

HITTING THE BUFFERS

*The Critical
Importance
of Buffer Management
To Real Continuous
Improvement*

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INTRODUCTION

I never cease to be amazed at what I find when I visit companies where both the concept of Constraint Management is fully accepted and taken to heart and Drum Buffer Rope (DBR) has been implemented – yet no lasting improvements beyond the initial surge have been experienced. The management have soon become disillusioned and maybe even returned to their old ways, attacking localised improvement projects or measures in the search for better results to report.

By involvement and observation, my understanding of Drum Buffer Rope implementation has grown and repositioned with each subsequent activity in different companies. As a Jonah I saw the simplistic yet powerful set of tools that Constraint Management can give to any management situation, but in hindsight I can now see that my use of the tools in the early stages was somewhat limited.

Experience in my own companies and active involvement in a large number and variety of companies over the last 2 ½ years have led me to realise the absolutely critical importance of Buffer Management in achieving *real control and continuous improvement*. This is not made clear - and possibly not adequately emphasised - at the outset of DBR implementation.

THE PROBLEM

What management often hope for is that Drum Buffer Rope will take away the need for an awareness of effective Factory Management principles. This is in the belief that DBR will be their salvation, allowing them the freedom to abdicate (temporarily at least) the responsibility for managing the system, particularly in the areas of supply chain, materials management, process control, quality assurance systems and information and document control. What they truly fail to realise is that **DBR will collapse** if these factors are ignored.

To succeed, DBR must have a semblance of system support in all areas, throughout the total delivery system. DBR does provide a powerful, rigid system of control with the attendant needs of strong disciplined procedures and rules. What DBR will do is provide a *common goal or focus* for the team, which in my experience is often sadly missing.

The use of local or sectionalised measurement standards or KPI's drives this local segregation further apart. Communication, team briefing and thus real teamwork are nearly always at a low level in these situations and walls of distrust are created. This results in declining morale and a lack of awareness outside of the section or function as to how well the company system as a whole is performing. As long as staff are judged on their local measurements (as far as they are concerned, these are the key criteria) company performance is given secondary importance.

The issue of general Factory Management referred to above **must** form the major part of Buffer Management activity. After all, the idea of DBR is to highlight the system constraints to allow the team to gain continuous improvement in Due Date Performance and hence bottom line results. In my experience the biggest gain is in the level of management control that arises from the discipline of DBR.

The use of the **5 Focusing Steps** of Constraint Management:

1. Identify
2. Exploit
3. Subordinate
4. Elevate
5. Repeat the process!

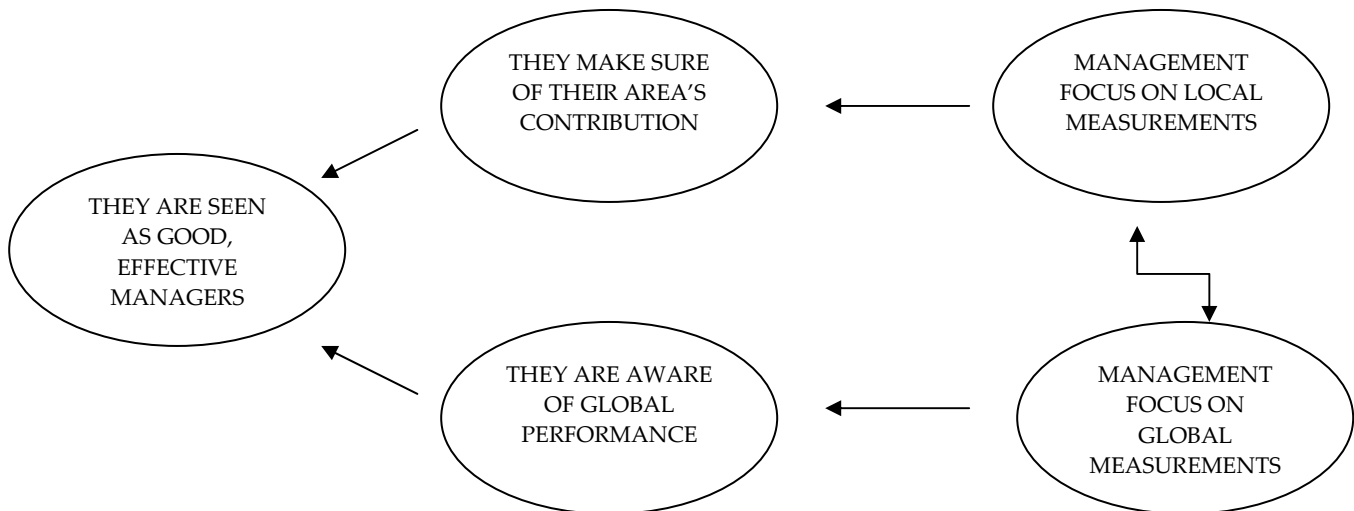
will focus the total team on agreed goals and activities. I have often found that although some 'ready made' answers may exist, the use of 5 Whys, Six Sigma and 'Herring Bone' type analysis of the identified constraint problem/s will develop the team's problem solving skills and ability to take collective action towards the agreed goal of "making more money, now and in the future".

