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Analysis of Card controlling System in Conwip, Kanban and Base Stock Control System

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Abstract*—Productive production control system is that which produce the right parts, at the right time at a comparable cost. These schemes are often referred to as just–in–time, push or nil inventory. In push system uses card sets to firmly control work-in-process between each two of workstations. Total system work–in-process (WIP) is restricted to the summation of the number of cards in each card set. Production happens at a workstation only if raw material is accessible and the material has a card authorizing production. Each set of push card between workstations authorizes material to be dragged into the upstream workstation for processing and consignment to the downstream workstations. In pull seems to share the advantages of push while being applicable to a wider kind of production environments. A pull system values a lone global set of cards to control total WIP. Material enters the systems only when demand happens and raw material obtains a card authorizing entry, the card authorizes the material to move through the system to complete production. When the products depart the system, the card is issued, permitting the new material to go in the system. In this system, the WIP is not controlled at individual workstation. Conwip control system, Kanban System and base stock control system are the major control systems from push and pull systems. The purpose of this research paper is to investigate and analyze the card controlling system of Conwip system, Kanban System and base stock control system.
***Keywords*— kanban, Conwip, Base stock control system**

I. INTRODUCTION

There are two main types of strategies used for production control: push and pull. Push systems schedule periodic release of raw materials into the production line, while pull systems authorize parts to be processed in response to the actual arrival of demand. Push systems batch and control the system's release rate (hence throughput) and monitor work-in-process (WIP) periodically, while pull systems control WIP and monitor throughput. A push strategy pre-schedules production jobs according to capacity. On the other hand, a pull strategy focuses on balancing production flow, and triggers the production of a new job at the arrival of demand or completion of an existing job.In another classification production control systems may be classified into two systems. The first is Materials Requirement Planning and its successor Manufacturing Resource Planning-II. These control systems impel materials into the production facility based on Forecasted demand, and are thus known as push systems. In the second control systems, known as pull systems, the material is issued into the production facility only when the demand for the end point triggers it. Since the material is issued into the system only when it is needed, these systems are furthermore called JIT systems. The popular implementations of JIT control systems are Kanban ,Conwip and Base stock systems[1,2].

II. PRODUCTION CONTROL SYSTEM

Production System have existed since the earliest days of civilization in the form of craft production, in which handcrafted product is used for one-by-one customer with uniqueness and made entirely by one individual. Now Production system in manufacturing is a method that has ultimate aims to make a one unit at a time, at a formulated rate, without waiting time, queuing time.

A. kanban System

This kanban is a japanese word for card. a kanban control system is a production mechanism that uses kanbans, or production authorization cards, to control the work-in-process (wip) of the production floor. once a customer demand arrives, the kanban that was previously attached to the finished part is removed and sent back, upstream, to re-initiate the manufacturing production process. This happens simultaneously while the finished part is being shipped to the customer [1]. Kanban provides a direction of raw material or subassemblies with all necessary information regarding the use of parts and the inventory level. In the kanban system process enhancement is carried out by the reduction of inventory, which can be accomplished by: - (i) decreasing any of the replacement times or decreasing the pickup time by the process, this is generally accomplished by expanding the process frequency , decreases in any of these items will decrease cycle supply inventory(ii) decreasing the variation in the production rate, which allows security supply decreases (iii) decreasing the variation in the demand, which permits buffer supply reductions. in the kanban system, according to the calculation, set of kanban cards allow into the each workstation in the system.

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A kanban card is primarily attached to a batch to be processed by that workstation [3].

