Horizontal Carousel Basics
Horizontal Carousels

• What Are They?
  - Moving Shelving
  - Oval Track
  - Bring Product to Operator
  - Space Efficient – No Aisles
Machine Parts

- Non-Moving Parts -
  - Gearmotor
    - Inside Machine
  - Frame
    - Structural Steel
  - Feet
Machine Parts

- **Moving Parts** -
  - **Upper Chain**
    - Drives
    - Supports Load
    - Guides
  - **Bin**
    - Carries Load
  - **Lower Chain**
    - Guide Only
Upper Chain

- Support in 8 Places
- Low Wheel Load for Less Track Wear
- High Capacity Components
Drive

- Direct Drive
- Few Parts to Wear & Maintain
- Cycloid Gearmotor
  - 200% overload capacity
  - 500% shock load capacity
  - Occasional Inspection
Maintenance

• Drives – Occasional Inspection
  • Upper wheels
    – No lubrication required
  • Lower wheels
    – Glass-filled polypropylene
    – No lubrication required
• No zerk fittings, anywhere
Controls

• 3 Tiers
  – Portable Handheld Controller
    • Operator Interface Keypad
  – Machine Control Unit (MCU)
    • Accelerate, Brakes, etc.
  – RCC
    • Interface to Software
    • Additional Keypad Functions

• ANSI MH24.1 E-Stops & Eyes
How Are They Organized?

- 1 Moves While 2 Is Picked From
- Light Guided
- Pick By Software or PHC
How Are They Organized?

- Cell Sizes to Suit Storage Need
- Each Cell Pointed To By Pick Light Tower
Benefits Summary

• Quicker Picking
  – Reduce Travel Time
  – Bring the Product to the Operator
  – Sequence Picks

• Pick Light Advantage
  – Reduce Search Time
  – Increase Accuracy

• Save Floor Space
Quicker Picking ....
The Missouri Advantage

Shelf Picking

The Important Bit

Carousel Picking

- Recognize Instructions
- Travel (walk, fork truck)
- Locate and Recognize
- Wait, Mark and Dispose
- Pick

MEGASTAR SYSTEMS
Pick-To-Light
- Towers for Carousel Locations
- Batches for Orders
Batch Station
- Standard Configurations
Software

- Fastpic 4
- Others
How Does Batching Work?

- Group Orders
- Software Selects Shortest Path for All Picks
- No Confusion – Use Lights
How Do They Save Space?

- Customize Cell Sizes
- Change Shelf Pitches
- Higher Density
- No Aisles
  - Access One End Only
- Use All Clear Height

- See Handout
Space Savings

Shelving 3' x 1.5' x 7' - 240 Bays
Carousel 24.5" x 18" x 8' Carriers

Space Savings
1,839 square feet, or 65.6%
The Space Savings Tool

### Existing Shelving System

<table>
<thead>
<tr>
<th>Shelf Width (ft)</th>
<th>Shelf Depth (ft)</th>
<th>Shelving Bay Height (ft)</th>
<th>Bay Gross Capacity (ft³)</th>
<th>Utilization Factor</th>
<th>Net Used Capacity (Bay) (ft³)</th>
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<tbody>
<tr>
<td>1</td>
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<td>21.50</td>
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<table>
<thead>
<tr>
<th>Overall Shelving System Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelving System Width (ft)</td>
</tr>
<tr>
<td>18</td>
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</tbody>
</table>

### Horizontal Carousel System

<table>
<thead>
<tr>
<th>Carrier Width (in)</th>
<th>Carrier Depth (in)</th>
<th>Carrier Height (ft)</th>
<th>Gross Carrier Cube (ft³)</th>
<th>Effective Product Cube (ft³)</th>
<th>Gross Cube Utilization (%)</th>
<th>Total # Carriers Needed</th>
<th># Carriers Per Col</th>
<th>Carousels Capacity (ft³)</th>
<th>System Capacity (ft³)</th>
<th>Space Savings (ft²)</th>
<th>Space Savings %</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.50</td>
<td>18</td>
<td>7</td>
<td>2144</td>
<td>1134</td>
<td>80%</td>
<td>66</td>
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<td>33</td>
<td>707</td>
<td>1170</td>
<td>52.2%</td>
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### Overall Carousel System Dimensions