Many companies have at some time or other used very good procedures and rules, and on request can show them to you. The next questions to ask are: "When did you last use them? Why did you stop using them?" The usual reply is: "Well, they were good rules, but the manager at the time chose to introduce or allow local 'tribal' customs or rules to be applied, so the original ones were forgotten." Over the years, this results in a situation of implied rules, which lack discipline and offer no forceful control to the activities. The final outcome is that there exists little control over variation within the system and an absence of the sharing (or even use and awareness) of costly resources.

This has been exhibited in both large and small businesses. Many companies leave resource utilisation to local section management, generally at foreman/supervisor or team leader level. When I ask how they calculate machine and labour resource needs, their answers are based on historical knowledge and experience which has been gained over many years, and thus are subjective and not based on fact. Very rarely am I shown capacity and utilisation detail used to actively control the business. Then they wonder why their costs are so high or profitability poor!

This scenario applies to every function in the business when control and awareness is missing. The assumption is that the senior management have good, trustworthy people working for them and the right decisions will be taken. The reality is that middle and junior management are struggling to achieve the required output levels, and seeing 'the bosses' leaving them to it, they decide to throw resources and people at the problem. As we know, such local activity will not help the system to deliver more and consequently, costs rise.

As long as the need for local measurements persist and there is no 'iron-clad' system around the *whole* of the enterprise, the status quo will be maintained. Although senior management will be supportive in this environment, the need for a *change in the mode of operational management* is paramount to allow survival and ultimate profitability. The problem seems to reside in the local optima versus global optima conflict that exists in the manager's mind.



Why senior management don't see this has puzzled me for many years! This "inertia" or paradigm is so common in companies and yet once this conflict, (or 'cloud' as we call it in Constraint Management), has been addressed and the inertia removed, great gains may be made. Balancing the flow **not** capacities of the system must be an emphatic issue for management to understand and work towards.

Sales Order Processing and Material Management are key elements of system operation that are given scant regard. In many companies, particularly capital goods, SOP and New Order Review (NOR) / Contract Review often form the major time element of any agreed Buffer time. Yet their importance and effect on really reducing lead time to market are not realised.

The elimination of WIP and marked reduction in actual process lead time soon after the introduction of DBR are seen as very real benefits, but this is only the start of the potential continuous improvement within the company. What should happen next is that energy and effort must be applied to improving the information systems used in the processing of Sales orders and managing the Material elements required of the business.

What was not made clear to me in my early days of Constraint Management was the absolute need for Buffer management.

Continued.....

THE WAY AHEAD -

THE ROUTE TO CONTINUOUS IMPROVEMENT

My involvement with these and my own companies has led to a clear vision of necessary change management, based on Constraint Management principles. When I go into a company, my initial research is into how much of their structure is working well and I try to identify obvious system weaknesses.

Once identified, the first stage of change can be achieved, that of *STOPPING THE SYSTEM LEAKAGE*. The analogy I use to best describe this statement is that DBR implementation has the potential to increase the speed of your 'delivery system' from 50 mph to 150 or even 200 mph. If you liken this to a racing car, it's obvious that you won't put a new, highly powerful engine into a car without checking the steering, brakes, chassis and state of the tyres too. If you don't, it's a good bet that the car will crash.

