

**JD GRAY ASSOCIATES
MANUFACTURING PRODUCTIVITY CONSULTANTS**

PILOT

**PICK TO CARTON OR TOTE TRAY
SYSTEM SEMI-AUTOMATIC SYSTEM**

JANUARY, 2016

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A. WHY SEMI-AUTOMATION?

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Industrial Carousels – A Versatile Technology for Distribution Applications Page 3 of 14
Document #WMC-WP-2883, Revised March 4, 2002

Why Use Carousels for Order Selection?

Carousels can significantly improve an order selector's efficiency if they are properly applied. At first blush, you might think that this is counter-intuitive since most carousels travel at a rate of only 50-80 feet per minute (a little less than 1 MPH). Since an order selector walks at a rate of 3 MPH it would appear that carousels are just too slow to help (the order selector could walk to the location on the carousel and back faster than the carousel could move the product to the order selector). In a traditional distribution application (one where many items are being selected on a particular selection run) the order selector normally does a substantial amount of walking between locations. We'll explain why our normal intuition does not apply next.

Coordination of Multiple Carousel Units

Carousels can actually select orders faster when they are coordinated together. While the picker selects from one of the carousel units, software allows 1 or more other units to move the next item into place. This coordination helps equalize carousel speed with the selector's travel speed, but even with 4 carousels working together, the carousels are only working effectively as fast as an order selector can walk.

Using Software to Increase Order Pick Density

This is where the second feature of software driven carousels is applied – order batching. In a traditional picking environment, order selectors pick one or maybe two orders at a time. With carousels, using light directed order placement, as many as 40 orders can be picked with one rotation of the carousels. Given this enhancement, the slow moving carousels are able to gain a significant advantage over the traditional order selector. As more orders are picked together, the distance between pick locations on the carousel becomes smaller, and thus the carousel travel becomes smaller. Smaller travel equates to faster positioning of the next pick in very dense situations, carousels can position the next pick (on average) in just a matter of a few seconds, and by using more than one carousel, the picker has a negligible wait time between picks.

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B. LSRS SHELF AND BIN CALCULATION EXAMPLE

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LSRS SHELF AND BIN CALCULATION EXAMPLE

TYPE	TOTE CONFIGURATION	DAILY OUTPUT	DAILY TOTES	CONTAINER SIZE	CONTAINER TYPE	MONTHLY OUTPUT	MONTHLY TOTES	SHELVES AT 3 INCH SPACING	SHELVES AT 6 INCH SPACING	CAROUSELS
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY:154 SEE NOTE 1	188	2	2oz	Glass Bottle	5,634	37	37		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	176	2	5oz	Airless Pump	5,270	35	35		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	55	1	4oz	Jar	1,650	11	11		
XXXXXXXXXXXX	TOTE WITH NO DIVIDERS QTY: 20 SEE NOTE 2	121	6	8.8oz	Jar	3,624	181	181		
XXXXXXXXXXXX	TOTE WITH NO DIVIDERS QTY: 20 SEE NOTE 2	11	1	3.5ml	Tube	315	16	16		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	15	1	4oz	Jar	442	3	3		
XXXXXXXXXXXX	TOTE WITH NO DIVIDERS QTY: 20 SEE NOTE 2	29	2	2oz	Tube	864	45	45		
XXXXXXXXXXXX	TOTE WITH NO DIVIDERS (STANDUP) QTY: 40 SEE NOTE 2	42	2	8oz	Plastic Bottle	1,235	31	31		
XXXXXXXXXXXX	TOTE WITH NO DIVIDERS QTY: 20 SEE NOTE 2	125	6	4oz	Tube	359	18	18		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	206	2	1.7oz	Airless Pump	6,162	40	40		
XXXXXXXXXXXX	TOTE WITH NO DIVIDERS (STANDUP) QTY: 20 SHELF AT 6" SPACING SEE NOTE 2	126	7	16oz	Plastic Bottle	3,770	(189)		189	
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	190	2	4oz	Glass Bottle	5,671	37	37		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	106	1	4oz	Glass Bottle	3,176	21	21		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	128	1	4oz	Glass Bottle	3,838	25	25		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	67	1	4oz	Glass Bottle	2,005	13	13		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	207	2	4oz	Glass Bottle	6,188	41	41		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	294	2	4oz	Glass Bottle	8,818	58	58		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	247	2	4oz	Glass Bottle	7,406	48	48		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	52	1	4oz	Glass Bottle	1,560	11	11		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	70	1	4oz	Glass Bottle	2,078	14	14		
XXXXXXXXXXXX	TOTE WITH DIVIDERS QTY: 154 SEE NOTE 1	150	1	10ml	Glass Bottle	4,500	30	30		
TOTAL		2605	45			74,565	715 (904)	715	189	
THROUGHPUT IN DECIMAL MINUTES		0.1727 DEC MIN				0.1207 DEC MIN				
THROUGHPUT IN SECONDS		10.4 SEC				7.2 SEC				
BINS								26	14	Two 40 Bin Units (allows shelving for a month's supply of this month's pick and next month's putaway)

NOTE 1: FLEXCON TOTE TRAY 24" L X 20" W X 2.5" Qty 904 x 2 = 1806; DIVIDER SHORT 1.9"H - SLOTS 14 Qty 424 x 14 X 2 = 11,872; DIVIDER LONG 1.9"H - SLOTS 11 Qty 424 x 11 X 2 = .9328. Openings per tote 154. NOTE 2: FLEXCON TOTE TRAY 24" L X 20" W X 2.5"H NO DIVIDERS; NOTE 3: WHITE HORIZONTAL CAROUSEL with the following dimensions: 20-inch bin depth, 85-inch bin height and 24.5-inch bin width

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EQUIPMENT SPECIFICATION EXAMPLE

