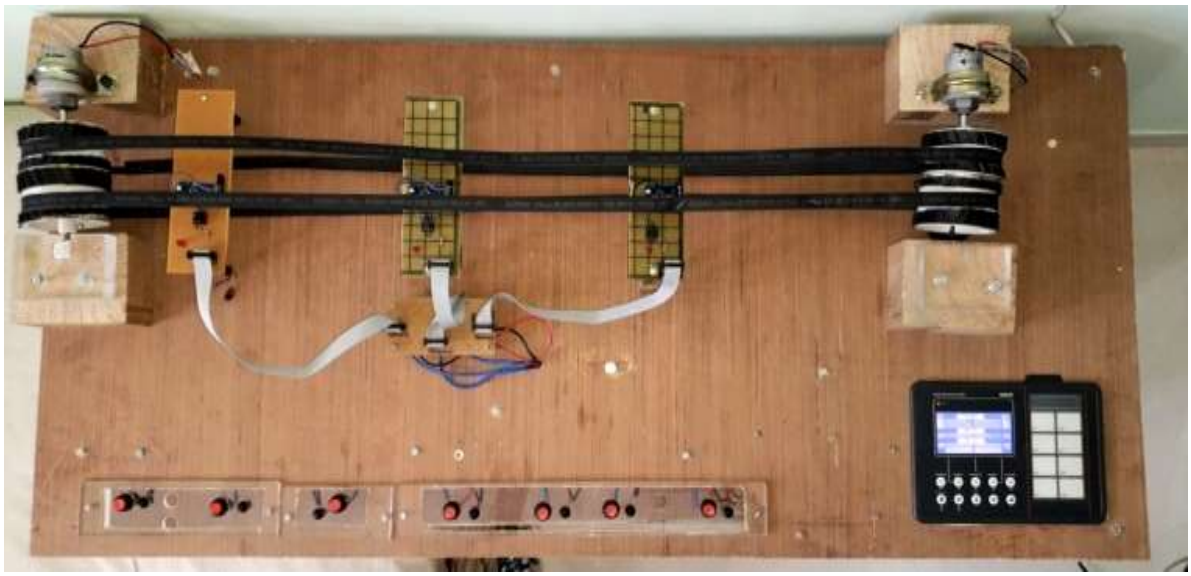

Figure 3 Hardware Setup

3.2 HMI configuration of GOC35 PLC :

Using CodeSys the four HMI window configuration is done as shown in fig. 4. CodeSys is a complete development environment for PLC. CodeSys puts a simple approach to the powerful IEC language at the disposal of the PLC programmer. So the operator can see the current status of each line on HMI screen. It consist of operating time and planned production time and count of approved and rejected manufactured PCBs of each stage.