What is needed is a good 'MOT' type service of the organisation's functional activities. Having plotted the Revenue Stream, starting with Sales Order Processing, it is possible to complete a short review of Planning, Production Control, Materials Management, Quality Assurance procedures and the very important aspect of Document Control throughout the organisation. The crucial areas of Communication, Team Briefing and Morale will also be addressed. This review will highlight where time and effort are wasted (leakage) and will normally take 2 to 3 days for an organisation of between 50 – 250 employees.

If very obvious problems are found, prompt action can be taken to stop this 'leakage' of either wasted resources or lost output from the system. By lessening the amount of leakage and hence daily 'fire-fighting' for all management, some degree of improved managerial control will start to be seen. This will then allow time to discuss, plan and prepare for the introduction of appropriate elements of Drum Buffer Rope.

Unless the complete management team can allow themselves the time to become involved in DBR, I know that progress will be slowed by their non-involvement. They generally spend most of their long arduous days 'fire-fighting', and the presence of this phenomenon always points strongly to a lack of control. After all, which or how many companies pay their management to sit and think about their work? In my experience, not many!

By clamping down on obvious areas of haemorrhaging, there will be the opportunity for discussion to allow them to move to the next stage of development, *CREATING THE NEW MODEL*. At this stage it will require subordination of all areas, most certainly senior

management, to arrive at a consensus on what form the DBR system will take, which data is really vital, the KPI's and newly accepted performance measurements. The role of Buffer Management will be discussed, but what frequently happens is that, after the paradigm change of applying DBR principles and gaining common focus, there is **no follow through**; Buffer Management is not fully utilised because management tend to think that DBR will provide all the answers.

This becomes clear once the third stage of activity takes place, that of **IMPLEMENTING THE NEW MODEL**. An obvious factor here is the selection of the Buffer Management team. If the senior executives decide to immerse themselves fully in the new culture, they will drive it forward and be aware both of the problems which arise and the obstacles which are removed by the team as they move along the path of continuous improvement. Managerial control will increase immediately and dramatically. Once the fires have been put out there is an inclination to ease off, sit back and enjoy the rest. It's almost as if the hard work is done!

It comes as no surprise then, that when stage four – **CHECKING THE MODEL AND MAKING NECESSARY ADJUSTMENTS** – is reached, the initial impact of DBR has been lessened by a lack of true subordination to Buffer Management.

One of the problems is *timescales*.

Following the initial company survey and analysis there is likely to be a period of 6 – 8 weeks' stemming system leakages and adjusting information and control systems in readiness for DBR implementation. Having put that shiny new engine into your car, you must check all the other relevant support systems to ensure that you don't wreck everything at the first bend! This first stage is, in my view, an absolute pre-requisite for the successful implementation of DBR. Unfortunately it is often over-looked; even in my own case I failed to attend to it on several occasions.

Once the first stage **has** been achieved, it may take another 4 – 6 weeks to gain consensus on the implementation model. However, this will take place in an atmosphere of increased awareness and understanding of how it all works. Implementation can then follow and the first obvious results will be seen in 6 – 8 weeks. This is a generalisation and in one company, lead times were cut by 70% and Due Date Performance increased from 40% to 86% in just 3 weeks!

The same company then had problems as the importance of Buffer Management was ignored and 8 weeks later the daily fire fight and reactive management style returned. This is a common occurrence which negates the many benefits of DBR implementation and the achieved results. Sadly, DBR will be seen as a failure and the search for the next solution will commence.

It cannot be emphasised strongly enough that support and coaching during this period of change should be sought. After a further 8 – 12 weeks of infrequent yet consistent reinforcement, the company management will have the requisite knowledge to manage their process of real continuous improvement and development of their team, individually and collectively.

As you can see, the time scale is much longer than you would at first suppose. I believe that it takes nearly 8 months to put a company on a strict, well-ordered route to success and that senior management have to be single minded to finally arrive at the starting point of the future for the company. They will of course be receiving benefits along the way; noticeable results can be gained after just 8 weeks and many more will surface as the process continues.

Another problem centres on the measurement indices used by many companies. In one company recently I found that local Key Performance Indicators of 'Uptime' for the plant had an adverse effect on process performance. Because the team was assessed by this measurement and directed to maximise it, plant maintenance was not a priority and yield problems ensued. I asked if they had historical data on comparatives of Uptime to RFT / YIELD (Right First Time) figures. The Maintenance Engineer then showed me a graph for 2003 which revealed that as Uptime increased, the RFT figure dropped! When I asked if he had raised this issue, he pointed out that his appraisal would mark his performance and that of his team against the Uptime figure, so what was he to do?