SEMI-AUTOMATIC PICKING SYSTEM

**ALTERNATIVE A - SINGLE CONTAINER PICKING CELL – EQUIPMENT
3500 (versus 2605 current daily) PICKS PER 7.5 WORK HOURS**

Quantity - 2- 40 Bin Horizontal Carousels

Configuration	1 Pod of 2 (TOTAL 2 LSRS)
Length	46 feet
Width	73 inches
Height:	102 inches
Available cube	21 cu ft. per bin (minimum ceiling height of 10 feet)
Estimated Live Load	500 lbs. per bin
Bin Dimensions	Height-85", Width-24.6", Depth-20"
Bin Style	Galvanized Sides/Back Bins
Shelf Details	Up to 27 Shelves per bin, 904 Total shelves
Shelf Dimensions	24" Wide x 22" Deep
Shelf Capacity	25 lbs. per Shelf
Shelves adjustable:	3" centers
Speed	60 FPM
Photo Eyes	Front and Rear
Structure	Single Tier
Foot pedal	1 at Front and End of machine
Bin/ Shelf Location Controls	Software win Bin Location
Bin Numbers	1-40 both sides of bins
Light Trees	1 at Front and 1 at Rear of Carousel Pod

Quantity 1 – Lighttree Software to operate 1 Pod of 2 carousels, 1- Lot of Slider Bed Conveyor for the Putaway operation and Pick operation, Carton Folding / Gluing and Pallet Plastic Wrap Operations

Quantity (Below) – Slider bed conveyor sections

- 1 – Medium Duty, Indexing, Slider Bed Conveyor 65'L X 30"W X 30"H
- 1 – Medium Duty, Indexing, Slider Bed Conveyor 30'L X 30"W X 30"H
- 1 – Medium Duty, Indexing, Slider Bed Conveyor 25'L X 30"W X 30"H
- 1 – Medium Duty, Indexing, Slider Bed Conveyor 20'L X 30"W X 30"H
- 1 – Medium Duty, Indexing, Slider Bed Conveyor 15'L X 30"W X 30"H
- 1 – Control Panel with PLC's for Preset Dwell Times on each Family Type
- 1 – Variable Traverse Timer
- 1 – Variable Dwell Timer
- 3 – Emergency Stop Buttons

Quantity (Below) – Gravity roller conveyor sections -

- 51" between frames
- 6" Roller centers
- 1 - 6' length of conveyor
- 1 – 10' length of conveyor
- Guard rail both sides 2" Height

Quantity 1 - Crossover Bridge – 5'H x 3'W with four steps on each side

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Quantity 1808 - Tote Tray - 24" L X 20" W X 2.5"

Quantity 9328 - Long tote tray divider insert - 1.9"H - SLOTS 11

Quantity 11,872 - Short tote tray divider insert - 1.9"H - SLOTS 14

Quantity 1 – Optional (not illustrated in sketches) – Carton Form and Bottom Glue Machine – There will be an Operator Interface Terminal (OIT). The OIT will provide the operator automatic and manual system control and messaging. Pneumatic valves will be distributed in manifold banks near the system's cylinders. Machine Guarding – Guarding will be perimeter machine guarding. The construction will be extruded frames with wire mesh panels. There will be hinged interlocked doors. Bottom Gluing length of folded carton flap.

Quantity 1 – Optional (not illustrated in sketches) – Carton Top Glue Machine. Top Gluing length of folded carton flap

Quantity 1 – Optional (illustrated in sketches) – Pallet Load Plastic Wrap Machine - Stretch Wrapper with Pallet Live Roller Conveyor

Automatic turntable stretch wrapping machine

Production Speed Up to 50 Loads per hour

Automatic film cut, clamp and wipe system

Turntable with powered roller conveyor, powered roller on Infeed and exit

-OR-

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ALTERNATIVE B - DOUBLE CONTAINER PICKING CELL - EQUIPMENT
7000 (versus 2605 current daily) PICKS PER 7.5 WORK HOURS

Quantity - 2- 20 Bin Horizontal Carousels

Configuration	2 Pod of 2 (TOTAL 4 LSRS)
Length	24 feet
Width	73 inches
Height	102 inches
Available cube	21 cu ft. per bin
Estimated Live Load	500 lbs. per bin
Bin Dimensions	Height-85", Width-24.6", Depth-20"
Bin Style	Galvanized Sides/Back Bins
Shelf Details	Up to 27 Shelves per bin, 904 Total shelves
Shelf Dimensions	24" Wide x 22" Deep
Shelf Capacity	25 lbs. per shelf
Shelf Adjustability	3" centers
Speed	60 FPM
Photo Eyes	Front and Rear
Structure	Single Tier
Foot Pedal	1 at Front end of machine
Bin/Shelf Location Controls	Software with Bin Location
Bin Numbers	1-20 both sides of bins on all 4 carousels
Light Trees	1 at Front and 1 at Rear of each Carousel Pod

Quantity 1 – Lighttree Software to operate 2 Pods of 4 carousels, 1- Lot of Slider Bed Conveyor for the Putaway operation and Pick operation, Carton Folding / Gluing and Pallet Plastic Wrap Operations

Quantity (Below) – Slider bed conveyor sections

- 2 – Medium Duty, Indexing, Slider Bed Conveyor 40'L X 30"W X 30"H
- 1 – Medium Duty, Indexing, Slider Bed Conveyor 10'L X 30"W X 30"H
- 1 – Medium Duty, Indexing, Slider Bed Conveyor 20'L X 30"W X 30"H
- 1 – Medium Duty, Indexing, Slider Bed Conveyor 6'L X 30"W X 30"H
- 1 – Control Panel with PLC's for Preset Dwell Times on each Family Type
- 1 – Variable Traverse Timer
- 1 – Variable Dwell Timer
- 3 – Emergency Stop Buttons

Quantity (Below) – Gravity roller conveyor sections -

- 51" between frames
- 6" Roller centers
- 1 - 6' length of conveyor
- 1 – 10' length of conveyor
- Guard rail both sides 2" Height

Quantity 1 - Crossover Bridge – 5'H x 3'W with four steps on each side

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Quantity 1808 - Tote Tray - 24" L X 20" W X 2.5"

Quantity 9328 - Long tote tray divider insert - 1.9"H - SLOTS 11

Quantity 11,872 - Short tote tray divider insert - 1.9"H - SLOTS 14

Quantity 1 – Optional (not illustrated in sketches) – Carton Form and Bottom Glue Machine – There will be an Operator Interface Terminal (OIT). The OIT will provide the operator automatic and manual system control and messaging. Pneumatic valves will be distributed in manifold banks near the system's cylinders. Machine Guarding – Guarding will be perimeter machine guarding. The construction will be extruded frames with wire mesh panels. There will be hinged interlocked doors. Bottom Gluing length of folded carton flap.

