

Constraint Management – A Tool for Improving Throughput of the Process

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The organizations are complex web of People, Equipments, Methods, Materials, Processes, and Measures. Such detail complexity is bad enough, then add to it the dynamic complexity of changing Customers, Suppliers, Workforce, regulations etc and we have a picture of challenge faced by today's management team.

Traditionally, management has divided the organization into smaller, more manageable sections like spinning/weaving/dyeing/finishing etc in case of textile manufacturing industries. The basic objective is to maximize the performance of the each part. After all, the global improvement is the sum of the local improvements.

However, Theory of Constraints claims that a change to most of the variables in an organization will have only a small impact on the global performance on the bottom line. There are very few variables, perhaps only one, where a significant improvement in local performance causes a significant improvement in global performance. Such a variable is called "**Constraint**" which can be compared to weakest link in the chain.

Throughput Accounting:

The Throughput, Investment and Operating Expenses are a buzz words and will be seen frequently in this write-up and they have a very good cordial relationship among all three of them. This relationship will give and explain the significant role of these words and also we can understand basic objective in managing the constraint. It is not based on standard costing or activity based costing and equally applies to not- for -profit organizations. It helps to increase velocity at which products move through an organization by eliminating bottle necks within the organization and is also business intelligence for profit maximization. In this, effectiveness of each processes is important rather than their efficiencies which means flow of material is important than production. Anybody outside the organization can use such accounting for investment. The Throughput accounting uses measurements of Throughput, Inventory and Operating Expense, which can be applied universally across the company and are easily understood by those at the cutting edge of shop floor decision making. In particular, Throughput Accounting rejects the conventional reliance on efficiencies – and in particular, labor efficiencies – which it sees as counter productive. Since the goal of every for-profit company is to make money, the primary measurements of progress towards that goal are expressed in the same unit – **Money**.

1. Throughput (T): The rate at which the system generates money through sales by selling production units. These are yarns, fabrics or ready made garment pieces in textiles. The revenue earned by selling yarn is called throughput sales in spinning mills. Finished production units inventory in storage is not counted as Throughput because it has not yet generated money by selling. The Throughput is money for profit organization and delivery of product or service to the customer for non profit organization. In financial term, Throughput means the money is coming-in (Funds In flow).

2. Investment (I): The obvious inventory of Raw Materials, Work-In-Process, Finished goods, and Spares. The investments are that are owned by the organization in order to generate Throughput: Premises, Machines, and

fittings etc. The investment is all the money that is tied up in the system. In financial term, it is money tied inside (Money Engaged /Stock in the form of Inventory).

3. Operating Expenses (OE): These include the expenses incurred in converting inventory into throughput such as Wages, Utilities, Logistics, Energy, Consumable Supplies, and Depreciation of Assets etc. This includes all regular labor expenses. In financial term, it is nothing but money is going-out (Funds Outflow or Cash Out flow). The permutation and combinations of cordial relationships of these three components of throughput accounting are : 1) **Profit** = Throughput – Operating Expenses ($P = T - OE$), 2) **Return On Investment** = (Throughput – Operating Expenses) / Investment ($ROI = (T - OE) / I$), 3) **Productivity** = Throughput / Operating Expenses, ($P = T / OE$), 4) **Cash Flow** = Throughput – Investment – Operating Expenses ($CF = T - I - OE$),

Now organizations have 3 different options for the system improvement: 1) Increasing Throughput, 2) Reducing Inventory or 3) Reducing Operating Expenses. The increase of throughput is based on market, easy tool in the hands of organizations. There is hardly scope in drastic reduction in operating expenses, then only option is reduction of inventory in the process which consumes huge working capital on continual basis.

Effectiveness is more important, not efficiency for better working of company, The measures used by throughput accounting ensures that all decisions are focused on ultimate goal of the company (i.e to make money now & in future). With conventional cost accounting, local all efficiencies are important, but this would only needs to excess production of inventory. This does not make money for a business because both making and storing goods cost money and tied up valuable cash flow. The reduction of inventory not only requires less working capital, but also shortens the manufacturing time which is ultimately demanded by customers so that they should be able to get goods as early as possible. The theory of constraints basically produces only required throughput units instead of producing more than required to block the capital as in the throughput accounting, inventory is only variable and changing with throughput and consumes major share of working capital. Hence inventory needs major attention of the management.