I then enquired whether he monitored the process and established any 'audit trail' for process verification matched to process problems. The answer was "no". When asked if he could provide any data – for his highly automated plant – on MTTR (Mean Time To Repair) and MTBF (Mean Time Between Failure), his response was also negative!

These are the truly vital statistics necessary for meaningful process verification and the limitation (or even elimination) of process variation. Yet management often fail to realise what is really important.

So, for me, agreeing measurement standards and Key Performance Indicators is critical. Then they must be adhered to! Customer '**Due Date Performance**' (DDP) and '**Material Release On Time**' (MROT) are the primary indicators of successful system performance. If you can't start right, how can you expect to finish right? Improving performance in these two areas indicates an increasing level of system effectiveness.

The material release issue is often overlooked. Another facet of this subject concerns when material release actually takes place. In three or four of the companies I am currently working with, the documentary side of Sales Order Processing is actually the 'material release' for the system. Whilst everyone is focusing on the physical aspect of material release

to the shop floor, a blind eye has been turned to the very important function of order processing and contract review.

If DBR is to be implemented as a cornerstone of the company's control systems, there must be agreement on what constitutes the '**Drum Schedule**'. Where there is no identified constraint to date, this is regularly fixed as the customer's shipping due date. This will allow us to look back down our supply chain route to identify and surface throughput obstacles.

This can sometimes be misused, as shown by one company which decided to use a kan-ban to protect shipments to the customer and used the kan-ban level to trigger material release into their system. They thought that they were operating DBR, but the collation and analysis of operational data did not provide the opportunity for continuous improvement. What they were actually doing was measuring the effectiveness of their kan-ban levels! What should have been measured was the ability of the various manufacturing departments to meet their daily plan (which in effect supported the kan-ban system).

Having decided exactly what the Drum Schedule is to be, data should be collected to arrive at a '**Rough-Cut Capacity**' report. This will allow the Buffer Management team to gain real control over establishing the '**Drum Beat**' at which the Drum Schedule, and hence the delivery system, can be set for the company. From the Rough-Cut Capacity report they can agree Buffer times, determine lead times for new sales orders and, most importantly, identify those company resources that are overloaded and those which are under-utilised. This will be of great benefit to them as meaningful discussion with local / functional middle and junior management will be based on fact not opinion. The team can therefore collectively make decisions on a proactive basis, before demand hits the shop floor. An additional benefit is that the shop floor are asked to deliver an achievable robust plan where resources are considered and 'protective capacity' built in for the contingencies of everyday life.

In the context of organisational control, this agreement on the level of "Rough Cut Capacity" and the setting of the Drum Beat of the delivery system will commit the company to the maintenance of expensive resources such as staff, equipment and material consumption. One company I was recently working with had successfully implemented DBR and achieved 100% OTIF Due Date Performance FOR A PERIOD OF 14 WEEKS WITHOUT A BLINK! What the management had failed to notice was that their delivery system was in fact capable of delivering 70% more throughput and they had failed to ensure that sales volume was increased to make effective use of the resources available and for which they were paying. Be warned! The constraint will move and sales will generally become the major issue for company action.

One very simple but effective control tool I use regularly, is to set up a "**Timeline**" **control sheet**, which will give senior management and the Buffer team a clear view of where problems within any function are causing the buffer progress to be retarded and poor

performance to de –motivate all involved in the system. This is particularly important in companies where Sales order processing, Engineering review and complex material sourcing are every day factors, By watching where the Timeline activity is stalling on a weekly basis, the team can take appropriate action well before the analysis of holes and misses directs them to the next area for collective scrutiny. It is obvious that if one department is 3 or 4 weeks behind the suggested buffer date line, then increasing the capacity, even temporarily, or deciding on alternative actions such as adjusting the buffer zones can be quickly agreed.

As the shop floor see management taking control and receive clear indication that measurement standards are realistic they will respond, particularly if some have been involved in the creation of the new system. They will quickly realise that the inputs and hence the outputs from their efforts can now be seen.

