

Literature Review on Throughput Time Reduction with Help of Lean Tools

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Abstract—Throughput time means time Required manufacture a product from Raw to finished, In Present Scenario, the Customer Demand Change Rapidly And Product life is lesser than earlier, how fast company Can fulfill The new Demand of Customer That Much Chance to have higher Profit, time is only a material which can't be stored or stop just can be utilize in Proper way, Ensure That Company Reduce lead time, Downtime, Waiting time and Other Time. To Reduce Waste of Any Time lean tools like Poka yoke,5S, Kaizen V.S.M., S.M.E.D. and Many Other Tools Work Very Effectively.

Index Terms—Throughput time, lean Tools, non Value Added Activity, Value Added Activity

i. INTRODUCTION

productivity is output/input.[6] so to increase the productivity need to produce more product at less resource & time[1], to minimize non value added activity reduce all unwanted activity like move, search ,wait. to reduce throughput time need first perform time study or method study to understand the flow of material or product and then select tools which are best optional tools which can reduce time waste. time study helps to understand where and when waste is generated. to reduce waste and non value customer ask for best quality at minimum cost. and this thing is only possible with achieving higher productivity, added activity find problem and with brain storming find possible alternative to reduce waste[5]. lean manufacturing technique aims to reduce 7 type of waste and then eliminate waste ,there are 45 type of lean tools available but majorly tools used to reduce throughput time are 5s, kaizen, poka yoka, smed. in throughput time major time consume for waiting ,delay, transportation ,searching, this things affect productivity very much reducing this ensure less time consumption with higher productivity. different lean tools have their different aim like 5s try to reduce searching time ,increase cleanliness, store in required number of components at right place and operation performed with minimum non value added activity [5],kaizen is japanese term which means continuous improvement to improve quality and reduce waste for all over company with out investing large amount at same time. poka yoka aims reduce chance of sudden surprises to avoid accident and chance of error which is caused by human or any surrounding, poka yoka reduce chance of rework which increase productivity. to reduce throughput time also need to reduce chance of bottle neck, rejection rate, reduce downtime when this things are in control manner company's productivity increase. lean implementation are complicated thing it required time, money, knowledge, patience, employee support and involvement of all staff from company.

ii. LITERATURE REVIEW

- I. ajay anandrao joshi (2016) uses kaizen, 5s, and automation to reduce lead time and manufacturing throughput time per piece. implement 5s, kaizen, automation. the problem is time required to make product x is about 1:42:30hr and per day production is 13 pieces, they found 50%, of their lead time is n.v.a. but with 5s, kaizen automation they reduce n.v.a. to 46% and with change in lead time by 4%, they 14 piece per day.
- II. kinjal suthar (2015) find problem in gear manufacturing where the lead time is higher than demand so with implementation of s.m.e.d. company reduce throughput time upto 1:07:03.methodology used by author is first they prepare pareto chart and aim to reduce major 2 problem so to find cause of the problem use root cause of problem use fish bone diagram where each branch indicate different cause like error in man, machine, material, whether etc. from fish bone diagram they understand that higher throughput time is due to no parallel activity when other things are under process, take time to change work piece side from 1 to 2 position. and sharing gauge between worker are also consume time which should be utilize for production.
- III. francisco henriquez alvarado (2019) reduce downtime for s.m.e. in peru, s.m.e. are not able to fulfill the market demand because of not having enough resource to improvement of plant so to improve productivity with less resource are only possible with implementing lean tools like 5s, kaizen etc., which require less resources. author use 5s to reduce dead time,5s also help to utilize available space and v.s.m. to find most efficient way to perform operation and v.s.m. give idea of work flow and improve and maintain the new process.
- IV. ebyl sanchez (2020) prepare a risk control frame work for safe manufacturing workstation for covid, according to u.s.department of labor and u.s. health and human service provide some guidelines to continue work after covid ,where certain factor need to considered like distance between worker, duration of contact, type of contact etc. author analyze every movement and contact between worker and workstation and give them number according to exposure and probability of spreading virus and after that implement hierarchy of control, 5s, standard operating procedure, problem solving basically author aims to reduce risk with risk assessment and 5s.