Quantity 1 – Optional (not illustrated in sketches) – Carton Top Glue Machine. Top Gluing length of folded carton flap

Quantity 1 – Optional (illustrated in sketches) – Pallet Load Plastic Wrap Machine - Stretch Wrapper with Pallet Live Roller Conveyor

- Automatic turntable stretch wrapping machine

- Production Speed Up to 50 Loads per hour

- Automatic film cut, clamp and wipe system

- Turntable with powered roller conveyor powered roller on Infeed and exit

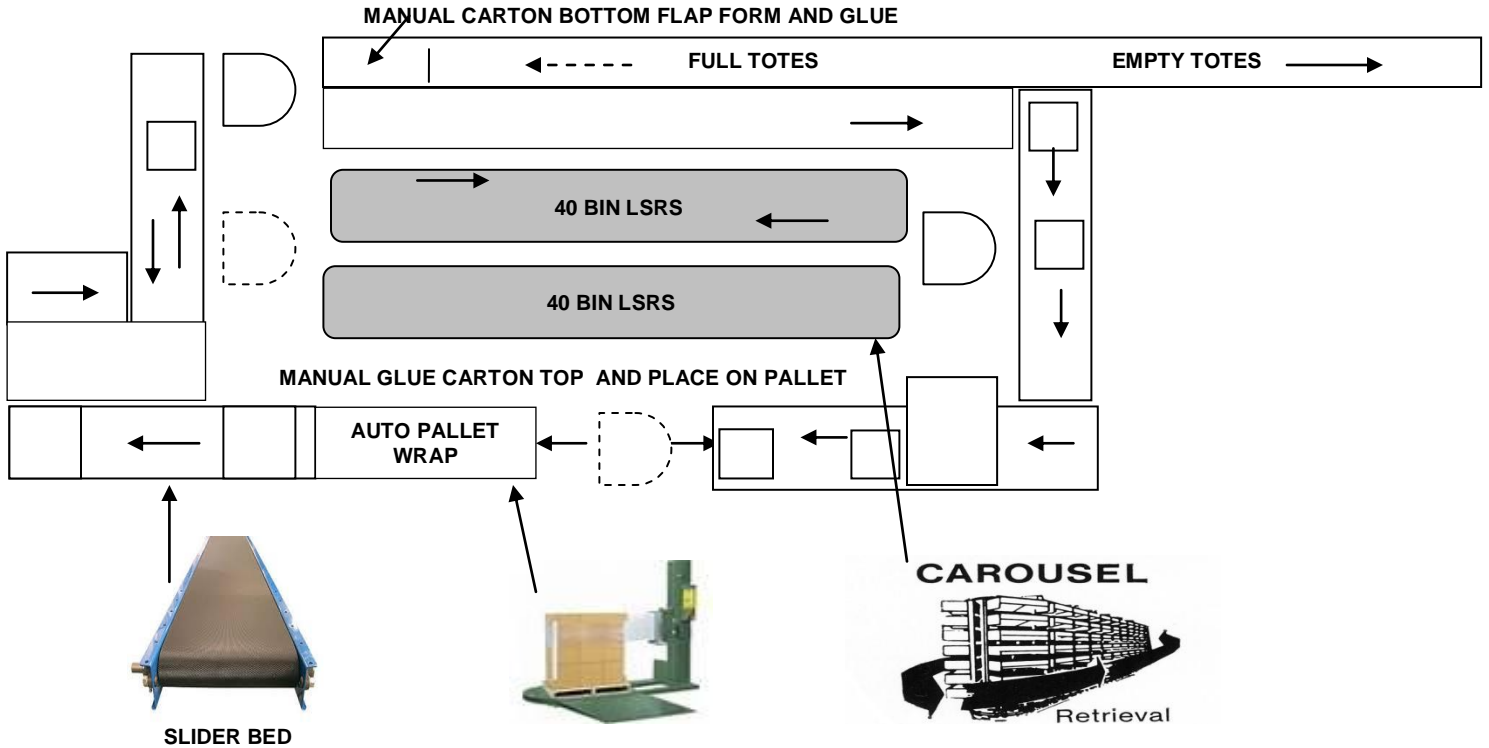
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**C. PICK SKU TO CARTON OR TOTE TRAY
SEMI-AUTOMATIC SYSTEM - EXAMPLE**

