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Integrating Network Technology with Production Supervision: Low Cost Solution for Managing In-Process Inventory

Suraj Yadav
(Department Industrial Engineering FM INDIA PVT LTD, Ahmedabad, India)

ABSTRACT

In context to the manufacturing situation in the shop floor, work-in-process (WIP) management or the in-process inventory and control as the inevitable result of the production process have become the key link of production plan. Due to the growing production requirements and the potential economic benefits of manufacturing process flow, enterprises have been pushed to integrate work-in-process management with their manufacturing process and the larger the company the larger the list of in-process inventory and this all are typically hard to manage so for the same respect the author in this paper has lighted on the integration of the sophisticated electronics and networking technologies with the W.I.P with an native and low cost solution for managing the same, specially for the medium scaled company dealing with large number of product or with the customized product with reference to study of present scenario of a multinational company's plant engineering department.

Keywords – In-process inventory, Lean manufacturing, WIP visibility, Inventory traceability, WIP reporting.

I. INTRODUCTION AND LITERATURE SURVEY

Today's manufacturing scenario is based on continuous and continual improvements which in turn are dependent on the different type of analysis carried out at different stages of manufacturing and process, based on the same the plan, estimation and other activities are forecasted in context of betterment of the present condition. In-process inventory traceability and visibility are a tool for analyzing the situation of perfection and improvements, these all are the data which contribute for different improvements and chances for the same, in turn all these consumes ample amount of time, manpower and cost for computing different reports and analysis. There are different types of ERP systems available for the same but implementing these for the entire organization and full utilization of the ERP system is very tedious.

Some more disadvantage of S.A.P/ERP's is the high cost of purchasing and implementing this program. The company must purchase the software and hardware necessary to run the programs company-wide. Costs also include labour costs of internal information technology (IT) employees or external consultants overseeing the process. Once the company implements the software, employees need to be trained. This involves training each employee in the functions they have access. On-going costs include software maintenance and periodic upgrades. Another disadvantage of SAP is the complexity built into the software. Most companies implement one feature or function of the software at a time, allowing employees to gain familiarity with the software before moving forward. The complete implementation process may take several years. Considering all these, a module is developed which is simple to use and will give a better analysis report and the function which are developed all will be used. We can say that it is fully customized solution with low analysis and implementation cost. That will give a proper traceability of in-process inventory and will give a proper plan of action for the routings.

II. Analysis of Present Scenario:

A study was conducted on Present production scenario of a company's plant engineering department the study was based on a specific cell of the department dealing with 10 huge machine, with production of number of clamp platen(GGG40 CAST IRON machining) and injection platen(GGG40 CAST IRON machining), Dealing with about 50 number of different clamp platen and about 35 number of different injection platen also dealing with alteration and special option of customer in any of the platen (alter platen).and all in 3 different setup (each set up requires work to be performed on different machine) .

Dealing with about 150 to 160 parts with different types of particular machine operations in clamp platen cell, about 104 to115 parts with different types of particular machine operations in injection platen cell and in totality dealing with 250 plus customized product with a tedious monthly schedule and a complex flow path

The monthly production data of the factory was analyzed and total production of a month was calculated with considering the different types of alteration which is summarized below in figure 1.

HMC PLATEN CELL PRODUCTION STATUS					
	M/C/ DATE	1 TO 10	11 TO 20	21 TO 31	TOTAL
1	HMC 1	19	33	47	99
2	HMC 2	20	15	18	53
3	HMC 3	9	11	10	30
4	HMC 4	8	13	8	29
TOTAL		56	72	83	211

BORING MACHINE PRODUCTION STATUS					
	M/C/ DATE	1 TO 10	11 TO 20	21 TO 31	TOTAL
1	BORING M/C 1	24	29	18	71
2	BORING M/C2	10	11	10	31
3	BORING M/C 3 1ST SET UP	15	25	10	50
4	BORING M/C 3 3RD SET UP	21	14	44	79
TOTAL		70	79	82	231
A TOTAL OF 442 No. OF STAGES ALL WITH DIFFERENT ALTERATIONS					

Figure 1: Monthly production of product on the HMC CELL machines.