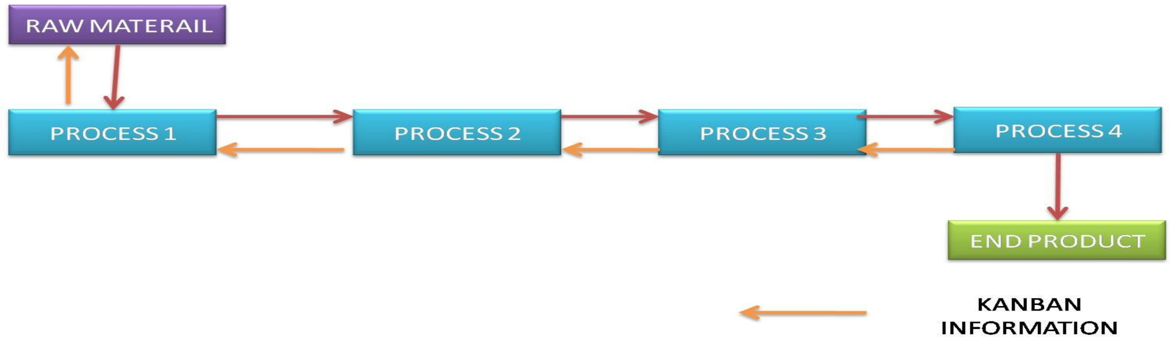

Fig. 1 Kanban Production System

The kanban card stays attached to the batch until a downstream workstation has a kanban card available. when this happens the adhered kanban card is freed from the workstation's and the before set free kanban card from the upstream workstation becomes allotted to that particular batch, therefore a free kanban card permits a workstation to get material from the previous position when the material is available.

B. Conwip System

The conwip system is a modified pattern of the kanban system. The conwip to limit the wip of a system whereas kanban are assigned to a system of particular workstation. This distinction allows conwip to be control the whole line and the kanban system for particular machine or workstation[4]. In a conwip system the cards get attached to batches only at the first station. The card continues affixed to the batch until the batch has completed processing on the last workstation of the conwip system and the batch is utilized to complete a system's demand. The issued card is then returned to the initial workstation of the conwip line and to authorize the entry of a new batch into the system. Under a conwip system sufficient cards should be assigned according to the utilization of bottleneck. If the number of cards is insufficient then the bottleneck points can decreases the system's throughput.

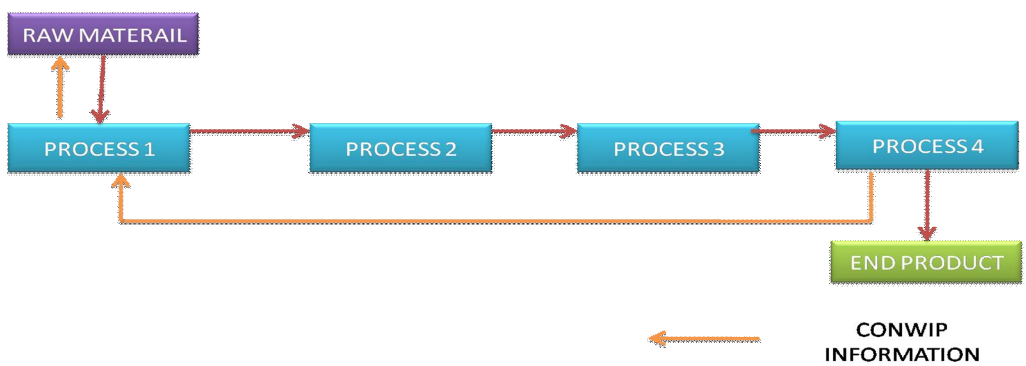

Fig. 2 Conwip Production System

conwip functions as a pull system; the start of a batch is triggered by the end of another batch. in alignment to accomplish this procedure of control, conwip utilizes a pull -push approach. it can be address a repaired number of or cards that complete a circuit, which constitutes the whole production line. each card is dispatched back to the starting of the line where it waits in line to obtain another batch of pieces.

C. Base Stock Control System

Base stock control system is a simple drag control means for coordinating multistage output system where the period "base supply" is scrounged from inventory control theory[5]-[7]. It tries to maintain a certain allowance of finished components in each output buffers, subtracting backlogged completed items demand, if any. This allowance is called the base stock grade of each stage. To function a base stock system, it is necessary to convey demand information to all production phases as demand occurs, which can be called international demand data. This can be finished by using either card-based scheme or computer-based scheme.

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III. CARD CONTROLLING SYSTEM

The main difference between all productions controlling system is, movement and controlling of card in particular system. In this section, we will compare Conwip system, Kanban System and base stock control system.

A. kanban System

Kanban control is likely the most famous pull-type mechanism for multi-stage output system throughout the last couple of decades. This control and respect bounds the amount of inventory to a fixed greatest for each cell consisting of a stage and its yield buffer, where the greatest is identical to the number of kanban circulating within the cell.

The design drawing shows the mesh form of a single-product simple Kanban control principle with two phases in tandem. B is the output buffers of stage n encompassing both completed parts and stage-n kanbans. line Kn comprises stage-n kanbans. When the scheme is in its initial state, Bn contains kn stage-n completed parts, each part having a stage-n kanban attached to it, and all other line are empty. The Kanban control functions as follows. When a customer demand arrives at the scheme it connects queue D requesting the release of a completed merchandise from B3 to the customer.