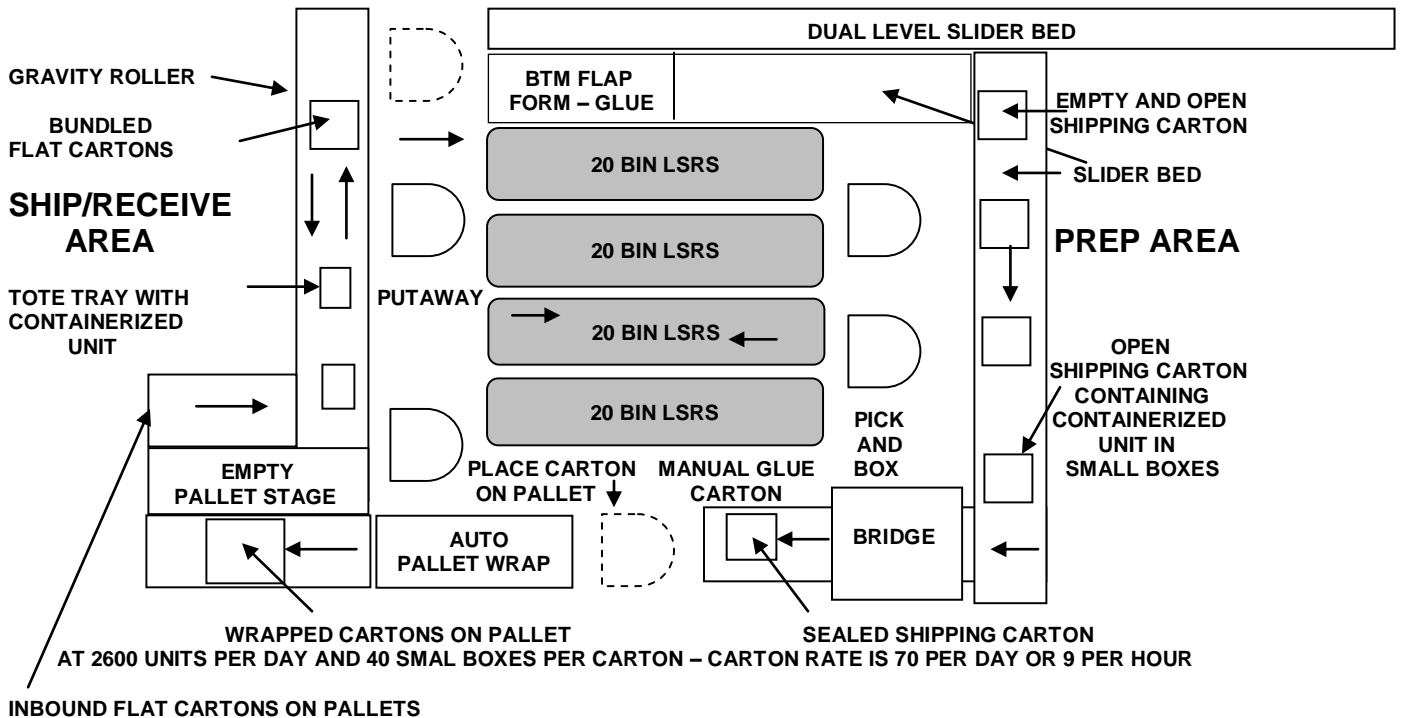
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PICK SKU TO CARTON OR TOTE TRAY SEMI-AUTOMATIC SYSTEM - EXAMPLE

**SINGLE CONTAINER PICKING CELL – EQUIPMENT
3500 PICKS PER 7.5 WORK HOURS**



**DOUBLE CONTAINER PICKING CELL - EQUIPMENT
7000 PICKS PER 7.5 WORK HOURS**

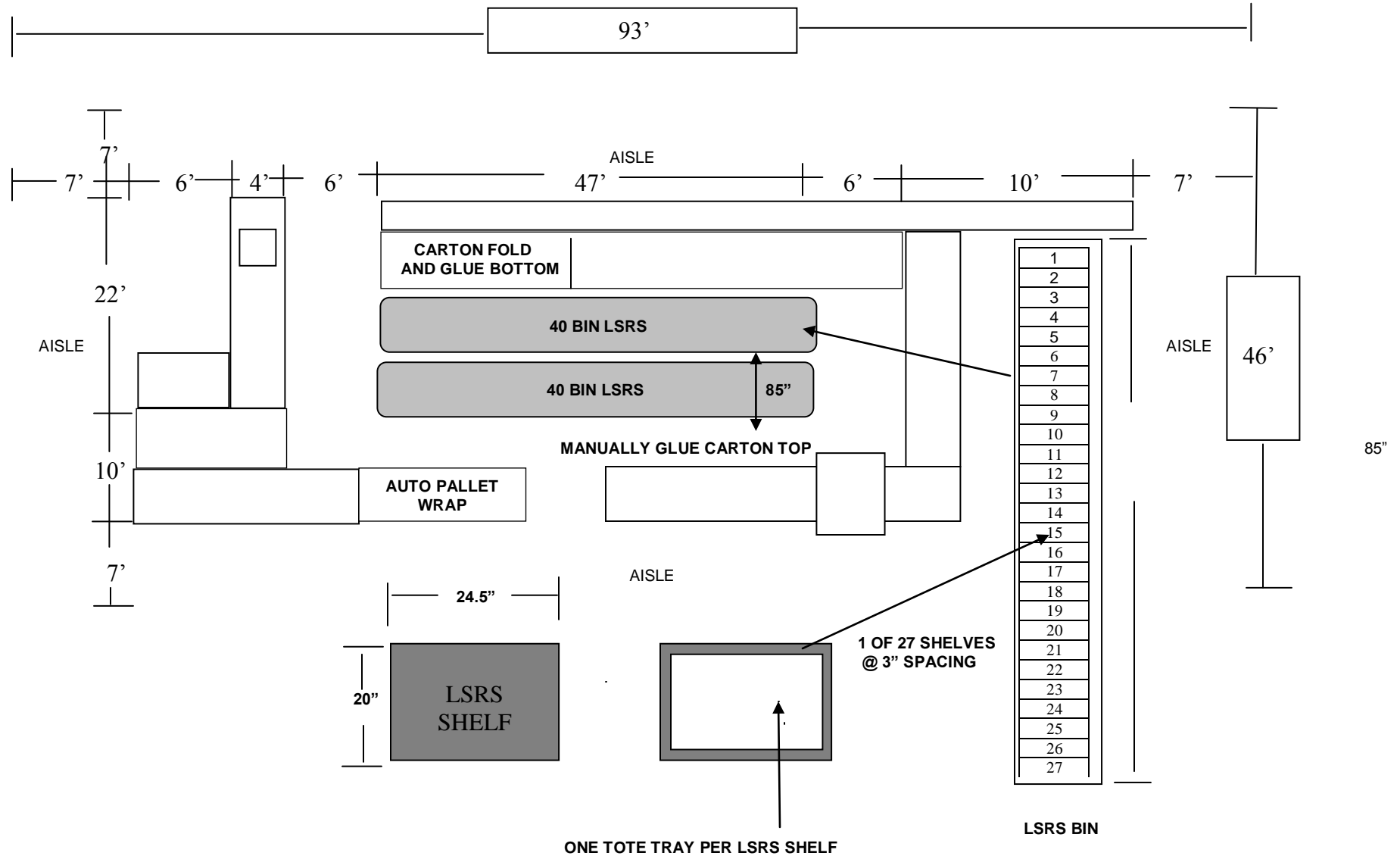


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D. SPACE REQUIREMENT – EXAMPLE