Also the layout of the HMC cell is shown below in fig 2:

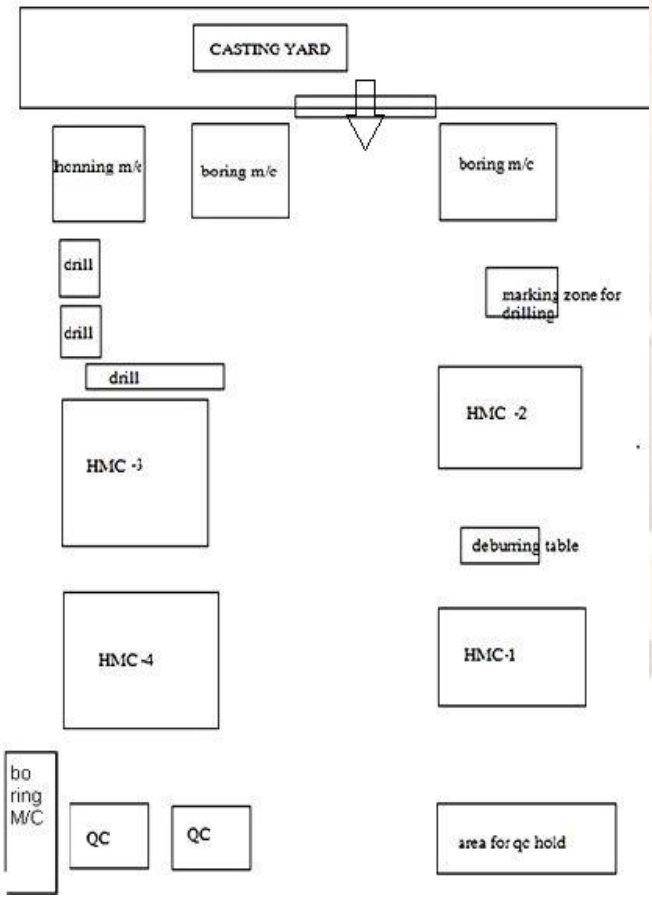

Figure2: Layout of the platen cell of machine shop

III.THE ROUTING FOR SINGLE PRODUCT

The material is 1st brought from the casting yard then marking is done with respect to the casting drawing then it is send to the boring machine for the 1st set up also kwon as reference cut in which the casting faces are machined accordance with required dimension which takes about 8 hours for completion, after that is goes on the horizontal milling machine(H.M.C) where it is clamped and according to the drawing dimension it is machined which again takes about 10 to 11 hours for the 2nd set-up, after that again it is send on the boring machine where it is finally profiled in shape this is sometimes also done on the same machine in which the 2nd set up is done with re-clamping on different side. After that it is again send to the marking table for marking against drilling with respect to the machined surface and also drilling some drill points which are not possible on the horizontal milling centre(H.M.C) which again takes about 6-7 hours to be completed and after that platen are given to the de-burring table where the machining burrs are remove and the bores are made under allowance by papering and hand grinding tools which again takes about 3-4 hours then the platen is handed over to the quality people where the dimension are checked and accordance with the inspection report the platen comes under shop's stock and send to the fettling area where the casting part or the non machined part are maintained in shape or the evenness is maintained and then send to the paint shop for painting, The flow for the routing is shown below in figure 3

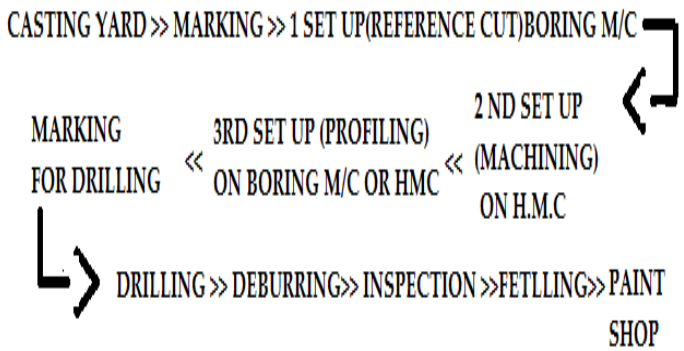

Figure 3: sequence of routing.