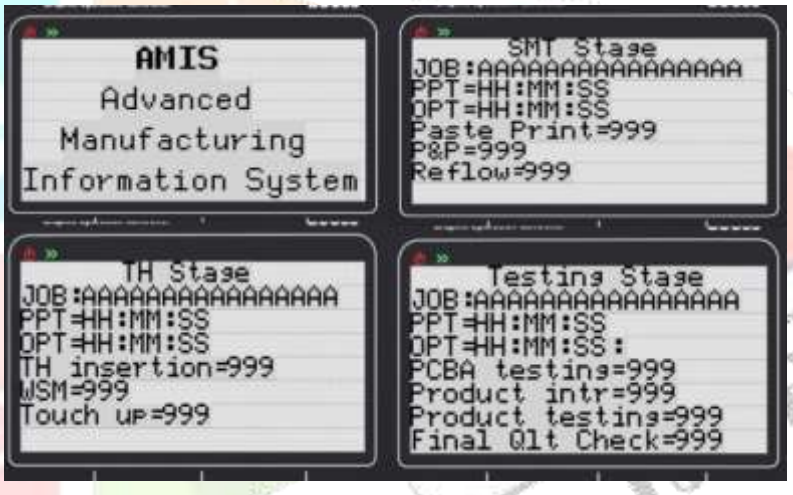

Figure 4 HMI Windows

3.3 GUI Windows*:*

The 1st window to enter information about quantity, select product type and parameters of the stage is shown in fig 5. It gives the information about the job order number and other parameters are displayed and PCB serial no. is provided which is scanned by the barcode scanner. This PCB serial no. is different for all PCB. Product type give the information about the which type of product is going to be manufactured. Here we monitor three stages i.e. SMT, Through hole and testing stage. The window shows the updated the status of manufacturing process, count in real time and the OEE is displayed along with performance, availability and quality. The fig. 6 shows the setting screen for setting the planned production time which is required for OEE calculation.