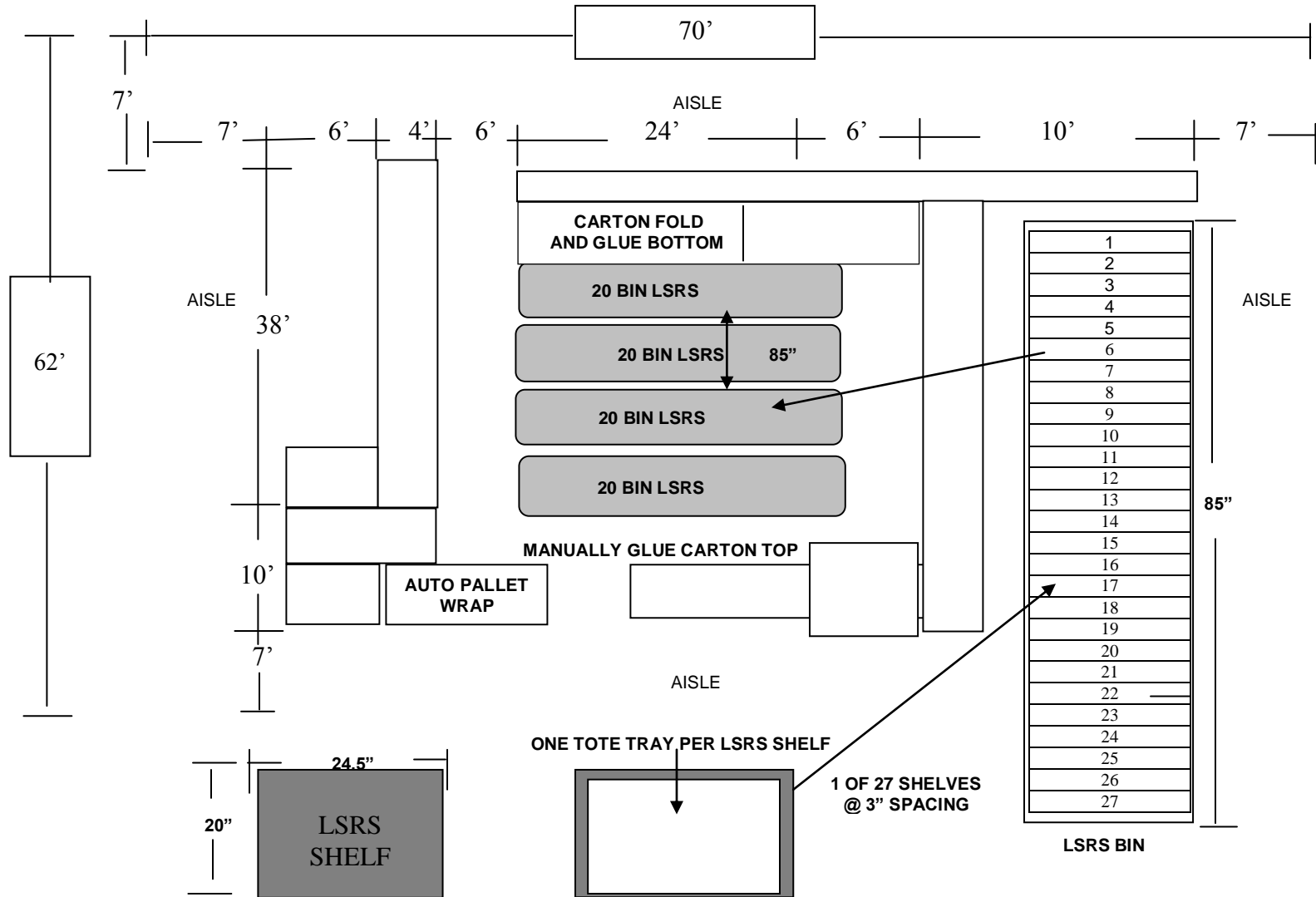
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ALTERNATIVE A - SINGLE PICKING CELL – EQUIPMENT - 93' L X 46' W = 4278 SQ FT – EXAMPLE