‘Work To’ lists, based on the Drum Schedule sequence, will control activities within each work centre with the clear understanding that they are asked to work as fast as possible when the work is available. When it is not, there will be no alternative material release, and they should be involved in 5S programmes, multi-skilling, Kaisen, quality circles or any other general upgrading activities for their sections.

So, we have a plan, a drum beat, a sales customer ‘horizon’ and mechanisms for internal control. It is now necessary to confirm the method by which operational data is to be collected. The route to continuous improvement is via the obstacles and problems analytically collated from the performance of the system. The Buffer period should be set and zones A, B, C designated by time. The Buffer Management team should be paranoid about how they now operate.

Following material release, ‘holes’ in the buffer should be monitored and ‘misses’ recorded against the agreed Due Date Schedule. This is when the real work of Buffer Management takes place. The individual elements of these holes and misses may not appear to be obvious, but a weekly **‘Pareto Analysis’** of this data will start to guide the team towards the real constraints in the business. Subjectivity and emotion will be removed from these discussions as they are now based only on fact.

The Pareto analysis will determine which subject the team are subordinated to. Tasks can be agreed and allocated and the *common goal or focus* for all of the team will ensure a sharing of available resources. At the same time, by driving at the biggest single element identified by the Pareto analysis, the team will be reducing variation within their company process.

So, by changing its *‘mode of operation’*, management has addressed the two core issues of process variation and effective use of resources. Without Buffer Management, this will not be achieved!

PRE-REQUISITES OF DBR IMPLEMENTATION -

STEPS TO TAKE TOWARDS MAXIMISING THE BENEFITS OF DRUM BUFFER ROPE

- 1) Where obvious system weaknesses and information gaps exist, *fix them before you start!*
- 2) Be positive that senior management really understand the programme of likely events and that they are committed to the 'long haul'.
- 3) Discuss with senior management the nature of the 'change in mode of operation' that will take place. They must understand that the typical 'triangle' of hierarchical command will be inverted. To me, the most difficult task is to ensure that communications throughout the entire organisation are complete. Responsibility and accountability should be passed down to all levels of management – but it is often the case that responsibility is passed without authority to act.

The most common elements I have found recently in companies are two separate areas of detachment affecting understanding and collective focus. Typically, senior management may have a clear idea of what they are trying to achieve but become frustrated as middle and junior management fail to respond in the expected way. Also, there is a communication gap between middle and junior management and the shop floor 'wealth creators'. The reason for this lies, I believe, in the traditional management approach, reinforced over many years.

The application of Constraint Management into any company is designed to release the potential and talent of the whole workforce. This means that senior management must 'let go' and really trust their people. For my own part, I had a very simple philosophy. I used the approach of '*trust but verify*'. I would trust the individual to complete the assigned and agreed tasks but verify for myself the completeness of the task execution.

I also used the 'Nike' logo as a badge or code of conduct for all those involved in Drum Buffer rope. This meant 'just do it'. In other words, **try**. If you don't try, you'll never fail – but you'll never succeed either! My job was to offer support and try to be one or two steps ahead of the game. There was no blaming culture and I repeatedly told staff that the brave thing to do was to ask for help if they were not sure. The cowardly / unwise act was to pretend the problem would go away.

Whilst working with Yamaha, I was closely associated with a Japanese Director. He showed me that talking is easy, doing is not so easy. This was confirmed many times in our work situation as we first talked the situation through with the involved staff and then,

importantly, we would complete the tasks together, giving total support and confidence to the individuals. There were no surprises for any of us! I am sure that many managers in companies believe they are taking this approach and some may be right, but I do not see this working in practice.

When a situation reaches boiling point the managers sit in their offices confused and baffled as to why the team is not delivering. Maybe they should look at themselves first? After all, if nothing changes, it will stay the same and the continuing cycle of unwanted and undesirable effects will be ever present.

4) Once the three preceding points have been properly addressed, it will be time to move on to the mechanics of an effective Buffer Management system:

(a) Agree key performance indicators (KPI's) or measurement indices for the company.