- V. rahul r. joshi (2019) implement lean tools in pump manufacturing industries and reduce throughput time by 35% around 1085 min. author firstly find 3m and then identify project which can improve productivity and made pareto analysis and minimize the major time consuming problem like cleaning, hydro cleaning, painting, packing. and after some brainstorming change work process, some sequence of operation and reduce downtime, wait time, searching time reduce throughput time from 3222 min to 2125 min.
- VI. ismail w. r. taifa (2019) finds that all industries of world are facing global competitiveness. author observed that most of industries focusing on improvement of productivity with help of lean tools but major manufacturer are using v.s.m. to identify non value added activity; there are some other tools like synchronous manufacturing tech. which can give better comparison of throughput time reduction technique and with that best option can be selected which improve response to demand.
- VII. lexic,l.(2020) studied the impact of using different lean manufacturing tools on waste reduction author observed that lean and green production can improve productivity when it been applied but only 10% organization successfully implement lean tools,first overview process and use software tools like statistical package for the social sciences on lean organization 12 lean tools were identified for reduce throughput time and waste.t.p.m. ,poka yoka, kaizen, 5s, kanban all different tool have their different waste reduction impact.
- VIII. berna ulutas(2011)s.m.e.d. focuses on recognition of internal and external activities.today product life become short so company need to use smaller production lot size to get flexibility for customer demand,s.m.e.d. can reduce setup time from 25% to 85%.s.m.e.d. istool of lean manufacturing it provide rapid and efficient way of converting running the current to running for next,single minute does not mean that changeover only take one min but it should take less than 2 digit value like less than 10 min.
- IX. justyna trojanowska(2016) describes lean manufacturing and different lean tools like 5s, s.m.e.d., standardized work, total productive maintenance, value stream mapping, kanban, kaizen, jidoka ,poka yoka, heijunka, kamishibai, hoshin kanri and find that which lean tool reduce which type of waste.

iii. BODY

I. Lean Manufacturing

lean manufacturing is method which aims to minimize waste within manufacturing system and improve productivity. main benefit of lean manufacturing is reduced lead time, reduced operating cost and improve quality, reduce over production, waiting time, inventory, defect, process waste, motion. [3] l.m. is also known as lean production. some well known companies use l.m. are toyota, intel, and john deer etc. there are 5 principal of l.m. 1.identify value from customer's perspective,2.map the value stream,3.create flow, 4.establish pull system, 5. improve continuously with kaizen.

there are total 45 lean tools but some are main tools like 5s, t.p.m., kaizen, six sigma,s.m.e.d. and v.s.m. which are mostly used[3],there are also less known tools like poka yoka, jidoka, standardized work, just in time, gemba, andon, hoshin kanri, 5 why, root cause analysis etc. lean manufacturing helps to find 7 type of waste like over production, transportation, defects, waiting, inventory, motion, extra production. when ever waste is reduced with any lean tool there is increase in productivity and higher productivity is main element to survive in competitive world, waste reduction also consider set up time and changeover time as non value added activity [8]

lean manufacturing is complicated thing to implement it require time and employee support then and then only lean manufacturing can be implemented, in u.s.a., u.k. and india lean implement success rate is less than 10%,soto successfully implement lean company need to sustain and maintain new methodology and it require time and broad mindset to accept the new methodology.[7]

II. Tools Which Can Reduce Throughput Time

i. 5S:

5s aims to reduce the wastage like muda and mura, the time which is wasted because of searching, transportation, motion etc.5s ensure there is no generation of drift due to improper tools alignment which can increase accuracy of operation and reduce rework and reducing rework also improve productivity.5s have 5 phases as indicated by its name.1.sort, 2.set in order, 3.shine, 4.standardize, 5.sustain.

1s. sort:

sort items according to wanted & unwanted items, first s ensure that only required items are at required number and this thing should maintain by all who is working on that work station.

2s. set in order

arrange and labeling items in manner that item's are easy to find and rearrange every time, things should be at proper are location every time, this step of 5s require mutual understanding between worker of different work station.

3s. shine:

remove dirt, stan, filth, dust in work area, in sort clean and maintain tools and machines in its new stage, clean tools and workstation ensure that tools work in proper way & clean surrounding encourage workers to maintain cleanliness.

4s. standardize

ensure that what change are done for implement 3s (cleanliness & orderliness) achieve should be maintain. train & educate worker to use 3s turn into habits. standardize make sure that do right thing with right way every time. it is must needed thing to implement 5s because workers forget the new method and start working according to old method. but once workers adopt new method with their own interest there will be higher chance of successfully implement 5s.