Now adjoining all the above facts and drawing a flow complexity of a single product which is shown below figure 4

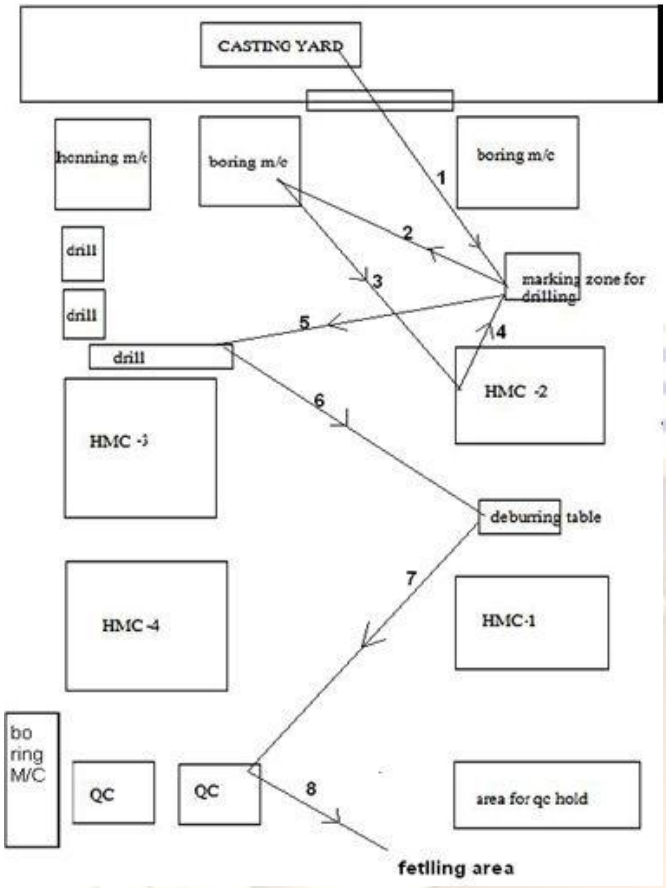

Figure 4: Flow complexity of single product

Dealing with such a complex and repetitive scheduling in not so simple task and also not simple when you are dealing with such a scenario day by day this all lead to development of some inventory tracking instruments and ideas for keeping track for the W.I.P status. Although there are many systems available in market like bar-coding systems and RFID systems that are advantageous but they also invokes many disadvantage, some of them been discussed below

IV. DISADVANTAGE OF CURRENT INVENTORY MANAGEMENT SYSTEMS

Barcode inventory management systems

Barcode scanners need a direct line of sight to the barcode to be able to read.

In order to read the barcode, the barcode scanner needs to be quite close; around not more than 15ft.

Barcodes have no read/write capabilities;

They are very labour intensive; as they must be scanned individually.

Barcodes have less security than RFID; as they can be more easily reproduced or forged.

Barcodes are more easily damaged; as the line of sight is needed to scan, the printed bar code has to be exposed on the outside of the product.

If a barcode is ripped or damaged there is no way to scan the product.

Disadvantage of RFID systems

RFID involves assembling and inserting a computerized chip; which works out to be more expensive.

RFID readers struggle picking up information when passing through metal or liquid.

Reader collision can occur where two signals from different readers overlap and the tag is unable to respond to both.

Tag collision can occur when numerous tags in the same area respond at the same time.

RFID still has two separate chips (read only and readable/writable), which cannot be read by the same machine.

So dealing with all this, a local in-process inventory tracking system was conceptualized for effective and low cost solution.

Suggested Module

Suggested module consists of a dedicated local area networking which consist of one control points/receiving point and different input points placed at different machine. The input module will have different types of input options it will be like a screen consisting of different buttons which will be used by the operators to enter the work in process on their machine, the semantic of the same is shown below in figure 5.