I would recommend that *Due Date Performance (DDP)* and *Material Release On Time (MROT)* are adopted universally as they give immediate judgement of how well the delivery system is operating in support of the customer. I have been involved recently in many discussions with senior management caught in the normal trap of needing to give financial indicators of improvements gained. Here, I would suggest that *Throughput* (sales revenue minus material costs, '*T*'), *Inventory* and *Operating Expense* are monitored. As '*T*' increases and capacity is released from the system, financial gains will be made as long as '*I*' or '*OE*' do not get adjusted upwards.

A word of warning here! To keep team focus, financial monitoring should not be a measurement of performance used by the Buffer Management team. They **must** keep focused on improving system performance, reducing variation within the system and sharing previously unutilised resources.

(b) Fix the 'horizon' for setting the Drum Schedule and hence the Buffer length.

This will give Sales and Manufacturing clear direction on how to deal with new order enquiries. Once regularised, the Buffer length should **not** be adjusted without team consensus.

Unless visible capacity exists, orders should not be introduced inside the Buffer time. If order intake increases, the regular Buffer review meetings should consider this but only allow modest increases (10 – 15%) on a very controlled basis. One of my companies reduced lead times from 8 weeks down to 2 within 3 months. Sales and our customers were delighted and the orders rolled in. Owing to my lack of experience at the time, I did

not spot this until deliveries had again moved out to 5 weeks and customer demands for priority service were causing many problems.

(c) Fix the lead times (from the Buffer length) and don't let anyone change them (even the boss) without team consensus.

Sales and Manufacturing **must** agree the Buffer lengths and communicate constantly regarding market or capacity movements. Uplifts in volume should be controlled to 10 – 15% in any 4 – 6 week period unless capital resources are employed, in which case a longer term view on the 'Drum Beat' should be taken.

(d) Create a 'Rough-Cut' Capacity Plan allied to work centre sequencing.

This has many advantages. Besides surfacing overloaded and underused resource centres, it can assist critical cost decisions on labour manning and overtime. Besides this upgrading of management control, it will also allow an achievable, robust drum schedule to be constructed with in-built 'protective capacity' for the vicissitudes of daily life. In many cases, team leaders and supervisors remark that this is possibly the first time they have been issued with a sensible schedule. Capacity planning should also allow for 'what-if' scenarios to answer sales requests and customer enquiries on potential due-date. Remember, capacity costs money!

(e) Set the Drum Schedule.

This will be sequenced to agreed or requested customer delivery dates and ideally ought to be daily. This is not always possible and a weekly schedule may have to be used. Even if you issue a daily schedule, do not change it daily.

(f) Set a "Timeline" control, if the elements of the delivery system are lengthy and complex.

(g) Agree the Buffer Team.

Mistakes are often made (I've done it!) by omitting specialist and technical staff from the Buffer Management team. As the goal is continuous improvement for the company by identifying and eliminating (or reducing) constraints, all functions will undoubtedly play a part at some time. Also the involvement of all functions and their subordinations to one common problem reinforces team work, communication and motivation.

(h) Agree a system for collation of 'Holes and Misses' data.

Remember, Watch (Zone 3) and Plan (Zone 4) are important but it is only in Act (Zone 1) of the Buffer that clues to constraints will be relevant. A clear 'miss' on the schedule must be categorised for the reason to supply the necessary data for analysis. Three or four of the companies I am now working with have introduced simple yet clever systems to track the customer's order through Order Receipt and Contract Review, to Material Release onto the shop floor. This has shown a distinct series of 'holes' in the delivery system affecting DDP.

(i) Pareto the data from (g) above on a weekly basis, then use the '5 Focusing Steps' to assign and allocate tasks.

A simple Pareto of recorded problems over 1, 2 or 4 weeks will reveal problem areas.

(j) Agree time scales for team action and report back 1 week later (2 weeks maybe acceptable).

The Buffer Management meeting can be used as a problem solving forum where the use of '5 whys' or 'Herring Bone' type analysis can often surface the **real** problem, not the symptoms! Once the team is operating well together, the real discussions should take place outside of the meeting between the 'intimately involved persons'. They will often bring agreed actions to the meeting for information and verification.

The Buffer Management meetings **must** take place in a disciplined fashion on a regular basis. **Subordination** to this activity must be complete or you will see a dissipation of focus within a very short time. My own experiences show me that true subordination is the hardest thing for the Buffer team to achieve and all concerned should be advised of this constantly.

(k) REPEAT THE PROCESS!