5s. sustain

sustain refers to discipline to follow 4s which are implanted to improve productivity and reduce waste the goal of sustain is to stick with new standard workstation and practice the first 3 steps everyday untill it become accepted by workers, the last 2 steps are most challenging.[1] 5s do not required large amount of money, it ensure creation and maintenance of tools and machine in functional state and clean and proper working environment. it is 1st step for developing ownership feeling to employees for their workstation. And equipment.[9]

ii. Kaizen

kaizen is a philosophy which aims to continuous improvement. in kaizen problem is seen as opportunity for improvement. kaizen require involvement of all company's employees, operators, up to the higher authority, everyone from company search for idea and main aim of kaizen is to permanently reduce waste activity from every non value activity[9], continues improvement is only possible when company empower employees then listen to them implement their solution if it can improve productivity.[9] to implement kaizen need to follow 6 steps as given below

- search for 3m
- collect and analyze data
- root cause analysis
- search for alternative
- select the best solution
- implement and standardize new method[5]

iii. Single Minute Exchange Dies

single minute exchange dies focus on identify internal and external activities and than convert internal process into external process which are possible and minimize the internal one, in s.m.e.d. changeover time and setup time also considered as waste. with s.m.e.d. can minimize non value added activity which consumed due to load and unload work piece in machine [9]it can reduce setup time from 25% to 85% with reduced setup time production flexibility will increase which reduce lead time and faster service to customer. it is useful where setup time is longer and batch size is small, single digit does not mean that changeover or setup should be done in one min, it means that change over should be done in single digit time means less than 10 minute. it is similar to but less difficult than one touch exchange of die, in o.t.e.d. the changeover should be done in less than 100 second. the setup operation are done when the machine is still running. change over performed either before or after machine is off[9].

There are 5 Steps To Implement S.M.E.D.

- Calculate Process Time
- Separate External And Internal Process
- Reduce Internal Process
- Reduce External Process
- Standardize And Maintain Best Practice[8]

iv. DISCUSSION

throughput time include loading+setup+processing+unloading+move+searching+waiting time[1] if throughst time reduced manufacturer can produce more good with best quality. increase productivity in current scenario delivering good at least time with changing demand, it become necessary to reduce lead time or throughput time. time is only resource which can't stored and once it passed can not get back, so it's managing time is must needed for current market situation[5]. through put time calculation can be done with vsm & man machine chart & other chart can give proper info about where & when the waste in generated. after calculating required data identify v.a. & n.v.a. separate them as (ajay anantrao joshi) [1]can see that 50% are n.v.a. of with lean tool they reduce nva to 46%. there are several lean tools which can reduce the. throughput time like 5s, kaizen, kanban, poka yoka andona, v.s m. etc. most of author use v.s.m. to understand current flow of process but other tools are also helpful to reduce time. consumption. ismail w.r. talfa (2019) advise to implement other. innovative methods for better comparison of better cycle time reduction technique, small medium small and medium enterprises[6] turrent strength of ase have more role in development of company (fancisco henriquez avorrado) [6] small and medium enterprise's problem is not able to satisfy customer demand due to less capitalizing on their productivity. v.s.m. and 5s are most used lean tools to improve productivity but they are basic lean tools where 5s aims to reduce searching time, motion and process time, improve cleanliness and operator's perform maintenance of their tools

and machine this thing will increase relation between worker and machine, 5s also reduce chance of drift (problem due to machine tools). kaizen, poka yoka, gemba, s.m.e.d., standardized work, total productivity maintenance, jidoka, heijunka tools are not popular but this tools also helpful to reduce lead time [9]. s.m.e.d. will reduce changeover time which only possible with loading and unloading when process are still on, s.m.e.d. convert non value added activity into value added activity [8]. but the most important thing to reduce throughput time is employee engagement and employees adaptiveness to adopt the new methods, due to employees habits of old method or procedure are reason of failure of lean tool, only 10% company can successfully implement lean manufacturing, different tools can reduce different waste so selecting perfect tool for reduce specific problem or waste [9]. lean is most frequently used method for the operative and strategic restructuring process [9] many industries wanted to adopt lean manufacturing but lack of knowledge, loss of enthusiasm, and bad decisions are main reason of lean failure. [9]

v. CONCLUSION

after studying several research paper now understand that what is throughput time & other time which affect the production planning & control. and different tools to reduce throughput time with help of lean tools like kaizen, 5s, s,m,e,d, kan ban, poka yoka etc.. throughput time reduction directly reduce time to deliver product to customer and fast service or product to customer, build positive image of company and increase value of company, with high productivity company gets higher profit. lean tools reduce n.v.a up to 35% in some case more than that. if company want to reduce throughput time it must need to use lean tools and reduce n.v.a. it will increase productivity. & today condition higher productivity is main aim of and company. lean implantation is complicated because it need proper knowledge of lean tool and which type of tool is best to reduce specific waste and most important thing is acceptance from worker which can be increase by incentive or reward for any suggestion for development, to reduce throughput time reduce chance of bottleneck, reduce downtime and setup time and reduce rework this things are major problem for higher throughput time. this cause can be solved by successfully implement lean tools.

vi. REFERENCES

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