PHYSICAL PRODUCTIVITY

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Today we're going to deal with the warehouse manager's dilemma.

Should I: Get my facility to maxi-productivity as a conventional system before I mechanize? How?

or:

Mechanize to get an automatic improvement in productivity? How?

We'll attempt to deal with this dilemma as fully as time permits.

The basic truths are:

-- Almost any conventional operation can make improvements in methods and gain productivity.

-- Almost any operation can benefit from mechanization.

(The remainder of this talk will deal with the specific improvements possible from each type of operation--based on studies in nearly 30 operations).

Let's deal with the conventional operation.

First, let's identify the basic components of cost in a conventional operation. They are:

-- Pallet moves.
-- Selection travel distance.
-- Case and item handling time.
-- Work pace and delays.

Pallet Moves

The average warehouse moves each inbound paller 3-4 times over a distance of 500 feet:

To the dock (backhaul + rail only)	60 feet
To storage	200 feet
To ready reserve	200 feet
To selection	40 feet

Each move is 30 seconds.

Each 100 feet of travel is one-way 30 seconds, including an empty return trip.

Thus, pallet handling costs could be 270 seconds, or nearly 5 minutes.

At 30 cases per pallet, this could be nearly 10 seconds per case.

(Every second costs ½ cents, including equipment, $10 labor and fringes).

A very efficient inbound system could cut pallet moves to 2-3 and the distance to 150 feet.

Costs could be 135 seconds, or 2½ minutes per pallet, or 5 seconds per case.

(More improvement is possible with mechanization).

Selection Travel Distance

A typical warehouse has 6,000 feet of aisle.

A 1,200 case order needs 20 pallets, which are taken to the dock in 10 trips of 400 feet (round trip) each.

This travel of 10,000 feet can be done at 20 seconds per 100 feet--2,000 seconds.

Additional cost may be 3 minutes per trip or 1,800 seconds paperwork, equipment.

Thus, travel time is just over 3 seconds per case.

You can see it is possible to halve or double this time if:

-- more or less aisle is needed for the assortment.
-- selection is done on only one side of aisle.

Case Handling Time

A typical 12' aisle warehouse and 1½ cases per stop and equal number of 1-high, 2-high and 3-high slots could have a case time of 15 seconds per case.

(Thus, selection time at 18 seconds per case, including travel of 3 seconds, would give an overall rate, without delays, of 200 per hour).

Thus, in summary:

Element	Typical Time (Seconds)	Range of Time (Seconds)
Pallet moves	10	5-15
Selection travel	3	2- 6
Case handling	18	14-20
TOTAL	31	21-41

(Delays, miscellaneous tasks, work pace losses, would cost 10-30% additional).

Thus, there are real improvements possible in handling costs of a conventional operation.

Note also, cherry pickers, radio tuggers, double pallet transporters, batch pick, etc., can be analyzed in this context.

Let's now deal with mechanization.

First, let's broadly define mechanization:

-- equipment in an integrated system to save substantial amounts of labor.

--speed of operation normally beyond the individual operator's control.

Normally, mechanization would either save:

-- case handling times.
-- inbound pallet travel.
-- outbound selector or pallet travel.

There are four basic types of mechanization:

-- belt conveyors (example: rapistan pick to belt).
-- vending machine (example: si ordermatic).
-- convey merchandise to selector (example: si cartrac).
-- stacker crane (example: interlake).

Each has different characteristics.

However, we have learned that you can analyze each system in a comparable manner:

-- fixed cost for the system.
-- incremental cost per item carried.
-- savings per case or items handled.
-- environment where works best.

Each of these systems have a common application problem:

-- minimize fixed cost by more effective management (e.g., sorting and accumulation conveyor).
-- install only on items where justified incrementally (we'd want 5 to 6-year payback).
-- install for high volume items to recover fixed costs (also on 5 to 6-year payback).
-- keep the utilization high--as close to 3 shifts as possible.

(Let's discuss each of the basic systems).

Mechanization Options

1. Belt Conveyor

-- manual batch selection (4-8 orders) to conveyor.
-- loader palletizes off conveyor.
-- pallet roller replenishment.
-- save 4-8 seconds per case (2-4 cents).
-- cost $200 per item if 2 high pallets ($50 per item if case flow rack).
-- justified above 30 cases per week.
-- fixed cost $50,000 (1,000 cases/hour, batch = 4) to $1 million (5,000 cases/hour, batch = 10), for loading, sorting.

(Generally, 75-100,000 cases/week would justify mechanization).

2. Vending Machine (Si Ordermatic)

-- automatic selection.
-- semi-manual replenishment.
-- loader palletizes off conveyor.
-- save 8-10 seconds per case (4-5 cents).
-- costs $800 per item for average size cases, justified above 100 cases per week.
-- fixed cost $250,000 per system, plus $200,000 per quadrant (1,500 cases per hour).

(Generally, 100-150,000 cases/week would justify one quadrant).

3. Convey Merchandise to Selector (Cartrac)

-- selector selects and loads pallet.
-- fork truck replenishment.
-- save 10-15 seconds per case, since no travel.
-- works for non-conveyables.
-- cost $2,000 per item, if full pallet.
-- justified above 150 cases per week.
-- fixed cost $50,000.

4. Stacker Crane

-- computer controlled life and transfer eliminates all of replenishment, most of put-away labor, up to 90' high.
-- costs $25 per slot, plus $200,000 per stacker.
-- 1 stacker per aisle, handles 60-100 moves per hour, for up to 2,000 pallets.
-- save 5-6 minutes per pallet ($1.50).
-- (justified above 600 pallets per aisle, per week).
-- can also save on building cost, since integral.

Management Issues

Generally, mechanization requires a group of people to work on a coordinated basis.

Timely maintenance is more critical than with conventional systems, though not necessarily more costly.

Justification required multiple shift utilization.

Utilization depends on effective "space allocation" in the system.

(Thus, mechanization is harder to manage than conventional system).

Conclusion

Mechanization savings can be substantial, up to 7½ cents per case and $1.50 per pallet, but mechanized systems:

-- do require management skills.
-- do require application skills.

Conventional system savings can be nearly as large (10 cents per case, or $1 per pallet is practical):

-- often, investment is very modest.
-- will develop management skills.
-- but, also requires application skills.

Recommendations

1. Establish what conventional savings are possible.

2. Establish what mechanization savings are possible, at what cost!

3. Realistically assess management skills.

4. Mechanize if skills to manage and investment justified versus conventional improvements.

5. Make conventional improvements, except where not warranted by impending mechanization.

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