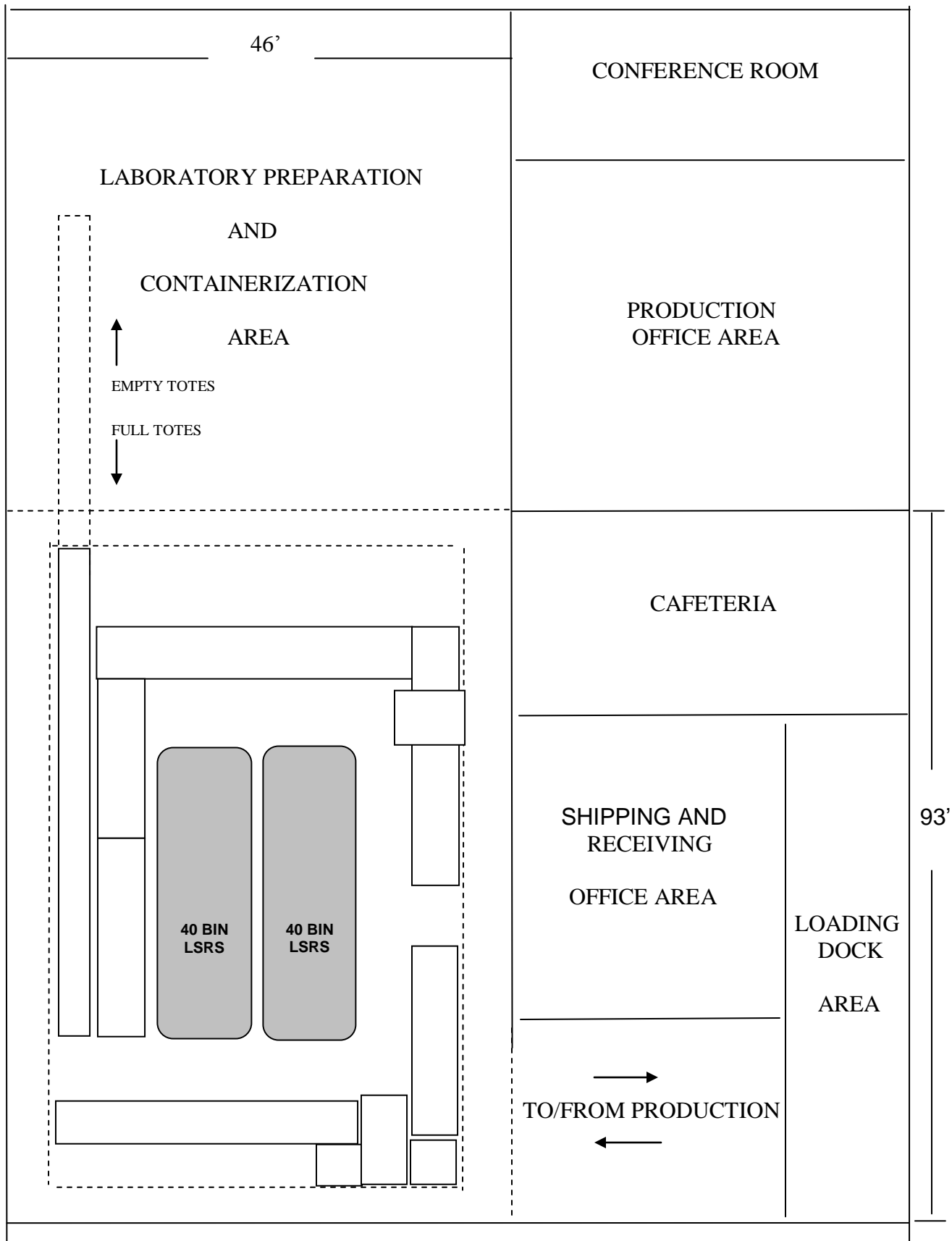


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ALTERNATIVE B - DOUBLE PICKING CELL – EQUIPMENT - 70' L X 62' W = 4340 SQ FT – EXAMPLE



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CONCEPTUAL PLANT LAYOUT – ALTERNATIVE A – EXAMPLE



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**E. PILOT FIXED
INDUSTRIAL ENGINEERING PROPOSAL**

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**INDUSTRIAL ENGINEERING PROPOSAL
SEMI-AUTOMATED MATERIALS HANDLING SYSTEM
PUT-A-WAY, PICK AND PACK SYSTEM**

**ONE FAMILY WITH REPETITIVE PICK LIST - 250 SKU (SHELVES) MAXIMUM
INVOLVING MULTIPLE PICKED CARTON OR TOTE TRAY PATTERNS**

Service Activity	Fee Per Service Activity	Number of Families	Service & Fee Selection
Work Measurement of each Family for Loading Flat Shipping Cartons into Pre Form and Bottom Gluing, Tote Tray Put-a-way to LSRS Shelf for Storage, Pick Tote Tray from LSRS Shelf and Pack into Small Box then place into Pre Formed Shipping Carton, Top Carton Gluing, Unload Sealed Shipping Carton and Place on Pallet for Plastic Wrapping.	\$1,800	1	\$1,800
Line Balance of above using variable operators to attain optimum throughput and be synchronous with daily output expectancy.	\$1,200	1	\$1,200
Final LSRS Equipment Specification and Shelf Layout by Monthly Sales Projections, Revisions to Equipment Specifications based on location of Preparation and Containerization Areas, location of Shipping and Receiving Departments as well as Support Column Spacing. LSRS Equipment Request for Fixed Cost Quotation (RFQ), Liaison with Equipment Vendors and Review of Submissions.	1,500	1	1,500
Family Final Review of Tote Tray and Divider Insert, Pick and Pack Detailed LSRS Shelf Layout	\$1,100	1	\$1,100
Work Station Visual Aids	\$1,500	1	\$1,500
Work Station and Pick and Pack Department Final Layout	\$ 600	1	\$ 600
Pick and Pack Job Code Detailed Description	\$ 600	1	\$ 600
Work Station Instructions	\$ 900	1	\$ 900
Group Leader Training	\$ 600	1	\$ 600
Written Procedure for each Family Put-a-way to LSRS Shelf for Storage then Pick from LSRS Shelf and Pack	\$800	1	\$800
On-Site LSRS System Set-up Assistance	\$1,000	1	\$1,000
On-site Pick and Pack System Installation Assistance	\$1,700	1	\$1,700
On-Site Pick and Pack System Follow-up	<u>\$1,500</u>	1	<u>\$1,500</u>
Industrial Engineering Fixed Price	\$14,800		\$14,800
Travel Expenses including Air Fare, Lodging, Car Rental to be prepaid by client. Per Diem Expenses to be billed at the conclusion of each month's activity	Travel Expenses Prepaid by Client		Travel Expenses Prepaid by Client

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Industrial Engineering Agreement

- JD Gray Associates shall submit detailed service fee invoices to company. Said invoices shall contain a detailed itemization of the date(s) on which services were provided and a description of tasks completed during the period with respect to which the invoice is submitted. On-site travel expenses to be reimbursed by company at the conclusion of each month's activity.
- Each compensation payment made by company to JD Gray Associates shall be within 10 days.
- Company Property – JD Gray Associates agrees that any confidential information furnished by company to JD Gray Associates or acquired by JD Gray Associates during the period in which JD Gray Associates is retained by company is and shall remain the sole and exclusive property of company and shall be placed in the hands of company by JD Gray Associates upon termination of this Agreement including any copies made thereof.
- Confidentiality – JD Gray Associates agrees that at no time, either during or after the period in which JD Gray Associates is retained by company shall JD Gray Associates utilize or disclose to any third party any of the confidential information of company.

