Flexible or Direct?

Part 3 in a 3-Part Series
Presented by Intralox

Part 3: Determining
Your Package Handling System Design

Key indicators for deciding when to use flexible or direct package handling systems

In parts one and two of our "Flexible or Direct?" series, we defined the differences between end-of-line (direct) and integrated (shared asset) package distribution to palletizing systems. We identified criteria used to choose the system design and walked through the process of evaluating competing system designs. The third and final step is to identify key indicators to assist in drawing high-level conclusions on determining when to use flexible and when to use direct package handling systems.

KEY INDICATOR #1

Individual Production Line Capability

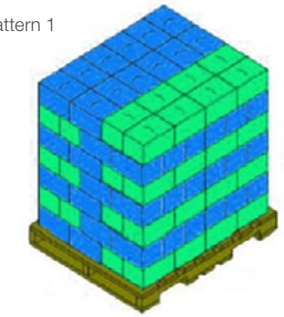
When determining if multiple palletizing destinations are necessary, a key component is the range of varying SKUs each line is capable of producing.

It is most cost effective to design and use an end-of-line palletizer if an individual line has minimal variety in terms of:

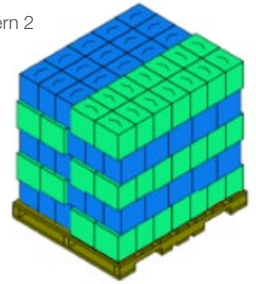
- **Product type**
- **Dimensions**
- **Rate**
- **Pallet patterns**

If individual lines have a wide range of production capability, then designing a flexible, integrated system may be the best option depending on the overall system capability requirements.

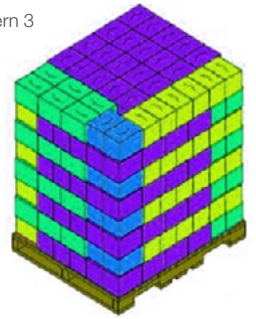
Pallet Pattern 1



Pallet Pattern 2



Pallet Pattern 3



When a line produces similar product types with common pallet pattern configurations, such as in pallet patterns 1 and 2, an end-of-line palletizer can use simple, repeated motions with common end-of-arm tooling to build the patterns efficiently. When a line can also produce SKUs that require more complex pallet pattern configurations, such as in pallet pattern 3, more expensive and complex palletizer systems are required to support the variations in patterns. An integrated system can achieve these outcomes while saving on costs for multiple palletizers.

KEY INDICATOR #2

Unique Product Handling

A risk associated with flexible, integrated systems is that the conveyance is shared by most or all lines. This means all product formats running during a given production schedule need to be capable of not only being handled but being handled together.

These product formats may be unique in:

- **Shape**
- **Dimensions**
- **Weight distribution**
- **Material**

The goal of the conveyance system from packaging to palletizing is to transport product reliably so it can be processed. Unique products may require special tooling, such as adjustable guide rails or up enders, to convey properly. With that goal in mind, end-of-line systems may be the best option when handling unique products, at least for individual lines capable of producing them.

KEY INDICATOR #3

Overall System Production Capability

When individual lines have a wide range of production capability, there are two common actions.

Design for the worst-case scenario on each individual line.