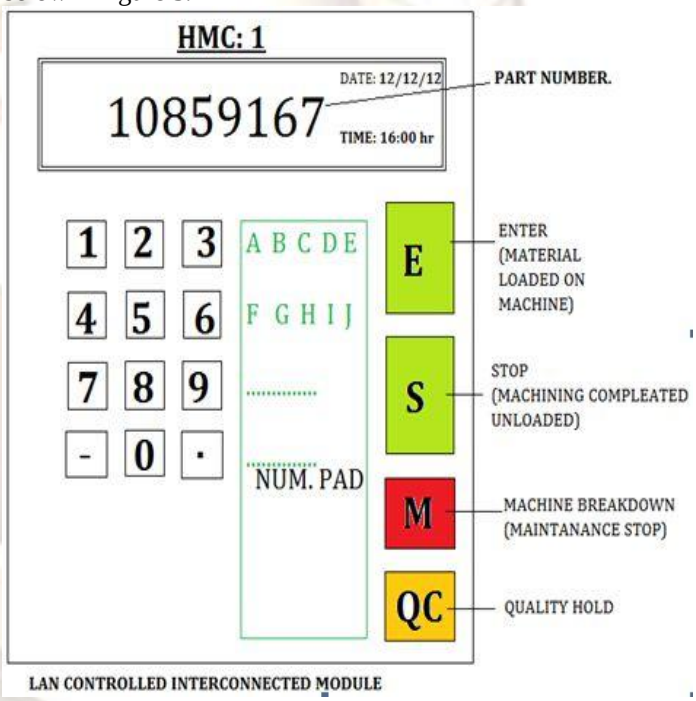

Figure5: Lan Controlled Module

This will be placed next to the control panel of each machine

At starting the of each part the operator will just enter the part number of the product to be machined and then he will press enter, after this he will continue his routine work, the data entered will be updated on the network controlled computer, stating for example. A product no 10853772 is started on HMC-1 at hh:mm hours and anybody can assess these or search for the product status. After machining of the product the operator will press

"stop" button and due to this network computer will be automatically updated for the finish time of the product and the total time taken by the machine to finish the operations, now the same product as per routing will be routed to different machine and now due to this update interface/input interface it will again show the start time of the other operation of the same product on different machine, mean while the ideal time or the material movement time can also be calculated.

Now during machining if any problem is found or any product is rejected the operator will press "QC" button that's means the machining is stopped due to some quality issues and if the machine is under maintenance the operator needs to press "M" button it will show that the machine is under breakdown and operation is stopped.

All the entry of the LAN module will be recorded in a data collection centre this will have the records of all the LAN module with reference to the part No. of the product, so any authorizes person can easily have a real time stage wise availability of the in process inventory, status of the product process and can easily work on the calculation of the plants time study, bottlenecking, efficiency and many more with-out visiting the shop floor although in a clear and concise manner.

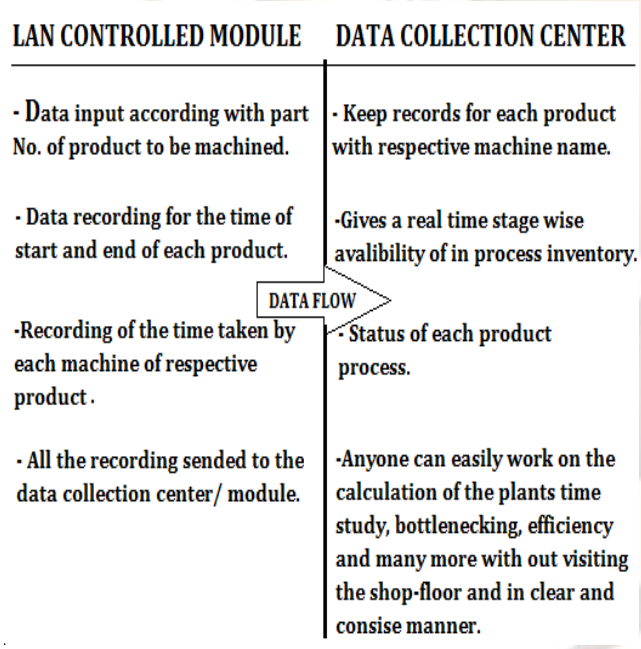

Figure6: LAN module and data collection system

After consideration and the study of different aspects of production supervision this above mentioned can be a low cost solution for the management of in-process inventory.

V. CONCLUSION

In a nut and shell this way of production supervision will open a gate for the networking especially in the small and medium scaled production industries where the amount of automation is constrained with the amount of investments. Also it will provide a better solution for managing of in-process inventory and will give the tool for better analysis and at last will lead to increase in efficiency.

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