Forklifts, Carts & Tuggers – A Winning Combination for Profits and Safety

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Increasingly, companies are mandating that the use of forklifts be limited to designated loading and unloading zones or "Red Zones." This movement is based on the concern for employee safety as well as the desire to reduce forklift lease and maintenance costs.

Realistically, factories will not operate completely forklift free. The challenge for Six Sigma managers, lean managers and material handling specialists is to intelligently mix tuggers, non-powered manual material handling equipment and forklifts in order to benefit the bottom line and satisfy safety concerns.

While safety and cost reduction are macro benefits, there are many other less visible advantages that may play an important role in reducing costs and improving customer response. Identifying these benefits requires a big picture overview of the project as well as an understanding of how each department and suppliers, both internal and external, will be impacted.

Balancing the mix of forklifts, carts and tuggers can be extremely challenging and at times frustrating. Many familiar habits of both the material handling support and production assembly personnel will be changed. Physical plant, assembly line and storage constraints, packaging changes, budget limits, ergonomic issues and project completion time add additional complexity. Working through these difficult problems will require unabridged input from top management, the affected departments and suppliers who will share ownership of the plan.

The Case for Restricting Forklift Usage

There is no question human loss and liability cost relative to forklift injuries has been the number one driver for initiating forklift control programs. Each year in the United States, nearly 100 workers are killed and another 20,000 are seriously injured in forklift-related incidents. Forklift overturns are the leading cause of fatalities involving forklifts; they represent about 25% of all forklift-related deaths[1].

The Hyster Company estimates that businesses waste over $1 billion in unnecessary operating costs associated with material handling equipment. A recent study suggested that unfortunately, only 6% of end-users actually know their real maintenance costs. Even fewer have programs in place to reduce these

[1] National Institute for Occupational Safety and Health (NIOSH) at www.cdc.gov/niosh/2001-109.html

expenses[2]. An old industry axiom states that on the average over the life of a forklift, only 20% of its cost is ownership. Approximately 80% of total forklift costs are operating costs[3].

On the flip side, forklift control programs can contribute value in areas relating to reduction of inventory, improvement of material flow, reduction of line-side handling equipment and floor space, improved operator ergonomics, cycle efficiency and reduced need for coordination between forklifts and operators for replenishment. Benefits of forklift control programs include:

1. **Cost avoidance** due to fewer and less expensive line-side handling equipment.
2. **Cost avoidance** of extra line space required for forklift replenishment.
3. **Improved** scheduling flexibility by not needing tight coordination between line operators and production floor material handlers (built-in system using RF, Kanban, etc.).
4. **Decreased** total WIP (work-in-process) inventory.
5. **Improved** control of FIFO (first in, first out) products delivered line-side.
6. **Reduced** coordination time between forklift operators and production floor material handlers.
7. **Improved** personnel morale as forklift activity is reduced in response to a serious injury or fatality involving forklift operation.
8. **Decreased** loss in worker production, lower insurance rates, fewer worker compensation claims and litigation costs associated with less forklift injury claims by going to a forklift controlled environment.
9. **Reduced** costs for forklift leasing, purchase, maintenance.
10. **Reduced** forklift operator costs (direct labor, benefits and operator certification).

Macro Issues

Building a forklift control program requires that a significant amount of time be spent on the front end of the process clarifying plan targets, goals, identifying waste, ergonomic and safety threats. At the start of the project, a framework can be established by asking probing questions about how changes might impact operations and the supply chain. Manufacturing / industrial engineers and material logistics personnel are the typical project leaders who would ask questions and make decisions with input from safety and ergonomic teams, production managers, line operators, proposed tug drivers, market supply teams, purchasing and suppliers. *Poor communication* is the root cause of ineffective forklift control programs that add waste, increase costs and create the “tried it once, not going to try again” mind set on future programs.

[2] The Hyster Company, www.hysterusa.com/fleetsvc.html
[3] Materials Handling Equipment Co., materials-handling-eqp.com/forklift/significantly-reduce-forklift-operating-costs.htm

The following questions are samples of those that should be asked to help uncover possible problems and define the foundation / framework of the plan. At the end of the exercise, all affected personnel and departments should have a clear picture of any changes to past procedures and new responsibilities that may be required under a forklift control plan.

Objectives

1. What are the goals of the program? Can they be clearly defined, measured and shared with all personnel?
2. Do proposed plans and actions support the goals or stray from the target?
3. What will be the impact on the company's bottom line?

Parts Presentation

1. Are mixed product lines with complex parts change outs being used?
2. Will they be handled with sequencing or kitting part configurations?
3. What criteria will determine where containers will be "pushed" to/from conveyors or containers on carts will be "exchanged" in work cells?
4. Will suppliers (internal/external) support different container configurations and more frequent deliveries? What are the costs?

Logistics

1. Where in the plant will forklifts continue to be used?
2. Will there be one market area and/or multiple smaller staging areas?
3. How much inventory can be removed from the floor?
4. How much can be removed from the market?
5. Will forklifts be used to load line-side supply carts in the market areas?
6. What kind of tugs will be acceptable to the drivers, maintenance personnel and be suitable for the loads handled?

Personnel

1. How many material handling support personnel are needed for a cart/tugger replenishment plan? Is this better or worse than present forklift manpower? Why?
2. How closely will ergonomic guidelines be followed?
3. Will material handling (MH) operators be loading/unloading any carts to conveyors?
4. What maximum weights will MH operators need to push, pull? What frequency, distance?
5. Will assembly operators be expected to move containers or carts?
6. Will MH operators be required to get in and out of tuggers repeatedly? Stand up vs. sit down designs? Ergo impact?
7. What are the Union regulations and issues related to the changes?