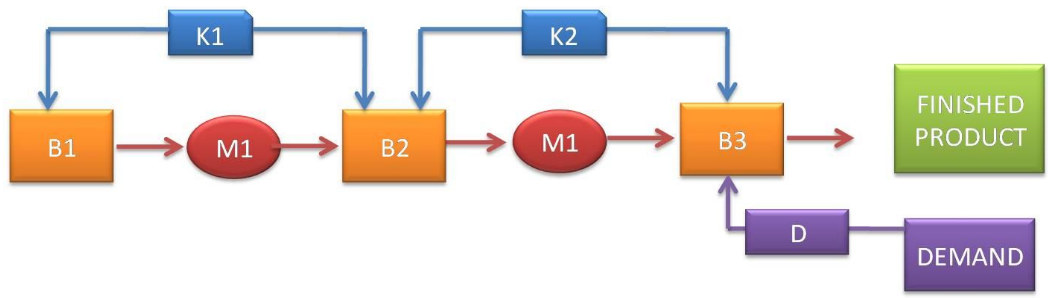

Fig. 3 Card Controlling in Kanban Production System

At that time there are two possibilities:

If a part is accessible in B3 (which is initially the case), it is released to the clientele after liberating the stage-2 kanban that was adhered to it. This kanban is moved upstream to K2 carrying with it a demand pointer for the output of a new stage-2 completed part.

If no part is accessible in B3, the demand is backordered and waits in D until a new part completes from stage 2 arrives in B3. The freshly finished part will be issued to the customer instantly and the attached kanban will move to K2 line instantly too.

This way the customer demand data is moved upstream by kanban signal. If at some stage n a completed part is not accessible in Bn, no kanban is moved upstream and the demand information is for the time being stopped; it is resumed when a part becomes available afresh in Bn. therefore, the beliefs of the kanban control is that a clientele demand is conveyed upstream from stage n only when a finished part is issued downstream from stage n[8].

The kanban is a easy control system that depends only on one parameter per stage, namely kn, n = 1,…, N. These parameters leverage both the transfer of finished components downstream through the system and the move of demands upstream through the system.

B. Conwip System

CONWIP sustains a WIP grade top compelled for the whole system. When the preset WIP grade is come to, no new occupations are authorized for issue to the system before some job departs. This happens in answer to demand events. A CONWIP line can be glimpsed as controlled by a lone kanban cell including all stages. Figure 4 shows the queueing network model of a single-product CONWIP control policy having two manufacturing stages in tandem. Even though there are two stages drawn here, CONWIP production control is executed only at the entry of the manufacturing system and the intermediate buffer, B1, plays no control action. CONWIP control is really advised as a single-stage control [9] [10]. We depicted the system as two stages for the consistency purpose, since all other control policies will be recounted later are depicted as two constructing phases. M1 and M2 represent constructing stage 1 and 2, while B1 comprises raw material buffer. line Bn is the yield buffers of stage n. line Mn is the total amount of components that has been issued to stage n. line D comprises the demand and line C comprises CONWIP cards/signals .

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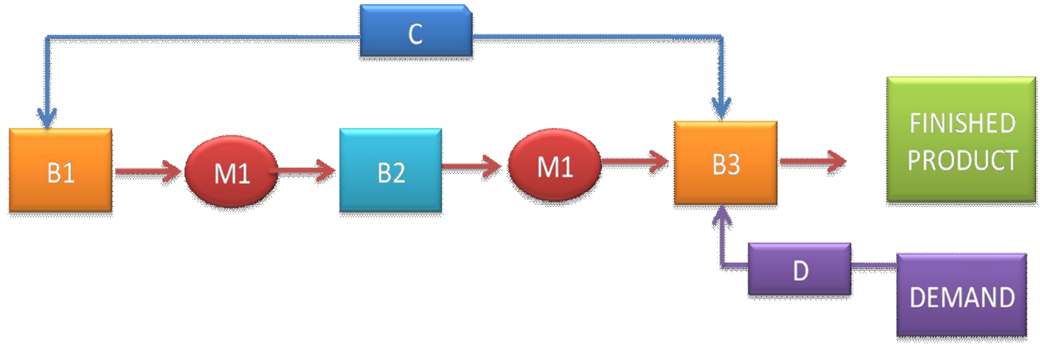

Fig. 4 Card Controlling in Conwip Production System

When the scheme is in its initial state, that is before any claims have arrived at the system, buffer B1 comprises no part. Only buffer B3 comprises C completed parts attached with the CONWIP cards. The CONWIP policy functions as pursues. When a customer demand reaches at the system it demands the issue of a completed product from B3 to the clientele.

