

Efrat's Nuggets

By: Eliyahu M. Goldratt and Efrat Tal

**Efrat's nugget -12: Light blue 2, or:
A way to exploit the protective capacity using orders (as
opposed to using stock).**

(MTA combined with MTO)

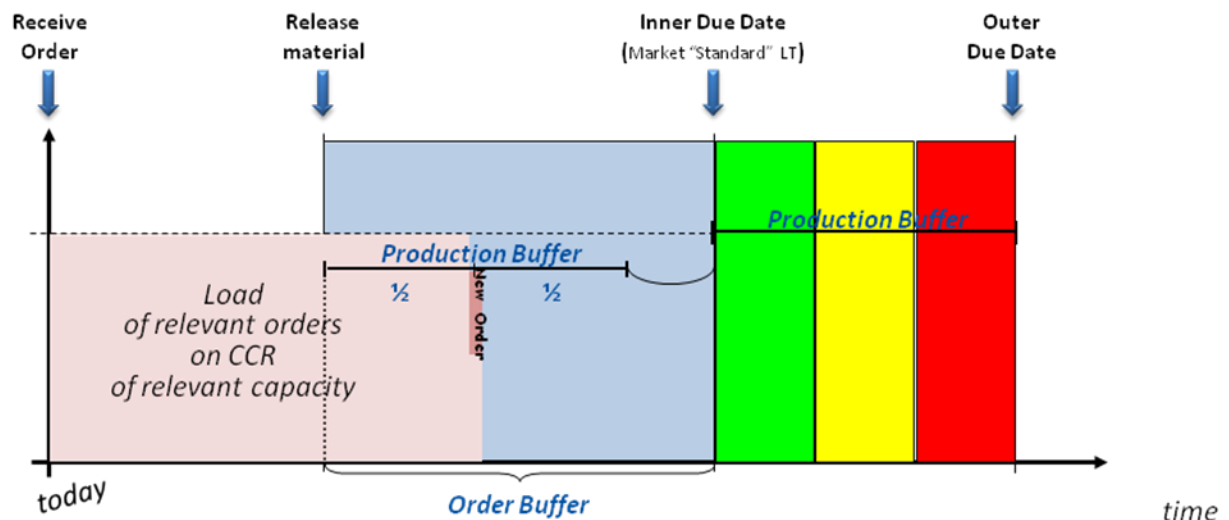
In MTA environments there is a need to hold protective capacity. The problem is that in order to use the protective capacity when needed, this capacity is on average idle. In the previous nugget ("light blue 1", no. 11) we discussed a way to directly exploit the protective capacity; to use this idle capacity to satisfy more sales. The first light blue method is based on the use of protective capacity to produce to stock, which is then offered in segmented markets – dumping markets. The nugget ended with a warning not to use this method if the company cannot find suitable dumping markets. In cases where the company can't find enough such markets, and consequently a part of the protective capacity is left unutilized, there is another possible method that can enable exploitation of the remaining free protective capacity. This method is based on processing clients' orders by the protective capacity and therefore it is applicable only in mixed MTA+MTO environments. It mandates the following, not overly restrictive, two conditions:

1. The production lead time is not more than half of the market lead time.
2. There is a certain section of the MTO market that is prepared to accept delivery with an elongated lead time, equal to market lead time plus production lead time.

This is how it works:

1. These light blue orders are always promised with a due date equal to current date plus market lead time plus production lead time.
2. Before sales commits to such an order it has to check with operation if there is still available protective capacity.

3. Operation does the check using the regular mechanism of load control. The relevant capacity is just the free¹ protective capacity. The commitment is allowed to be given if the “front of the load” plus half the production lead time does not exceed the market lead time (much the same as with regular orders when the order lead time is bigger than the production buffer).
4. At the time of giving the commitment, the system determines the material release date in the regular manner (date of “front of the load” minus half a buffer), it also records the current date plus the market lead time as the “inner due date”.
5. When the released date arrives, the order is released having a light blue priority color².
6. When the “inner due date” of the order arrives, and the order is still not completed, the order is given a regular priority colors, and turns green (and then yellow and then red) as if it was an ordinary order that was just released to the floor (having an order buffer equal to the production buffer).



The last paragraph outlines the suggested solution. Yet, we need to demonstrate the logic behind it. A method that is designed to exploit protective capacity for obtaining extra sale orders must fulfill two fundamental rules: first and foremost, it has to make sure that no obstruction is caused to the regular operation; second, the company needs to keep its commitment for those extra orders. We will henceforth show why following the above steps satisfy these two rules.

¹ A part of the protective capacity might be used for dumping markets.

² The light blue priority color was discussed in the previous nugget; the floor personnel are guided to work on light blue orders only when there is no other work and, not less important, to immediately stop processing them whenever regular work is available.

How does this method fulfill the first rule - 'avoid jeopardizing operations'? Keeping them in special color, a “no priority” color, allows us to protect the normal operation of both the MTO and MTA section. As long as the extra orders will stay light blue they will pose no problem: at any moment that the capacity they are occupying is required for the benefit of any other order, it would still be available, since the floor personnel are directed to simply ignore light blue orders whenever the capacity is needed for other orders.

However, if those extra orders will stay forever light blue we cannot commit to deliver them on any promised due date; this may work with MTS mode of operation, but obviously not with MTO. So we do commit to a reasonable due date, and in order to fulfill the second rule and deliver the orders reliably on time we have to give them real priorities when there is still sufficient time. A full production lead time before the committed due-date is certainly sufficient time.

This covers the issue of the extra orders' reliability; but it creates a problem with protecting operations (the first rule). When the “no priority” time is up and the orders are given real priority, they start to demand attention, to compete on the company's resources with the ordinary orders (both MTO orders and consumption driven orders for MTA). So, we must make sure that there is a very high chance of completing the extra orders before the inner due date - before they obtain real priority colors and get a chance to disturb other orders. The way to ensure that is by simply allowing the orders to have enough light blue time. How much “light blue time” is enough for the orders to be completed in high certainty? Clearly this duration must be at least a production lead time.

The typical low percentage of black orders in TOC-regulated MTO is a good indicator for the percentage of light blue orders that are expected to invade to the “real-priority world” and create disturbance. Actually, since the “light blue world” has no priority colors, the expected percentages of light blue orders that would not finish on the inner due date (before turning green) is somewhat larger. Still, the lion's share of the orders will be finished before becoming green. Even if 10% of the light blue orders live to turn green, they comprise only a small fraction of the total load on the MTO system; in an environment where MTA requires half the capacity they will be just two percent of the MTO capacity, deeply within the noise of the load. For the nitpickers: not only are we dealing with merely a small percentage of the orders which may reach beyond the light blue period, but also these few orders are likely to be close to completion upon turning green; thus, the extra burden they cause to the system is insignificant.

Since the ability to get such orders may fluctuate, having a long window to average the demand is important. That is the reason for the requirement to have the production lead time smaller than the market lead time. Elongating the lead time of promised due-date by a production lead time ensures the reliability of the extra orders.

It might look complicated but it is actually very simple. Maybe it is not a triviality to understand why the conditions and the steps enable using the protective capacity but for the people who are doing the work it is very simple - the shop floor is aware only of the priority colors and the sales people have a nice segmented market to lower prices.



Pablo Picasso - Le Gourmet, 1901

Blue period