



Stock Transfer and Production Confirmation using ALPE and QR-Code

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Abstract- Today the world is entering into Industry 4.0, all systems need to be connected and sharing information with each other to get work done easier and more profitable. QR-codes are revolutionary technology which is currently been used from transferring payments to check-in into flights, everywhere. ALPE is barcode and QR-Code reading technology used in automotive industry. ALPE scans QR-Codes and arrange it in user required structure. Stocks and inventory are important aspect of any manufacturing industry. The stocks must be visible at every stage of production and must not become liability for much time for industry. The proposed system suggests an approach to make stock visible to management to make quick decision on production and make lesser stocks and avoid scraps. All stocks and inventory to be visible on one-click. Author also proposed to use proposed system in lean manufacturing to reduce inventory and produce only up to customer requirements.

KEYWORDS: QR-codes, ALPE, Stocks, Inventory, manufacturing industries, one-click approach, stock visibility, Industry 4.0.

I. INTRODUCTION

In today's business scenarios, manufacturing industries are keen to keep lesser inventory and focus on more productive and low-cost solution to achieve lesser defects and scraps. Industries want to predict, manage and deliver only what customer ordered. Manufacturing industries are currently using machine learning, deep learning and data science to analyze the data and predict the future of orders and customer requirements.

These days management wants to visualize and check their inventory at real-time to strategize the production and keep inventory to as minimum as possible. To visualize the data of production, management needs data from stock transfers and production confirmation.

Stock Transfer is process of transferring stocks from one bin to another bin of production i.e. from one stage of production to another stage. For example, a part currently in drilling stage and after stage completion it must move to visual stage, these stages are known as bins.

Production Confirmation is process of transferring the parts from complete production line to assembly stage or from assembly stage to dispatch stage. Production confirmation is done at end of each manufacturing process i.e. at end of production line or at the end of assembly line, etc. If parts are scanned at this point, it must be visible to production planners and if production is not according to plan, planner can make changes according to visualization and analysis provided by proposed system.

Using ALPE (Automotive Logistics and Production Execution) and QR-codes (as shown in Fig. 4 and Fig. 5) are technologies which will be used in proposed system to minimize the difficulties of generating supply list and transferring stocks and inventory from one production line to another.



Production planner can also visualize their production activities real-time on screen through application (as shown in Fig. 6).

Marketing and logistics are two disciplines that complement each other in a supply chain. Logistics is comprised of various functions and one of these functions is information technology (IT). Besides supporting various operational processes, information technologies also support marketing activities of companies. Some information technologies are used both in marketing and in logistics. One of these technologies is the Quick Response (QR) code. The aim of this study is to explore and discuss the usage of the QR code technology within the marketing activities of logistics companies, particularly third-party logistics (3PL) companies. Furthermore, the usage of this technology together with social media tools is proposed. In this research, it is pointed out that if the implementation of QR codes and social media tools is fulfilled in a coordinated manner, marketing activities can be managed by logistics companies more effectively, reputation of logistics companies can be enhanced and a growth in sales, profitability and market share can be realized. As shown in Fig. 1.