Kinds of constraints

There are different types of constraints. The constraints are not only equipments and processes, but also people, company policy will become constraints. These equipments, peoples, policy, internal, and external constraints depending on the situation. In majority of the time, people look for constraints in the process, but they also check for possibility of other constrains.

1. **Equipments:** The way the equipment is currently used limits the capacity of the system to produce more saleable / services of goods. Some times, people are habitual with low productivity when market is sluggish and later on they continue to resist to increase productivity when market improves even equipments have capacity and ready for fulfilling increased demand. Before going for additional investment, the equipment must be audited by technical team of department, equipment manufacturer, outside experts from either research organizations or some renowned consultants to look into all possibilities of capacity increase without or very nominal investment on existing equipment.

2. **People:** Some times, lack of skilled people limits the system. Mental models held by people can cause behavior that becomes a constraint. The people are liability if not handled or trained properly and become constraint. By training and proper handling, instead of liability they will become a valuable asset. When we

take care of people and people will take care of product and processes. Some times, organizations identified non performers (constraints) and replace them by hiring skilled persons from outside or promoting other suitable candidate on whom management is confident.

3. **Policies:** A written or unwritten policy prevents the system from making more from the process set-up. If so, policies need to be reviewed time to time and make them more flexible so that they should not become hindrance or constraint for growth of organization. The policies must be communicated well in advance to all employees across the organization.

4. **Internal:** An internal constraint is an evidence when the market demands more from the system that it can deliver. This gives clear indicates constraint is residing within the organization and identification of the same is necessary to focus on it. Thus management has to focus on increasing the throughput within the organization instead of focusing on market. Within organization, there might be only one constraint or there might be possibility of having constraints in different departments.

5. **External:** An external constraint exists when the system can produce more than the market will bear. This clearly indicates that the constraint is not in the organization, but it is there in the market outside the organization. Thus management has to focus on increasing the market base instead of focusing inside the organization.

The key objectives of adopting constraint theory are : move the system towards goal, reduction of inventory and most importantly increasing the throughput of the whole organization.

Identification of constraint in the process

Once you understand the significant role of constraint, the immediate step is to identify it by diving into the process to begin with the implementation process. The process of identification of constraints needs to examine the entire process to determine which process limits the throughput of whole process.

1.Slowest Process : In the production chain, the process which has lowest production capacity is a potential source and the place of constraints.

2.Work Pile-up :Simply you walk through the process, the process in front of which material piles up in whole set-up is another way of identification of source of constraint.

3.Linked to Wage allowance : The process which is linked already to the production allowances in the wage agreement of workers are supposed to be a constraints.

4.Key Process : The process which is already in focus, in the mouth of every body, talk of town among the management/workers both ,monitored daily and reports of performance of that process goes to the top management is the source of constraints in the organization.

The mills which are spinning yarn/fabric based on orders with prior commitment of delivery in specified time frame, better adopt theory of constraint .In case of spinning mill, the ring frame is the constraints as the project is installed on the basis of ring frame production looking into market requirement. There will be paradigm shift in the spinning process in implementing theory of constraints. The following table gives details changes required for the mills going for the theory of constraints.