At this time there are two possibilities: If a part is available in B3 (which is primarily the case), it is released directly to the clientele and the CONWIP card is detached from the part and moved to line C.

Else, the demand is backordered and waits in D until a new part completes from the upstream stage arrives.

For other phases beside the last stage, they will operate in the identical way as push system, i.e. parts move downstream without any impeding. The CONWIP control is a very simple control means that counts only on one parameter for the whole scheme, the allowance of CONWIP, C. It influences both the move of completed components downstream and the move of claims upstream through the system. There is no demand move between each stage except the last and the first stage. The production capability or the greatest output rate of the scheme is affected only by the allowance of CONWIP card, C.

If a stage goes wrong in a CONWIP line, the amount of material downstream of it will be gradually flushed out of the scheme by the demand process[11]. These demand events will trigger the release of new raw components into the system. When all CONWIP cards construct up in front of the failed appliance, the issue of new jobs to the system will then halt. CONWIP can be applied by associating a lone card with each part, authorizing its occurrence in the scheme. Whenever a part leaves the completed items inventory, its card is detached and dispatched to the first production stage, authorizing another part to enter the scheme. All other phases always authorized to work on any part issued to the system, so passing card to these machines is not necessary.

C. Base Stock Control System

Base stock control system is a simple demand control systemmeans for coordinating multistage output system where the period "base supply" is scrounged from inventory control theory. It tries to maintain a certain allowance of finished components in each output buffers, subtracting backlogged completed items demand, if any. This allowance is called the basestock grade of each stage[12][13]. To function a Base stock control system, it is necessary to convey demand information to all production phases as demand occurs, which can be called international demand data. This can be finished by using either card-based scheme or computer-based scheme. Figure 5 displays the queueing mesh form of a single-product groundwork supply control policy having two phases in tandem. Queue Dn contains the demand. In the groundwork supply control, there is no coordination between successive stages, i.e. a part is authorized to be moved downstream by the demand signals. When the system is in its initial state, that is before any demands have arrived at the system, Bn contains sn stage-n basestock level of finished parts.

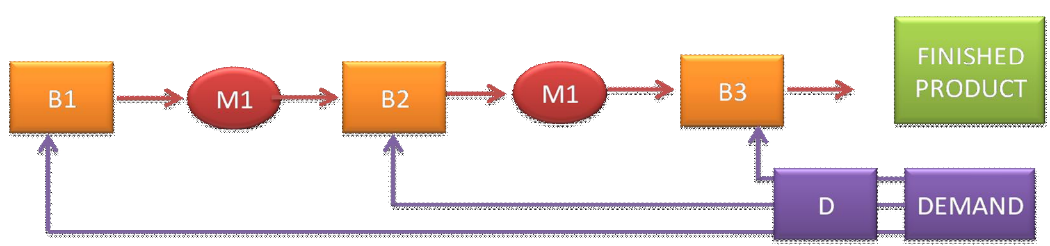

Fig. 5 Card Controlling in Base stock Production System

The base stock control system pursues[14]. When a customer demand reaches at the scheme it is separated into N+1 demands, each one is immediately moved its respective queue Dn and last one joins queue D demanding the issue of a finished merchandise from B3 to the customer. At this time there are two possibilities:

If a part is available in Bn, it is released directly to the downstream stage and make one to make up the basestock or to the customer for the last stage and this demand dn is satisfied.

If no part is accessible in Bn, the demand is backordered and remains in queue Dn until a new part completes from the upstream stage arrives.

Base Stock is a easy means that depends only on one parameter per stage, namely si, n = 1,…, N. This parameter leverages the move of finished parts downstream through the scheme, but it does not hinder the transfer of demand data upstream.[15][16]

The output capability of the system does not count on sn, really, it is granted by the production capability of the bottleneck stage. The completed part buffers are compelled by basestock grade; although, the WIP grades in each stage are unbounded.

When a stage goes wrong, the demand method will extend to eliminate components pattern the yield buffer, and the appliances downstream of the malfunction will function commonly until they become starved of components to process. The upstream phases extend to receive direct demand data and will function and release components as common. There will thus be an unbounded build-up of inventory in front of the failed machine.