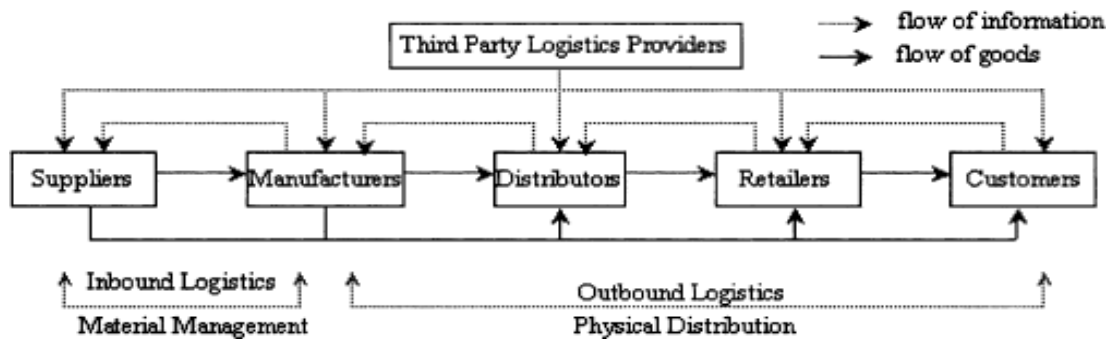


Fig. 1: Manufacturing Process in industries

Below is diagram explaining existing architecture and proposed architecture which simplifies production activity in any manufacturing industry and improve visualization to management for quick and wise decisions.

In existing architecture of production (as shown in Fig. 2), we can see there is no system of movement of material, parts are moved from supermarket (inventory) to either cleaning area or directly to assembly line, production managers or planner cannot track the material movement in real-time. Material once transferred to another area it was difficult to track location, moreover FIFO (First In First Out) was not maintained by associates as tracking was not possible of production. Whereas, in proposed system (as shown in Fig. 3), Author has introduced bins for every process and using QR-codes and bins we can easily track material movement in real-time and planners can plan their production activities according to current movement of material. Production can be tracked real-time through an app (as shown in Fig. 6)

Existing architecture:

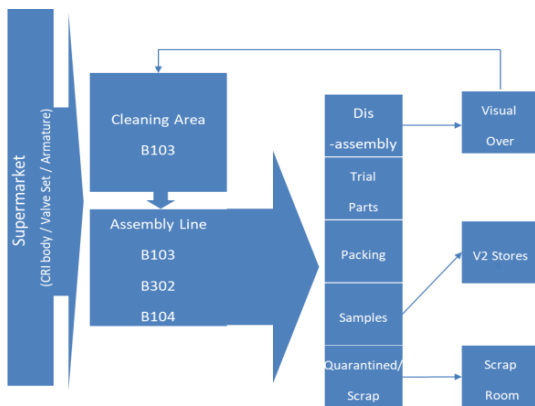


Fig. 2: Bosch existing manufacturing process

Proposed architecture:

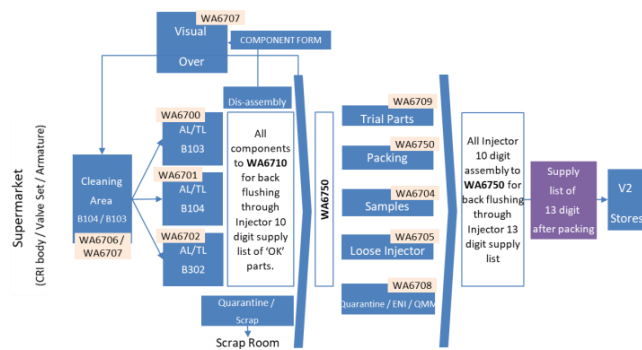


Fig. 3: Proposed system

Architecture [Resource: Bosch MFC]



QR-code format:

1. Stock transfer QR-code:



2. Production Confirmation QR-code:



Fig. 4: QR-Code used by operator to transfer stocks

Fig. 5: QR-Code used by operator to confirm production

Stock Visualization:



Fig. 6: Visual representation of stocks available in inventory of Bosch Company

II. PROPOSED ALGORITHM

2.1 Stock Transfers using QR-codes –

In stock transfer, QR-codes with ALPE is used to transfer stock from one stage to another so that responsibility of material is transferred from one production team to another production team in real-time. Production managers only need to scan QR-Code of part number which is associated with “FROM BIN” and “TO BIN”. At each stage some features are added to production which is confirmed by next stage. If any defect detected, it can be reported at each stage so that production must not move to next stage and extra cost can be saved. Process is explained in Fig. 7. [6]

