Tugger Deliveries – Implementation Guidelines

Project Team

Assemble a cross-functional Project Team. This team should have representatives from Production Planning / Material Handling, Industrial Engineering, Manufacturing (hourly operators and salary leaders) and Maintenance. The team should meet regularly (i.e. daily or bi-weekly) to identify implementation steps, review and discuss progress of activities and to resolve any problems that may arise.

The Team should be lead by a Project Leader. This is a senior person, preferably a Team Leader or above from the Material Handling organization, who in the future will be responsible for all Tugger Operations.

Calculations

Decide on the boundaries of the project and create a Value Stream Map of the process.

Collect and verify data from purchased parts and manufactured parts, as well as packaging that has to be delivered. Create Plan-for-Every-Part (PFEP).

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Evaluate packaging information plant wide, evaluate location of delivery points and pickup points, evaluate usage rate at the delivery point, evaluate production plans of the "customers", and evaluate the average amount of material moving based on out-the-door ship quantities of the material.

Perform calculations to estimate the number of routes, types of routes (small containers vs pallets), manpower needs and equipment requirements (push carts or Tugger carts).

Identify delivery points (Point-of-Use) and check to see how much inventory the part presentation racks hold. (Rule of thumb: start with 2 hours worth of inventory). Also understand that in order for this process to work you need a minimum "two-bin" system for each part.

Estimate the average number of containers (small and bulk) that the material handler must deliver during each delivery. This will require understanding ***customer demand rates.***

Calculate time required to load/unload material. Consider miscellaneous time (repack, loading special part presentation devices, etc.). Calculate the stop time. Revisit the layout and determine a possible delivery route.

Use a plant floor layout and place colored dot stickers on each potential drop or pick-up location. Estimate the number of stops. Visit the plant floor to verify stops. Calculate the travel time.

Decide if you are going to have a coupled route or de-coupled route. In a coupled route the same material handler is responsible for delivering components to the line as well as loading the Tugger cars in the Supermarket. In a de-coupled route there are two material handlers involved – one only drives the Tugger, the other one only loads the carts in the Supermarket. Coupled route is usually used in a small operation, where loading, delivery of parts and unloading can be completed in less than 30 minutes. De-coupled routes are used in large operation, where the second material handler also becomes a Supermarket Attendant responsible for cleanliness and re-ordering parts for the Supermarket.

Determine delivery cycles – frequency of deliveries. Part presentation inventory levels may be an indicator of how often material must be delivered. Create a Tugger Departure Board at the Supermarket and monitor attainment to schedule. Post a Tugger Delivery Schedule at each post and audit the process.

Determine the number of routes. Understand the different route options: coupled or decoupled, delivery of small containers vs delivery of bulk containers, filling routes by having material handlers also collect Kanban cards, convey scrap, finished goods, and indirect material. If there is more than one route, it will be necessary to distinguish between them (e.g. colors, shapes, etc.). This will help later in the process when visual controls come into play. The route path must be free of obstructions, i.e. the need for workplace organization.

Delivery Kanbans or Delivery Signals

Analyze each component for a delivery and design a PFEP. If the parts are common to all products or each component has only few types (models) and they all can be stored at the Operator Station use a Delivery Kanban for replenishment.

If the parts are not common (they are unique, or changeover sensitive) you must create a special delivery signal for them. This situation requires a development of a Material Handling strategy with inputs from Production Control and Scheduling, Industrial Engineering and Information Systems departments. Unique parts may have to be addressed on a step by step basis, with the initial trial using changeover racks, eventually progressing to the leaner kitting/sequencing concept. The accuracy of information flow at this stage is extremely critical. Any "Shopping Lists" or a manifest or printouts of Bill of Material

(BOM) must be accurate, updated frequently, simple to understand and easy to use. A Changeover procedure must be in place to support this process.

The delivery of bulk items by Tugger could be triggered by other types of signal. This could be a flashing light, a "flag", an empty space or an empty container. If this type of a signal is used the Team must design a method of informing the Tugger of what material and in what quantity he is expected to deliver. Verbal information is not acceptable.