Monitoring Parameters	Before TOC implementation	After TOC implementation
Production	Major focus was on production	No major focus is on production
Flow of Material	No major focus was on flow of material.	Major focus is on flow of material to meet the market requirement.
Visibility of Program	Longer visibility period of program up to a maximum of two months or even more.	Shorter visibility period of program up to a minimum of week or even less than a week .
Count Conversions	Because of less number of conversions, conversion work is carried out in general shift by clubbing with maintenance work.	Because of more number of conversions, the conversions are also carried out in shifts in addition to conversions in general shift.
Monitoring System	Only production was monitoring on daily basis, but weekly production/quality meeting was carried out.	Now material flow is monitored on daily basis. The flow meeting on shop floor and buffer management in the room are held on daily basis and production/quality meeting is held once in a month.
Number of lot sizes	The clubbing of same shades of different lots was a regular practice depending on the program. Hence lot sizes were little bit higher & favorable for production.	The clubbing is banned. Hence lot sizes reduced drastically and hence production is lower.
Program Release	The program was leasing by assuming the reality. Hence resulting into error in program due to assumption.	The program is released on reality and made online on daily basis which is absolutely error free.
Spinning Average Count	Because of focus on production, average count was steady with minimum count change changes in the process & trying to maintain little bit on finer side.	Now focus is on flow of material, average count is varying like anything within a week/month and hence frequent imbalance in the process & more count changes have become a regular phenomena.
Inventory	High inventory based on running all processes at their full rated capacity.	Now low inventory based on program release according to requirement of constraints. Only constraint is fully running at full rated capacity, not all other processes.
Focus on Weak/Bottlenecks	People were not aware about bottle necks/weak point of their own process.	Now not only management staff, but workmen also aware about constraints of their own process & concentrating on them.
Segregation of Shades	Based on quality issue of contamination, the machines were fixed for light/pastel shades with physical partition in between the machines.	Based on priority of flow of material, the contamination issue is neglected.
Roving Stock	Ample stock to feed ring frames	Now hand to mouth stock to reduce

	smoothly.	lead time.
Final check out of Material	It was not done on daily basis and doing in spare time.	Now it is followed on daily basis in spite of busy schedule.
Labeling of material	Each lot will carry only one tag in spite of its presence at multiple locations.	Each lot will have many labels based on its physical presence at multiple locations.

Exploitation of Constraint : Once the constraint is identified, next immediate step is its exploitation. Every body has to focus on constraints and it has to become talk of town, utilize it to its maximum capacity. It should not be broken down, starved and blocked at any cost. If any modifications are required without any significant investment, it is worth to modify it and produce more out of it ultimately as it decides throughput of not only of its own, but also decides through put of entire process. Making sure the constraint is working to the best of its ability is the exploitation. It must be fully utilized, but utilization must be fully utilized. Every body has to give attention to get best and full out of it.

Sub-ordination of Constraint : The effective utilization is most important issue. Every thing else is secondary. The release of program should be based on daily actual production of the constraint, not on the assumption or maximum capacities of the non constraint process before the constraints. Making sure that we have a right stuff in the right place at the right time is the sub-ordination. This does have direct bearing on what the constraint can do and when. We predate the release of the work, relative to the date at which corresponding constraints consumption is scheduled. In terms of constraint language, we can say “ doing what is supposed to be done or in other way not doing what is not supposed to be done”. One has to sub-ordinate everything to non- constraint resources in order to protect the constraint and the system as a whole.

Elevation of Constraints : If market demands more in future, the constraints will become potential source of capacity increase by addition of machines by making significant investment. This process is called “Breaking the Constraints”. Majority mills will kept some space in the ring frame section for addition of few machines in future.

Reasons for Loss of Throughput: The constraints must be given kind attention every day and even every hour as entire organization’s through put is dependent on the constraint. For its throughput loss, management has to take care of following points.

1.Break-down of Constraint : Since no excess capacity exists on a constraint, the loss of capacity will directly result in a loss of not only throughput for the entire business, but loss of profitability to a great extent which is not recoverable in future. Without much inventory in the system, processes tend to be tightly linked and loss of operation will quickly bring down the entire system down. The preventive maintenance is a must rather than break down maintenance. Even technology used for constraint must be world class or best available in the market from internationally reputed and well proven supplier. The spares used must be from original equipment manufacturers only. The maintenance schedule must strictly adhered to run without interruption. The maintenance personal must be trained thoroughly and highly skilled maintenance workmen must be engaged in attending the break down. This process must be upgraded time to time with all latest developments. The maintenance becomes important for the managing sustainable good healthy condition of constraint to work uninterruptedly for roughly the same reason as for lean production system – the potential

high cost of a drop in throughput for the entire system. The use of imported ring & travelers, spares from machine manufacturers, highly skilled maintenance team, high speed spindles, systems like ring data, auto doffing, link coners etc in ring frames is beneficial to reduce down time and for quality output once it is identified as constraint. The use of ring data/auto doffing /link coners are feasible for the spinning mills working on more counts, more conversions, small lots, fluctuating average spinning count etc. The productivity and break downs of constraint must be included in the key performance indicators of people supervising constraint areas. The productivity of constraint should be monitored on daily and even shift wise within a day.