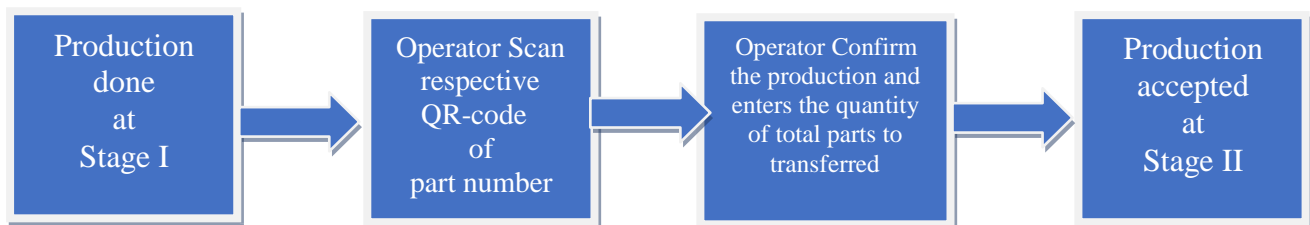


Fig. 7: Stock Transfer using QR-code.



2.2. Production Confirmation using QR-codes –

In production confirmation, QR-codes with ALPE is used to transfer stocks from one production line to another i.e. from raw material to semi-finished product and from semi-finished product to finished product and from finished product to dispatch. At every stage if transparency is maintained and inventory is visible the planning gets better and productivity is improved. Process is explained in Fig. 8.

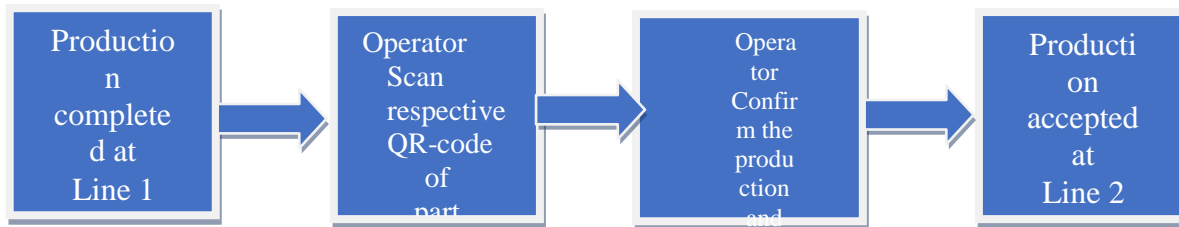


Fig. 8: Production Confirmation using QR-code.

III. EXPERIMENT AND RESULT

Author started experimenting on timing require to generate a supply list manually and supply list which is generated using proposed system.

Sr. No	Method	Time taken to generate supply list
1	Manual	15 minutes
2	Proposed system	2 minutes

Table 1: Savings achieved in terms of time

It was 7 times more saving of time than traditional method as shown in Table No. 1.

During experiment it was observed that in traditional method manually data was feed at the end of every shift which was not providing real time stock visual. Currently, implementing the proposed system in Bosch, we have observed that all stock is visible to planner and productivity of planner was improved. Also, scrap was reduced and lean manufacturing was achieved.

Author also focuses on cost of printing supply list to transfer material from one line to another. If proposed system is used in production, we don't have to print supply list as all stock is transferred to intermediate bin after which once acceptor of material accepts the material it is then reflected in acceptors stocks. Savings are derived in Table No. 2.

Sr. No	Method	Cost of paper/pc
1	Manual	Rs. 3.00
2	Proposed system	Rs. 0.00

Table 2: Savings achieved in terms of cost

During experiment, author found that training is also important aspect of building system, author trained the people who were using the system and result was people learned the proposed system well. Special training sessions was conducted.

IV. CONCLUSION

The system derives the method to minimize stock inventory of production and provide add-on on concept of lean manufacturing. The system helps reduce the cost of scraps, provide analysis to be in-line with client requirement and orders. Moreover, the system provides real-time view of inventory to production planners so that planners can plan the production and prioritize their production accordingly. Using ALPE and QR-Code in production line



makes it easy to understand production and saves time to print supply list for transferring the stocks from one line to another. Industry 4.0 is transforming the industry and its working to produce as cost-effective as possible and this system is a part of Industry 4.0 applications for manufacturing industries.

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