

What is Drum-Buffer-Rope (DBR)?

TOC-Lean Operations Management

The DBR logistical system is a finite scheduling mechanism that balances the flow of the system. DBR controls the flow of materials through the plant in order to produce products in accordance with market demand with a minimum of manufacturing lead time, inventory and operating expense.

DBR is based on the TOC logistics approach and the TOC Five Focusing Steps, namely:

1. Identify the system constraint(s). A constraint is any element or factor that prevents a system from achieving a higher level of performance relative to its goal.
2. Decide how to exploit the system constraint(s). This means making sure that the utmost is done to ensure that processes leading up to the constraint resource always run as smoothly as possible.
3. Subordinate everything else to the above decisions.
4. 'Elevate' (i.e. improve the performance of) the system constraint(s).
5. If, in the previous steps, a constraint has been removed, go back to step one, but do not allow inertia to cause another constraint.

The definitions of **DRUM**, **BUFFER** and **ROPE** are:

- **DRUM** - the rate at which the constraint resource is able to process. A correctly set 'drum beat' will ensure that the constraint resource always has just the right amount of work - neither too little nor too much - to process.
- **BUFFER** - A protection against Murphy, i.e. the assumption that if something can go wrong, it will! DBR Buffers are measured in **time** rather than quantity of material and ensure that process flow is prioritised according to the time an order is expected to be at the crucial, buffer-protected areas - namely the constraint resource, the assembly of constraint parts with non-constraint parts, and shipping.
- **ROPE** - this is an information 'link' from the Drum to the raw material release schedule, so that the constraint is always kept supplied with just the right amount of work.

The identification of all the processing, resource, and marketing constraints within the entire system is needed. These constraints become the primary focus of attention. They are then used to derive the planning, scheduling and control of all the plant's resources. The result provides a smooth and continuous flow of materials through the plant with minimum disruptions.

Any schedule or production plan must be productive, reliable, robust and realistic. Productive in that it must relate to the market demand while contributing to and being measurable against the organisation's goal; reliable and robust in that it must reflect the capability of the resources available and stand up to the inevitable disturbances or disruptions that will hit it; realistic in that it is capable of being done with the resources available including material supply.

In any plant, there are only a few **Capacity Constraint Resources (CCRs)**. All CCRs are identified, and the various orders that are to be processed through them are scheduled according their capacity potential and to the market demand. The schedule established for the CCRs determines the drum beat for the system.

The essential operational steps of DBR scheduling are as follows:

- Establish the due date requirements for the orders or demand. This provides the first and "ideal" drum to work to.
- Identify the CCRs in the system.
- Develop a Drum or a schedule for the CCRs which makes best use of them and is in-line with the needs of the market. The drum is effectively the master production schedule which establishes the "drum beat" and control for the entire system.
- Protect the throughput of the factory from statistical fluctuations through the use of time buffers at critical locations. Time buffers are strategically located to protect the throughput of the entire system and to protect the due dates promised to customers.
- Use logistical ropes tied to the CCR drum schedules for each resource. The ropes synchronise all non CCRs to generate the timely release of the right materials into the system at the right time. Ropes ensure that operations upstream of CCRs are time phased to CCR requirements and operations downstream do not subsequently impede product flow.

Buffers provide the timely protection of CCRs from any likely or expected disruption. The rope is the timely release of raw materials into the system; it is tied to the size of the buffer. Buffer Management (BM) provides the means by which the schedule is managed on the shop floor. The strategic points at which buffers are established are called the buffer origins.

Buffer Management & Continuous Improvement.

As said earlier a schedule clearly needs to be productive, realistic and reliable - it should also be emphasised that a schedule is only as good as the ability to manage it or "make it happen". This is where the Buffer Management control comes in and is a very important aspect of the DBR application. BM will help identify resources likely to restrict Throughput and/or increase Inventory and is also key to maintaining continuous improvement.

BM will firstly help to ensure the schedules for the CCRs, and thereby the total schedule, are maintained. Secondly, by identifying trouble-making non CCR's, it can also focus attention on these and point towards areas for improvement. If, as a result of the improvements there is less disruption from problems then the 'Murphy element' of the buffers can be reduced, resulting in shorter lead times.

If you would like to learn more about TOC-Lean Operations Management, why not consider our 2-day Flow Manufacturing for MRO & Production workshop?

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