2.Starvation of Constraint : There is no inventory from the proceeding processes available for the work by constraint. The constraint is capable of production, but can not produce without material to work on. The solution is to use a buffer in front of constraint .The buffer is inventory released early into the system. The release is daily based on daily actual output of constraint. The constraint should not be starved for shortage material unless there is uncontrollable reasons like change in market demand, shortage hands in pre on constraint processes, capacity imbalance or sudden change in count from coarse to fine. All these factors need to be analyzed for deciding the which factor is contributing to the loss and accordingly action plan to be decided. In case of dyed spinning, the buffer used for release of material is 18 to 20 days from release point (dyeing) to reach up to constraint. There must be continuous dialogue with Supply Chain Management to look for smooth running of constraint.

3.Blocking of Constraint : The constraint is available in good working condition and there is material available to work on it, but there is no physical space in which to place the completed production units of constraint. The solution to this potential problem is to have a space buffer available after the constraint in the process in which to place production completed by the constraint operation. In spinning, after constraint (Ring Frame), blockage issue is bound to come either low efficiency of post non constraint processes, stoppage of machines for shortage hands due to absenteeism especially in rainy/marriage/ big religious festivals, sudden change over of count from fine to coarse or because of capacity shortage of post non constraint processes. All these factors need to be analyzed for deciding what is best to be done for this situation.

4.In adequate Monitoring & Control Measures : The sustainability of any ordinary to world class system depends more on how strong is monitoring and control measures adopted in the process to get best and fully out of constraint as loss is permanent and not recoverable at any cost because loss is time bound & time is not renewable. The daily and even within day shift wise follow-up is a must. The constraint must be linked to wages during wage agreement in the large organizations so that workmen also start taking good care of throughput of the constraint. The monitoring of spread and lead time are important not on monthly or weekly basis , but daily mandatorily. The spread time means the number days required from incoming day of first lot to the outgoing day of the last lot of the same order and lead time means number of days required from incoming day of last lot to outgoing day of last lot of the same order. Normally, spread time of 18 days and lead time of 14 days are considered as reference for monitoring the effectiveness of the system in spinning PV dyed mill. The number order closed daily must be recorded and report to concerned monitoring cell.

5. Waiting of Downstream Processes : If the constraint is located near the beginning of the process say blow room or carding , then all the downstream processes draw frame onwards would always be waiting for work. In that situation management would most probably go about purchasing further capacity until they move the constraint further down the process and then buy it in work-in- process so that it is no longer visible.

How Constraint Management is different from other philosophies:

1) Other philosophies basically try to fix the whole company at once, which is a physical impossibility. By focusing on constraint, every one in the company is allocating resources in the right place and make sure you work on the right things rather than just doing things right. 2) With TOC, the “Cost World” is replaced by the “Throughput World ” which is driven by three key components : Throughput, Investment & Operating Expenses. 3) Cost World focuses on reducing Operating Expenses as primary means to improvement, where as throughput world views cutting Operating Expenses as the least important of the 3 key improvement measurements, 4) The TOC focuses on identifying and exploiting constraints as the way to achieve ongoing improvement and increased profitability. 5) Cost based management mentality invariably leads to flawed decisions, focusing on artificial targets, and masking root causes of the problem. 6) TOC emphasizes reducing inventory as way to expedite response time. In the throughput world, inventory is seen as liability, not as an asset (as it is viewed in cost world). 7) Tradition in cost world indicates that, to save money or reduce costs, a company must explore laying off as down turns occur. A TOC driven company, will not view lay offs as an option, as they would rather seek alternatives than to disturb employee morale and loyalty. 8) TOC is rather a long term approach and needs cultural change across the organization.

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