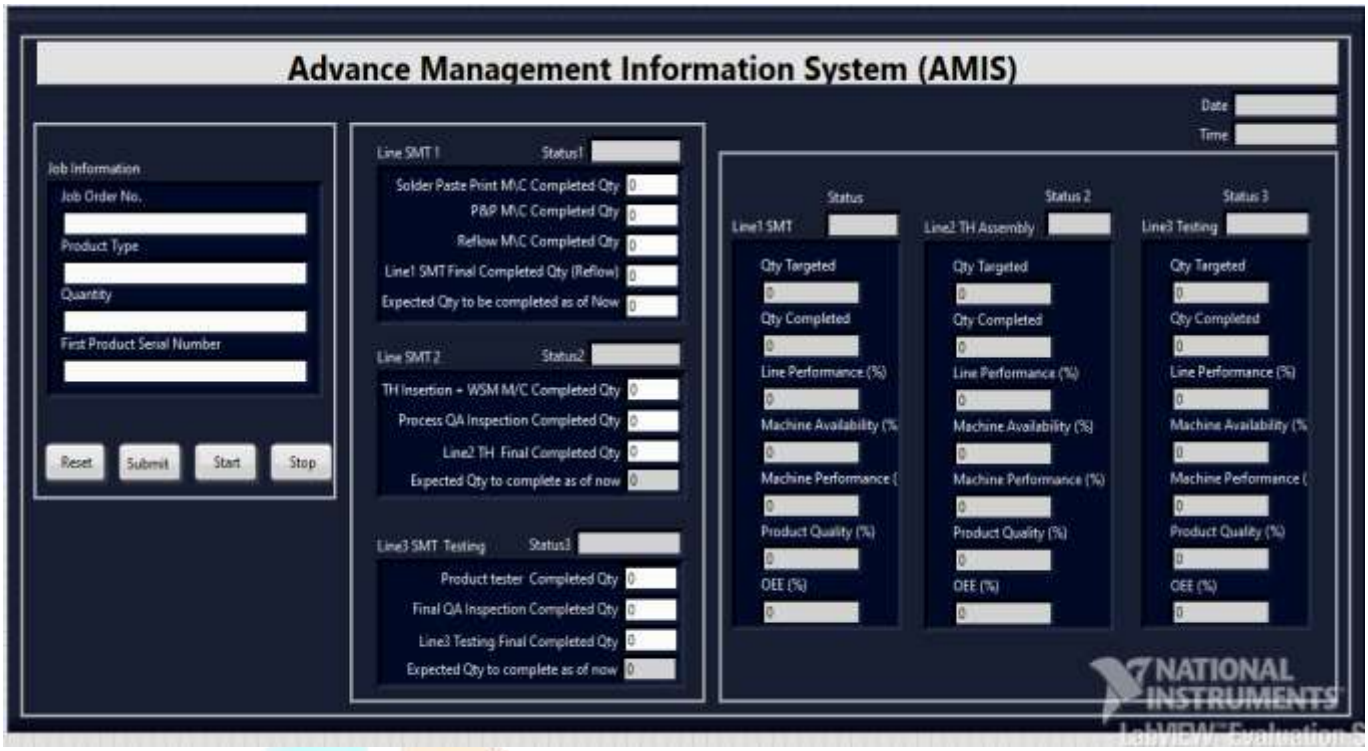

Figure 5 Final Server Window

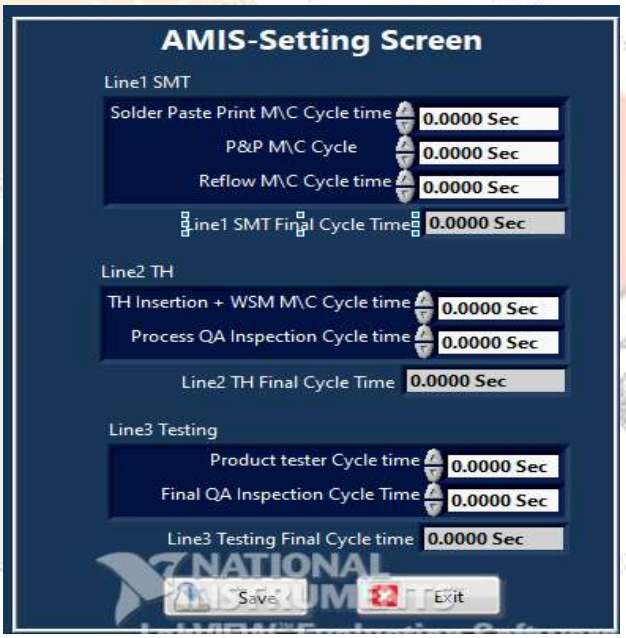

Figure 6 Setting screen

3.4 Sample output monitor screen display:

The output screen is shown in fig 5.The calculated parameters are displayed on monitor in the format shown in table 1. Also the online status of each stage such as in progress or planned or hold. Parameter considered are performance, availability, quality and OEE which are collected by monitoring the 3 stages SMT component assembly Line, Through hole component assembly Line and Testing, Quality check & Packing.

Table 1Sample Server Window

AMIS	**Online Production Information**		**Date: 30/5/2020**
			Time: AM11.22
Job order No.: P1112015	**Module type: PCB**		
Parameter	**STAGE1**	**STAGE2**	**STAGE3**
	SMT	**TH Assembly**	**Testing**
Status	In progress/ Planned/ Hold	In progress/ Planned/ Hold	In progress/ Planned/ Hold
Qty. targeted	100 Nos.	100 Nos.	100 Nos.
Qty. completed	90 Nos.	Nos.	Nos.
Availability (%)	60%	60%	60%
Performance (%)	37%	39%	41%
Quality (%)	90%	85%	80%
OEE (%)	19.98%	19.89%	19.68%
Employee information message			

IV. CONCLUSIONS

Advanced manufacturing information system is presented for real time monitoring and analyzing various performance parameters. It is an intelligent production system which utilizes the integration of manufacturing and services. Advanced manufacturing information system (AMIS) provides strong tool to collect, analyze & control production processes so that real-time decision making could be taken for a manufacturing line easily. The verification platform is introduced by means of the AMIS key technologies, which showed the OEE and other parameters.

Moreover, this system provides insight into performance at a system level that could be used to identify the need for actions such as maintenance, reconfiguration, or rescheduling. This hybrid model merges discrete and continuous variables at the machine level and considers system level interactions. It gives access Managers with Plant Information & analysis tools. System helps in better co-ordination between current management requirement for production and line managers. Also system evaluates performance and detects anomalies in production line

V. ACKNOWLEDGMENT

We take this opportunity to present our project report on *"*ADVANCED MANUFACTURING INFORMATION SYSTEM (AMIS)*"*..We are thankful to *Dr.Y.B.Thakare,* Head of the E&TC Dept. PVG COET, Pune. We are thankful to our Principal, *Dr.K.J.Kulkarni* and to all our staff members who encouraged us to do this project. Finally we own our thanks and deep appreciation much more than the words can express to our Parents and Friends for their Cooperation, Constant Support and Encouragement without which this would have been a distant dream.

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