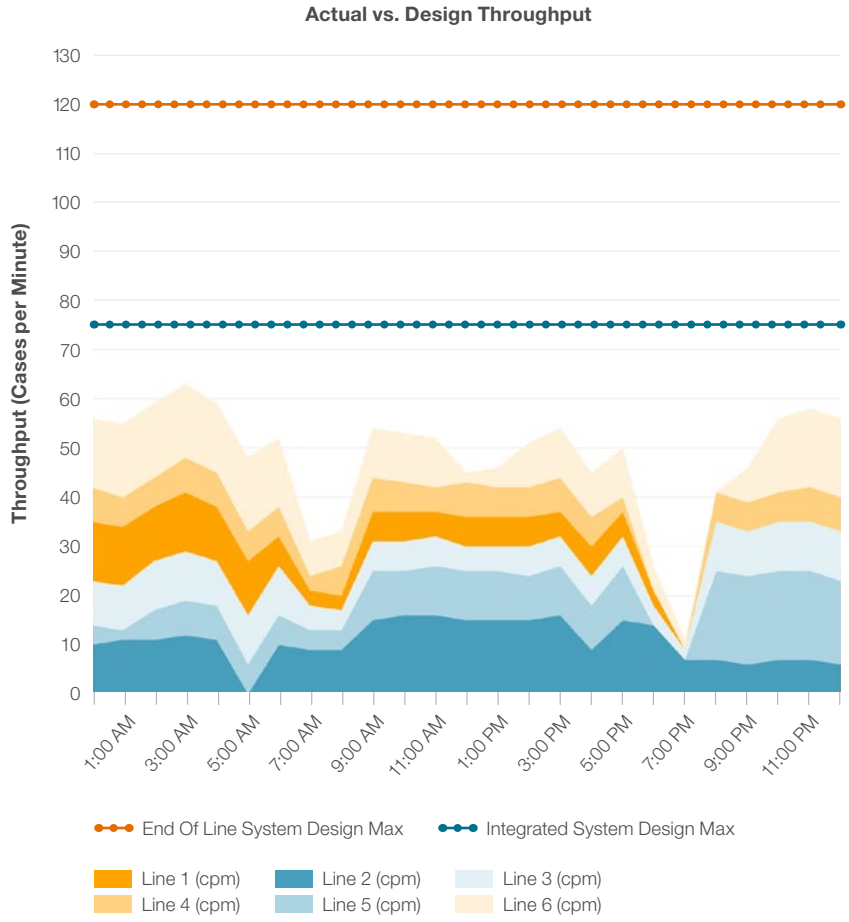
OR

Take a holistic look at the system requirements.

It makes most sense to holistically investigate the system requirements. An overall system may only need to support a fraction of the sum of the individual lines' maximum rate capability. This can be based on factors outside of engineering, such as:

- **Retailer preferred product format**
- **Sales**
- **Storage and distribution logistics**
- **Warehouse management**

If this is the case, using shared assets can minimize the number of palletizers needed. As a result, the total cost and footprint of the overall system decrease. This requires a flexible conveyance system to balance production from each line across the shared assets.



Six individual lines can each achieve 20 cases per minute (cpm), despite never reaching that mark. This is due to some lines running slower codes, changeovers, cleaning time, or other inefficiencies. In this way, the sum is always much less than the worst-case schedule.

An end-of-line system would need six palletizers capable of 20 cpm, or 120 cpm total, whereas an integrated system can be designed for less capacity—for example, 75 cpm total—by using shared assets.

Overall System Production Capability

An alternative design method is to explore the mix of product formats.

Consider this statement:

IF the overall system requires a specific mix of product types or formats across lines and each line has the capability to produce each type or format,

THEN an integrated, flexible system where each line can route product to the appropriate palletizer for each format will be the most cost effective.

KEY INDICATOR #4

Asset Utilization

Asset utilization and overall equipment effectiveness (OEE) are key performance indicators for evaluating capital spending for many end users.

- **Integrated, shared asset palletizing systems typically average 10%-15% higher OEE compared to end-of-line systems**
- **Conveyors are more reliable than palletizers when handling quality product, Therefore the benefits of being able to route product to multiple palletizers outweigh the risks of using shared trunkline and sorting conveyors**

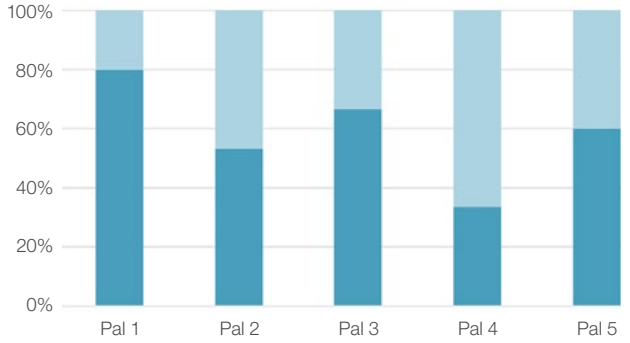
End-of-line systems often have lower utilization rates due to the palletizers being unusable whenever there is downtime on the upstream packaging equipment.