Date: _____ COMPANY OFFICIAL _____ Purchase Order Number: _____

Industrial Engineering Contract Terms:

Payment Schedule

1. 20% upon approval and Purchase Order	\$2,960
2. 20% end of 1 st month	\$2,960
3. 20% end of 2 nd month	\$2,960
4. 20% end of 3 rd month	\$2,960
5. 20% upon implementation	\$2,960

If there are additional families desired to be added to our pick and pack paced conveyor industrial engineering service activity, an additional consulting fee of \$14,800 plus per diem travel expenses per family is required.

Approximate time on site is 10 workdays.

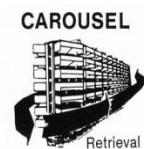
Final Case Put-a-way and Pick and Storage System (LSRS) Equipment Specifications on



Slider Bed
Conveyor



Automatic Pallet Shrink
Wrap Machine



LSRS

We guarantee savings on productivity systems (LMS, *Standards and Methods*, *Paced Assembly Production Lines*, *Industrial Incentives*, *Short-Interval-Scheduling*, *Labor Reporting* and *Semi-Automated Pick/Pack Systems*) approved by your management and installed by us.

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E. PILOT BUDGET EQUIPMENT PROPOSAL

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SINGLE OPERATOR PICKING CELL

A Configuration - 2- White 40 Bin Horizontal Carousel

Configuration	1 Pod of 2
Model Number:	WH 40
Length	47.13 feet
Width	73 inches
Height:	102 inches
Available cube	21 cu ft. per bin
Per carousel cube	848 Cu Ft
Total System Cube	1696 Cu Ft
Estimated Live Load	1000 lbs. per bin
Rated Live Load	1500 lbs. per bin
Bin Dimensions	Height-85", Width-24.6", Depth-20"
Bin Style	Galvanized Sides/Back Bins
Shelf Details	27 Shelves per bin, 2160 Total shelves
Shelf Dimensions	24.5" Wide x 22" Deep
Shelf Capacity	125 lbs. per Shelf
Shelves adjustable:	2" centers
Speed	60 FPM
Drives	Dual 1.5 HP Drives
Access Panels	2
Track Lubricator	1
Controls:	1- Motor Controller
	1- NEMA 12 Panel
	1- PLC and Cabling
Voltage Requirements:	480V/3P/60C
Photo Eyes	Front and Rear
Structure	Single Tier
Foot pedal	1 at Front and End of machine
Bin/ Shelf Location Controls	Scott Tech software
Bin Numbers	1-40 both sides of bins
Light Trees	1

A Configuration

Lewco Conveyor consisting of 1 Lot of Gravity Conveyor 24" wide and 51" wide with all necessary supports

Lewco Conveyor consisting of 1 Lot of Line Shaft Conveyor 24" wide with supports

Lewco Conveyor consisting of 1 Lot of Chain Driven Pallet conveyor 51" wide with supports

1 Lot of Photo Eyes, limit switches and controls

A Configuration Carousel Trays

1,430- 20" x 24" x 2 1/2" Trays

9,328- Long Dividers

11,872- Short Dividers

378- 20" x 24" x 4" Trays

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A Configuration- Scott tech Software package with Computers and Scanners

PicPro Software to operate 1 Pod of carousels, 1- Lot of Powered Conveyor for the Putaway operation and Pick operation. Including the flow of material from the pick operation through the stretch wrapper and staged at the end of the conveyor line. Pick Pro to keep inventory in carousels and will be interfaced to the host system to allow a seamless flow of material within the Carousel System. RF Scanners are included to track material for put away, picking and stretch wrapping.

A Configuration Total Budget Price FOB Destination

Installed and Debugged with Training \$500,000.00

DOUBLE OPERATOR PICKING CELL

B Configuration - 4-White 20 Bin Horizontal Carousels

Configuration	2 Pod of 2
Model Number	WH 20
Length	24.95 feet
Width	73 inches
Height	102 inches
Available cube	21 cu ft. per bin
Per carousel cube	424 Cu Ft
Total System Cube	1696 Cu Ft
Estimated Live Load	1000 lbs. per bin
Rated Live Load	1500 lbs. per bin
Bin Dimensions	Height-85", Width-24.6", Depth-20"
Bin Style	Galvanized Sides/Back Bins
Shelf Details	27 Shelves per bin, 684 Total Shelves
Shelf Dimensions	24.5" Wide x 22" Deep
Shelf Capacity	125 lbs. per shelf
Shelf Adjustability	2" centers
Speed	60 FPM
Drives	Dual 1.5 HP Drive
Access Panels	1
Track Lubricator	1
Controls	1- Motor Controller
	1- NEMA 12 Panel
	1- PLC and Cabling
Voltage Requirements	460V/3P/60C
Photo Eyes	Front and Rear
Structure	Single Tier
Foot Pedal	1 at Front end of machine
Bin/Shelf Location Controls	Spectrum Software with Bin Location
Bin Numbers	1-20 both sides of bins on all 4 carousels
Light Trees	1

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B Configuration Conveyor

Lewco Conveyor consisting of 1 Lot of Gravity Conveyor 24" wide and 51" wide with all necessary supports.

Lewco Conveyor consisting of 1 Lot of Line Shaft Conveyor 24" wide with all necessary supports.

Lewco Conveyor consisting of 1 Lot of Chain Driven Pallet conveyor 51" wide with all necessary supports

1 Lot of Photo Eyes, limit switches and controls

B Configuration Carousel Trays,

1,430- 20" x 24" x 2 ½" Trays

9,328- Long Dividers

11,872- Short Dividers

378- 20" x 24" x 4" Trays

B Configuration Scott tech Software Package with Computers and Scanners

PickPro Software to operate 2 Pods of carousels, 1- Lot of Powered Conveyor for the Putaway Operation And Pick Operation including the flow of material from the pick operation through the stretch wrapper and staged at the end of the conveyor line. Pick Pro to keep inventory in carousels and will be interfaced to the host system to allow a seamless flow of material within the Carousel System. RF Scanners are included to track material for put away, picking and stretch wrapping. Picking may be accomplished by Parallel or Pick and Pass methodology.