<table>
<thead>
<tr>
<th>Carousel Length (ft)</th>
<th>Carousel Width (ft)</th>
<th>Additional Depth (ft)</th>
<th>Space Saved Carousels</th>
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</thead>
<tbody>
<tr>
<td>37.9</td>
<td>5.4</td>
<td>8</td>
<td>611</td>
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### Try More Than One Area in the Warehouse - Make A Table of Results

<table>
<thead>
<tr>
<th>Option #</th>
<th>Ceiling Height (ft)</th>
<th>Shelving L x W x H (ft³)</th>
<th># Bays</th>
<th>Effective Product Cube (ft³)</th>
<th>Floor Space (ft²)</th>
<th>Carousel Model (bin size)</th>
<th>No. Machines</th>
<th>Carousels per Carousel</th>
<th>Carousel Space Used (ft³)</th>
<th>Space Savings (ft²)</th>
<th>Space Savings %</th>
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<tbody>
<tr>
<td>Sample</td>
<td>8.5</td>
<td>341.547</td>
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<td>611</td>
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</table>

### Overall Shelving System Dimensions

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</tbody>
</table>
What We Do ..... Ask Lots of (familiar) Questions!

- What Do They Want To Do (Order Pick, Save Space, Low Ceilings ....)
- How Many People Are Doing This Now?
- How Much Are They Picking?
- How Much Space Is Available?
- What Are They Picking?
- How Much Storage Have They Now?
And Then ... Budgetary Sizing

- Roughly Size The System
  - How Many Carriers?
- Estimate No. of Pickers Needed
- Select No. of Carousels Per Picker
- Select Carousel Length
- Verify With Simulation
- Estimate
Simulate

- Input Parameters
- Get Estimate
- Iterate

MEGASTAR SYSTEMS
If More Detail Is Required ...

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<th>4</th>
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<td>8</td>
<td>20</td>
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<tr>
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<tr>
<td>ft³</td>
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</table>

▲ Get Customer Data  ▲ Order Data  ▲ Cube Data  ▲ Analyze It

**SKU Distribution**

- Case Flow Lanes
- Each Rack Flow Lanes
- Pallet Flow Lanes
- Pallet Rack - Large Items
- Carousel Items

**Test Number**

<table>
<thead>
<tr>
<th>Test</th>
<th>Flow Rack Items</th>
<th>SKU Size</th>
<th>Pieces/Day</th>
<th>Consumpt</th>
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<td>4</td>
<td>115200</td>
<td>Large</td>
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</tbody>
</table>

**Orders**

- CHK 6
- RED 6
- RED 6
- V 6
- FLC 1
- NCIN 12
- G 1
- TEF 12
Commonly Asked Questions

- Carousels Go Both Ways
  - Each Carousel Will Make Less Than One Full Revolution Each Per Batch of Orders

- Carousels are Very Reliable Machines
  - History Shows That Properly Maintained Carousels Have Very Little Down Time

- Software Does Not Break or Wear Out
  - When Properly Tested and Implemented
Distribution Applications
What Belongs in Carousels?

- Handle One Month Supply per SKU
  - 10 to 40% of the SKU’s; up to 16FT³ / SKU
  - Top 15% in Flow Rack or Pallet Picking
  - Others May be in Shelving

- Excess Replenishment Demand is a Sign of Poor Slotting

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MEGA STAR SYSTEMS
Storing

- Stocking is Everything
  - The Most Important Past of a Quality Design is the Replenishment Portion
  - Random Storage is Always Better
  - Multiple random locations typically will improve cube utilization, throughput and load balance
- Restock 5% of The SKU’s Per Day
System Flow

- Keep Things Simple - Carts Often Work As Well As or Better Than Conveyor
  - Few Restrictions to Material Flow and Work Zones
  - Velocities In & Out Can Be Very High
  - Much Less Expensive
  - No Maintenance
  - Work Zone Flexibility
Start Simple

- For Design, Concept and Initial Budget
  - A Three Carousel Work Zone of 40 Bins Per Unit is a Good Start
  - 3 Carousels Are Always Better Than 2
    - Operators Rarely Wait in a 3 or 4 Unit Design
Start Simple

- Shorter is always Better
  - Beware Horizontal Carousels that are Too Long or Too Tall
- Always Design Excess Capacity
  - Don't Exceed 80% of the Demand or the Cubic Capacity