Micro Issues

Tracing the flow of material (and containers) from the supplier to receiving dock through the assembly station and back to the shipping dock for *each part or part group* can provide the insight into troublesome details that might otherwise not surface until the first run-off. These handling problems can be avoided if the forklift control system designer accounts for all of the plant clients who must touch material in some way. In example 1.1 that follows, the traditional forklift movement of one part (and its container) used in one production cell location is compared to a forklift control strategy. As the details unfold, note the number of operational issues, personnel and supplier changes that must be put in place.

Example 1.1

INJECTION MOLDED HOUSING
FORKLIFT CONTROL ANALYSIS

Receiving

Standard Forklifts

Original part is delivered from an outside supplier two times a week in 96" long x 45" wide containers. Parts are in 10 stacks of 50 each/container, 5 - 6 containers per/delivery. Production uses approximately 10 containers/week. Maximum market inventory: 3000 units.

Forklift Control Approach

10 stackable, gravity slide tube racks that hold 125 units each are delivered four times a week from the supplier. Racks are forklift loaded in the receiving area onto low push / pull force, towable carts and staged in the market area. Maximum market inventory: 1250 units.

Line-Side Delivery

Standard Forklifts

Forklift operator delivers one container to the line at the start of each shift for two shifts. Assembly operator places any remaining parts in new container, forklift driver removes empty container, loads new container on a lift and tilt device. Load time: 10 minutes.

Forklift Control Approach

Every two hours the tug operator tows one rack to the line. Tug operator rolls out empty rack (placing any remaining parts on the new rack) and pushes new rack over a small footprint lift. Maximum inertial push / pull forces are not exceed 40 lbs. Load time: 4 minutes.

Assembly Operator Actions

Standard Forklifts

Operator works from one side of the tilted container *walking the length (96") of the unit* to unload. Line space required: 81" linear (36" for operator and 45" for container width), plus 96" depth. Av. operator cycle: 45 seconds retrieve/install, 12 seconds rest.

Forklift Control Approach

Operator works from the back of the cart rack (end facing the line). As parts are removed, gravity slide rack feeds new parts to the operators allowing them to stay (sit or stand) in one area. Line space required: 42" for operator / rack width, plus 75" depth. Cart rack has double slides to accommodate required part volume. Av. operator cycle: 20 seconds retrieve/install, 37 seconds rest (opportunity to increase line speed or add second operation).

Return

Standard Forklifts

Forklift picks up empty container line-side, moves it to shipping and stacks it on the floor (stacked two high) until next vendor pickup.

Forklift Control Approach

Empty rack is towed to shipping and forklift separates the base from the rack assembly and stacks the rack on the floor (stacked two high) until next vendor pickup.

Plant Considerations

Controlling the use of forklifts in an existing plant (Brownfield) is more difficult than in new or remodeled facilities (Greenfield) where constraints can be adjusted on the drawing board. Even when approached carefully, existing plant constraints may make the best forklift control strategy less than optimal. Narrow aisle widths, blind aisles, poor floors, variable conveyor heights and set backs from the aisles, limited linear line space, ceiling height and poor market (inventory stores) locations are just a few of the basic challenges. Table 2.1 lists more examples of micro issues that would need to be addressed.

Area	Issues
Operator Ergonomics/Safety	Push/pull forces, rotational forces, reaching distance, lift height, bending/twisting needs, pedal forces, tripping, pinching, crushing or impact hazards
Part Picking, Sequencing, Presentation	Line-side configuration (cart exchange vs. push) relative to high density/low density parts, dunnage type, weight, size, and line space
Operator Efficiency (prod.)	Cycle time targets, eliminate wasted motion or action
Zero Line Stops	Simulation models, real variable assumptions
Line Space Required	See part presentation
Operator Efficiency (MH)	Market: loading/unloading dunnage, conveyor vs. forklift, tug speeds, market to line cycle times
Plant Constraints	Floor types/condition/flatness, column locations, aisle widths, production line set backs, turn around areas, market areas vs. high volume assembly locations
Equipment Constraints	Existing conveyors, lifts, tilters, etc. that compromise ergonomics, cart loading, cart geometry/alignment (to conveyors), number of carts/train
Financial Constraints	Poor planning/business case, cost overruns, budget cutbacks (at expense of long term gains)
Replenishment Signals	Determining the appropriate type of pull signals such as Kanban cards, electronic RF calls, etc.
Visual Factory/Error Reducing	Color coded inventory containers, open racking for easy identification of inventory, color coded delivery locations

Brownfield conversions work best when done incrementally by addressing one to two work cells at a time or common assembly areas. A good place to start planning is in an area where a Kaizen event or new product or process is being implemented and the material flow can be changed at the same time. Despite the challenges, Brownfield conversions can yield good results if it is understood that changes may require more customized solutions, higher initial costs and longer implementation times.

Summary

Converting to a forklift controlled plant floor is a significant technical challenge. Regardless of whether the plant is a Greenfield or Brownfield installation, material movement into and through the plant can be systematically analyzed and improved. Getting the best possible mix of forklifts, carts and tuggers that will yield both production and profit improvement is dependent upon getting detailed input from all departments and management. In converting to a forklift controlled plant, it is critical not to eliminate one problem by introducing a new set of problems; therefore, it is important to find suppliers who have experience in the forklift control arena and can provide useful plan feedback, suggest creative approaches and help avoid application pitfalls.

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