Calculate the number and design the Kanban cards. Define who is going to be responsible for collecting Kanban cards, scanning them and ordering parts.

A Delivery Kanban card must contain certain minimum amount of information. Required information includes: part number, part description, delivery address, storage address, standard pack, and instructions on what to do if the card is lost and found. There is also optional information which could include: delivery loop name, product family, digital picture of component and container, Kanban code (simplified part number).

A Kanban collection box must be constructed for each operator station. These collection boxes must be easy accessible by operators. There also should be another set of collection boxes at each Tugger stop. The method for sending the Kanban card from the operator envelope to the Tugger stop collection box must be designed. There should be a clear difference between a Kanban collection box at the operator station and a Kanban collection box located at each Tugger stop. The number of collection boxes and their location should maximize the efficiency of both the operator and the material handler. A poor design will weaken the Kanban system.

Design the equipment

The Team must decide which type of equipment to use - manual or motorized. Factors included in this decision should include the travel distance, material weight, number and size of containers to be delivered and cycle times of each delivery. Preferred method is to try a manual cart, and then choose a motorized Tugger if necessary.

The Tugger itself (the Tow Motor) should be of a stand-up type. This will make it much easier for the driver to get on and get off the Tugger.

Select the number and a type of delivery carts. Depending on your operation you will need carts for delivering small components and carts for delivering pallets. You will need enough carts to effectively hold one full route of material. You must be able to maneuver through the production area. The Team might also consider a special cart for collecting trash and scrap.

Training and Implementation

The Project Team should simulate one proposed delivery route with a material handler. The purpose is to identify any problems or issues that may arise. Representatives from Production Control, IE and Manufacturing must be present with the material handler for pre-training, and for constant assistance. A visit by management is recommended to stress the importance of the project. This day should be seen as a significant event to the success of the delivery system. The more support received from functional groups, the more successful the delivery system will be.

The simulation may run from one to several route cycles until enough observations are made. Based on these observations, Tugger route design may have to be edited. Feedback from all affected parties is

needed. Verify that part presentation racks are sized appropriately according to size and frequency of deliverance. Review Ergonomic and Safety Rules.

Implement and standardized the work cell or the line site change-over process including information about material flow.

When the route is finalized the Team must create standardized work for the route and the material handler. This means: a route map with all stops indicated, route times (for each shift), detailed process flow, any other items specific to the defined route or required by the plant.

Create and post visual controls. Direction arrows for specific routes (taped, painted or hung), stop signs at each designated location, part presentation labels (must include loop size) and locations for Kanban collection boxes (both at the cell and on the delivery equipment). A clock at the start of the route should be installed to help the driver follow the route times.

Line Operators on all shifts must be trained on the purpose and use of Kanban cards. This should be done by their supervisor with support from the Team.

Maintaining the system

Delivery system must be fully supported by management. Delivery routes can deteriorate if they are not maintained. The owner(s) of the system must be clearly identified. They will be responsible for the effectiveness of the system.

Kanban cards should be audited on a regular basis. The recommendation is to audit frequently when first implemented, and then with proven reliability, the frequency can be reduced.

As the work cell production rates increase or decrease, the number of Kanban must be adjusted. As part number changes occur, the Kanban cards, part presentation labels and parts presentation must be updated to reflect the changes.

Why Tugger Systems Fail

Insufficient training on a purpose of Delivery Kanban to the Line operators leads to misuse and loss of Kanbans. Insufficient training for the material handler (Tugger driver) leads to lack of standardized work and not following standardized work (e.g. not using Kanbans).

Wrong Kanban calculation, (e.g. adjusting the number of Kanban to changing customer demand) and a wrong number of Kanban cards in the loop will result in operators and material handlers not trusting the system and refusing to use it.

Unreasonable route design (too long or not frequent enough) - insufficient process studies result in unreasonable standardized work.

Parts shortages and not being able to find parts will result in a failure.

No ownership of the process and no plan to address issues. Issues will arise, and must be addressed by Material Handling department. It may be several months before the system is working relatively well.