IV. CONCLUSIONS

By the analysis of different card controlling system, we can analyze that all the system work in different type of manufacturing environment and any one system cannot be useful for all manufacturing requirements. In the present day environment, customers demand varied products at a lower cost and with a shorter delivery time. This has lead to the origination of classification of manufacturing environments. Today, there are not any effective control system for real manufacturing systems. The individually developed systems have separate benefit but if these may be combined together, a better model can be evolved. Practically main models used in and around the industries are conwip and kanban and base stock control system and by the using of card controlling system of different system, hybrid card controlling can be a better option for effective card controlling system.

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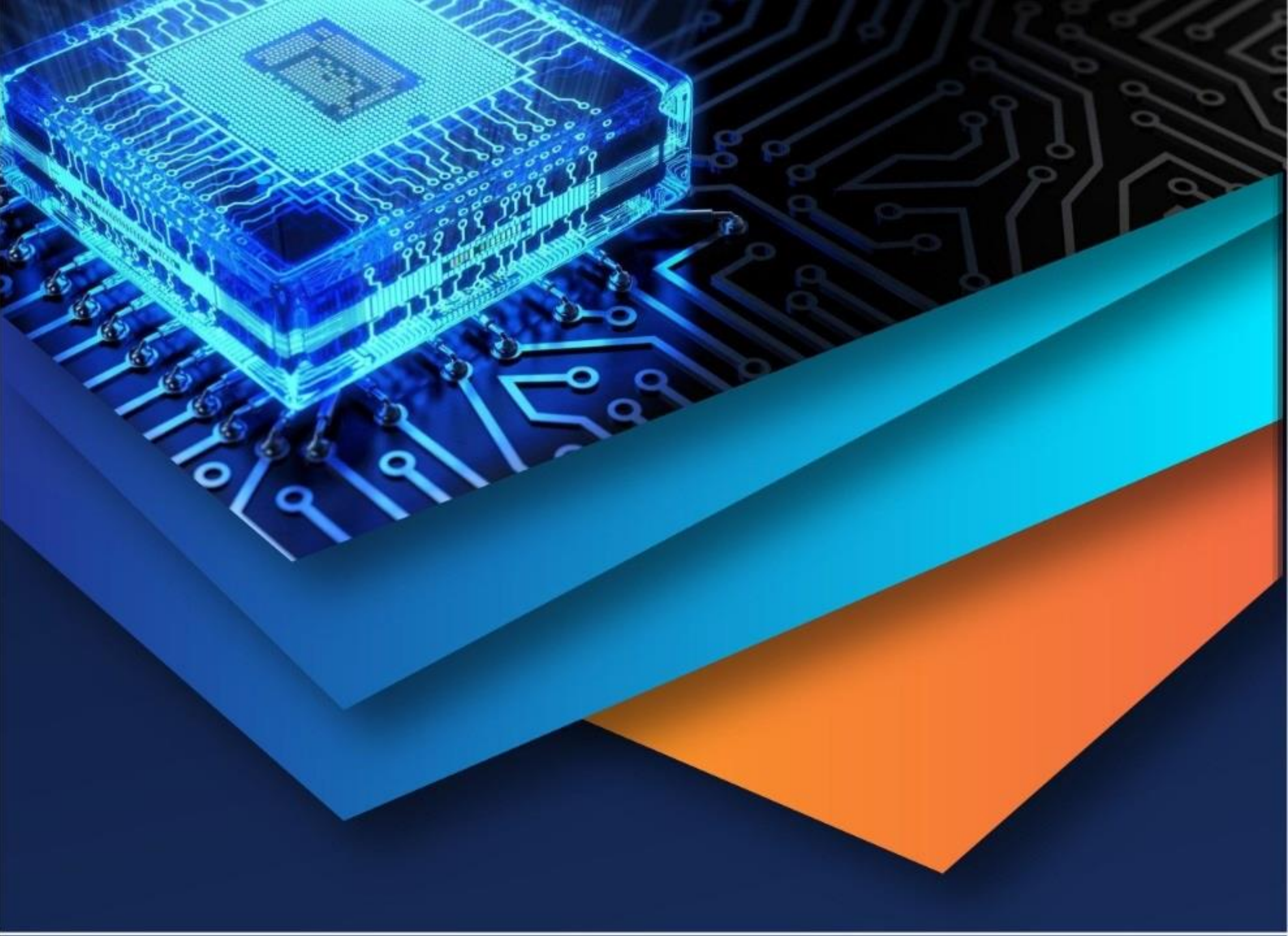

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