This downtime may be caused by:

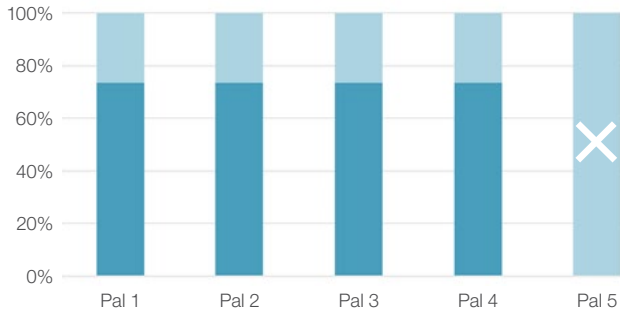
- **Cleaning**
- **Preventive maintenance**
- **Lack of demand**
- **Unplanned downtime events, such as component failure**

Palletizers designed to handle fast-moving products may be underutilized when processing low-rate products. This is a result of wide variety in throughput, which depends on the product mix the line is capable of.

Palletizer Utilization—End of Line Palletizers



Palletizer Utilization—Integrated System with Production Evenly Distributed



In this example, there are five packaging lines. Each line can produce up to 12 cpm, but never collectively more than 45 cpm. All palletizers are designed to have 20% more capacity than the upstream packaging lines. Each line can handle a max of 15 cpm.

In the topmost chart, an end-of-line system has five palletizers averaging 58% utilization. In the bottom chart, an integrated system balances production evenly across four palletizers averaging 78% utilization.

KEY INDICATOR #5

Unplanned Downtime Risk Mitigation

When choosing between end-of-line and integrated systems, a critical factor is the ability for the plant to manage unplanned downtime on the palletizer systems.

The benefit of integrated systems is that they provide production planners with options for managing around individual palletizer downs. These options include:

- **Prioritizing which lines run**
- **Adjusting SKUs or rates**
- **Making no changes if the remaining shared assets can support the total production demand**

Unplanned downtime may be easily mitigated through inventory management, co-packing, manually palletizing, or adjusting production schedules. However, if unplanned downtime can result in missing critical sales orders or production targets, the ability to mitigate through an integrated, flexible system will be crucial.

Flexible or Direct: Conclusions

So how do you know if an end-of-line system or an integrated system is right for you?

Uncovered in this series, you have learned about several factors that may help you decide:

- **Production capability**
- **Operational impact**
- **Cost effectiveness**

Let's draw conclusions on how these factors relate to both system designs. This will better inform a decision on when an end-of-line system or an integrated system will be the most effective.

Flexible or Direct: Conclusions

Production capabilities for an end-of-line system or an integrated system are directly tied to specific engineering factors.

When evaluating production capability, consider each system within the contexts of:

- **Sales volume**
- **Planned production time**
- **Storage capacity**

When considering the operational impact of each design, the critical factors are:

- **The number of personnel and resources required to support the equipment**
- **The effort needed to manage day-to-day production scheduling**
- **Major downtime events**

Flexible or Direct: Conclusions

End-of-line systems are the most cost effective when:

- **Each line has a high-uptime/low-rate profile**
- **Unplanned downtime can be easily mitigated**
- **Packaging lines are located near finished product storage or shipping areas**

Integrated systems are the most cost effective when:

- **Each line has a wide variety in typical product rates**
- **Unplanned downtime has a major impact on operations/sales fulfillment**
- **Packaging lines are located relatively far from finished product storage or shipping areas**

It is not uncommon to find both end-of-line and integrated systems within the same facility, as large plants may contain multiple departments with unique needs.

These hybrid systems—where lines can run to an end-of-line palletizer or be fed into an integrated system—can be used in special cases where the benefits provided by each system outweigh the cost of redundancy.

The Right System Comes with The Right Partner

The most crucial choice a producer can make is selecting an experienced layout development and optimization partner for your system design. When choosing an end-of-line or integrated system, your goals will be more difficult to meet if your system design is not engineered appropriately, with consideration to:

- **Palletizers' capacity to exceed production needs**
- **Accumulation to buffer against microstops and maximize utilization**
- **Conveyance design to optimize product handling**

An effective partner will be able to apply these crucial design principles and utilize the best technology to meet all your needs, and proactively address cost effectiveness and productivity.

Intralox's global team of industry experts can help you navigate these decisions. Our specialists are ready to assist you in project scope and specification, project realization, and post-project support when choosing your end-of-line or integrated systems.

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