B Configuration Total Budget Price FOB Destination

Installed and Debugged with Training \$615,000.00

Delivery: 14-16 weeks ARO

Installation- 3-4 weeks after receipt of material

Sales tax has not been included in this quotation.

Terms: 40% Down with Purchase Order

40% Delivery of Material

20% Upon Completion of Job.

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G. SAVINGS, COST AND ROI – EXAMPLE

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SAVINGS

Labor Productivity

Gains up to 800% over the use of conventional shelving and racks and fork trucks are accomplished by eliminating wasted walk and search time.

Inventory Accuracy

by providing accurate and timely inventory data, both the inventory levels and shortages can be reduced dramatically

Space Reduction

the carousels recover lost floor space by achieving the same storage capacity in 30% less space than with static shelving.

Fast Payback (ROI)

Increased efficiencies allow companies to recover their investment within 12-18 months.

High Throughput

Picking rates up to 500 lines per hour, per operator allow a single worker to be as productive as eight workers picking from static shelving.

Extended cut-off times

Orders can be prioritized by computer based on shipping times and thus increases the ability to ship more orders in a day.

Improved Service to your Customers

Integrating inventory control software, light directed picking, and bar code scanning assures up to 99.9% accuracy.

Equipment Reliability

Durable and well engineered, carousels provide nearly 100% uptime.

SAVINGS SUMMARY SINGLE PICKING CELL

OPERATORS REQUIRED TO PROCESS 3500 PICKS PER 7.5 WORK HOUR SHIFT

JOB CODE	CONVENTIONAL OPERATIONS	CAROUSEL PICK WITH LIGHTTREE SOFTWARE	USING A LABOR RATE OF \$20/HR (\$15/HR + 33% FRINGE)
ITEM PUT-A-WAY	0.995	0.130	
ITEM PICK	0.536	0.130	
TOTAL	1.531	0.260	
MINUTES	5358	900	
OPERATORS	12	2	10 OPERATORS SAVED
SAVINGS		83%	\$400,000

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TYPICAL PUT-A-WAY OPERATION

WORK ELEMENT	ELEMENTAL TIME	STATUS
SCAN LABEL OF TOTE IN STAGING LANE. READ HAND COMPUTER FOR SHELF LOCATION.	.224	AUTOMATED
TRANSPORT PALLET LOAD OF TOTES TO ROOM AND SHELF LOCATION USING HAND TRUCK.	.112 EST	AUTOMATED
SCAN LABEL OF SHELF. VERIFY ITEM DESCRIPTION (TOTE ID VS HAND COMPUTER).	.254	AUTOMATED
FIND TOTE LOCATON ON SHELF. VERIFY ITEM DESCRIPTION (TOTE ID VS HAND COMPUTER). VERIFY ITEM QUANTITY.	.088	AUTOMATED
PLACE TOTE ON SHELF. FORM NEW CARTON FLAPS. TAPE TOP AND BOTTOM FLAPS OF NEW CARTON.	.130	.130 (MANUAL)
READ HAND COMPUTER FOR TOTE LOCATION IF THERE ARE TOTES REMAINING ON PALLET.	.075	AUTOMATED
SUB TOTAL	.293	.130
RETURN TO STAGING LANE	.112 EST	AUTOMATED
TOTAL	.995	.130
SAVINGS		87%

TYPICAL PICKING OPERATION

WORK ELEMENT	ELEMENTAL TIME	STATUS
READ HAND COMPUTER FOR NEW ITEM LOCATION	0.075	AUTOMATED
TRANSPORT HAND TRUCK FROM STAGING LANE	.008	AUTOMATED
SCAN LABEL OF SHELVING	0.003	AUTOMATED
SEARCH AND FIND TOTE ON SHELF	.030	AUTOMATED
VERIFY ITEM DESCRIPTION (TOTE ID VS HAND COMPUTER).	.030	AUTOMATED
VERIFY ORDER QUANTITY.	.028	AUTOMATED
REMOVE ITEM FROM SHELF AND PLACE IN SMALL BOX. PLACE SMALL BOX IN SHIPPING CARTON.	.130	.130 (MANUAL)
READ HAND COMPUTER FOR NEXT TOTE LOCATION.	.075	AUTOMATED
SUB TOTAL	.293	.130
TRANSPORT HAND TRUCK TO NEW TOTE LOCATION	.006	AUTOMATED
WRAP PLASTIC AROUND SHIPPING CARTONS ON PALLET	0.139	AUTOMATED
PRINT LABEL AND APPLY TO WRAPPED PLASTIC	0.004	AUTOMATED
TRANSPORT PALLET FROM ROOM - INCLUDES SCANNING ID OF STAGING LANE.	0.008	AUTOMATED
TOTAL	0.536	0.130
SAVINGS		72%

**JD GRAY ASSOCIATES
MANUFACTURING PRODUCTIVITY CONSULTANTS**

A RETURN-ON-INVESTMENT OF

15.4 MONTHS

9.5 MONTHS

	SINGLE CASE PICKING CELL			DOUBLE CASE PICKING CELL		
ITEM	DESC	COST	SAVINGS	DESC	COST	SAVINGS
OPERATORS	2 (1 CASE PICK + 1 PUT-A-WAY)			4 (2 CASE PICK + 2 PUT-A-WAY)		
ITEMS PICKED SHIFT OUTPUT	3500	N/A	\$400,000	7000	N/A	\$800,000
EQUIPMENT BUDGET COST	TWO 40 BIN UNITS With Slider Bed Conveyor, Tote Trays and Software	\$500,000 (INCLUDES FREIGHT AND INSTALLATION)	N/A	FOUR 20 BIN UNITS With slider Bed Conveyor, Tote Trays and Software	\$615,000 (INCLUDES FREIGHT AND INSTALLATION)	N/A
CONSULTING FEE	IE SERVICES	\$14,800	N/A	IE SERVICES	\$14,800	N/A
TOTAL		\$514,800	\$400,000		\$629,800	\$800,000