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Lean Thoughts

Designing Delivery Routes

The word “designing” is used intentionally, and means that the material delivery system, including the definition of the actual delivery routes, is an extension of the line design itself. Just like a production line is designed for a certain Takt Time, the rhythm or beat of the line, the delivery system needs to have a cycle that it is designed for, and that it is able to achieve consistently.

A *Delivery System* documents all of the necessary aspects of material delivery by a material handler. Central to a replenishment plan is a setting of inventory quantities to be delivered, for each active part number. You will then set the Replenishment Cycle, the frequency of actual physical deliveries. Think bus schedule. This cycle will drive the staffing needs, the equipment needs, the inventory quantities, and the length of the delivery route. It serves a similar function as “Takt Time” does on the production line, setting the rhythm or beat of the replenishment cycle.

A *Delivery Route* is an outcome of the Replenishment Plan. It is the physical path that a Material Handler follows from a central parts location to various consuming locations. Note that the consuming location is normally a Point of Use on the production line, but it can also be a Material Supermarket location. Whether you use a hand-cart, a tugger, a fork truck, or an AGV, the goal is to define the physical path that will be traveled.

THE TAXI VERSUS STREETCAR DECISION

Given the nature of a mixed model flow line, you need to design your replenishment system to support a wide variety of parts in calculated quantities and on a frequent basis. Think of two very different forms of transportation systems:

Taxis. Go anywhere, anytime, on call. No schedule, some deadhead runs, and sometimes a little hectic. Can be pretty quick to serve any one request, but as an overall system the taxi concept has its weaknesses. It may not be the best for a complex line relying on linked, balanced and well-smoothed production.

Streetcar. In contrast, think of a first-class streetcar or transit system, operating on a fixed route, engineered entry and exit points, published and predictable timetable, and runs on time!

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A **Mixed-Model Flow Line** depends on levelled production scheduling, careful sequencing, timely presentation of numerous part numbers at lineside, and all functioning according to a designed takt time. Typically well over half of all the parts used on such a line can be replenished by a Kanban-driven system and delivered by tugger with cart train. So you can see that our delivery plan is going to look much more like a streetcar transit system than a fleet of independent taxi drivers.

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Where Lean Thoughts can become Reality

"Unless you try to do something beyond what you have already mastered, you will never grow.“

Ronald. E. Osborn

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IDENTIFYING DELIVERY AISLES

Assess the physical layout of the facility and determine where to lay out the delivery aisles. In the case of a new Mixed-Model Flow Line Design, the Material Flow Team should collaborate with the Manufacturing Design Team at or before the conceptual design phase, to ensure that optimal delivery access is fully considered. Shown below are a list of goals for aisle creation.

Your aisles will need to accommodate the kind of conveyance that you will use. Fork trucks require more room than tuggers, and the size of the parts that will be delivered is also a determining factor. Keep in mind that tuggers cannot back up easily, so your aisles will need to accommodate a one-way route with no dead-ends.
The goal for aisle maintenance, as well as the rest of the factory, is easy to understand. Would you feel proud if a group of visitors dropped in unexpectedly? If not, then more effort in the area of 5S is called for .

Define formally all delivery points serving lineside operators. Once these are mapped, the Material Flow Team must establish stops for the tugger train, considering which and how many replenishment points can be served efficiently from each stop. This is like designing a bus route, and deciding where the bus stops will be. Using actual standard times for driving and replenishment activities, the team will establish the best trade-offs between between stopping the tugger at every POU to reduce walk time, and setting fewer stops at the cost of more walk time.

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A CAD layout will be dimensionally correct, but it is also advised to experience the delivery route physically, and to get out of the conference room. Go out to the factory floor and walk the proposed delivery route, and visualize the impact of your proposed stopping points. Picture the effort required to replenish the various Points of Use, and you will undoubtedly come up with ways to make it better.

Coupled and Decoupled Delivery Routes

Now that we've determined the parts to deliver, the Points of Use, and the aisles, let's move to structuring the delivery route itself. There are two ways to go:

In the **Coupled** method, the material handler handles the complete cycle: driving the tugger, dropping off and picking up Kanbans and containers, and also picking and filling the bins (from a Supermarket area).

In the **Decoupled** method the work is divided: one person will drive the tugger and make the deliveries, and another person will pick the parts and load the delivery carts. With the decoupled method, you will need at least two people.

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