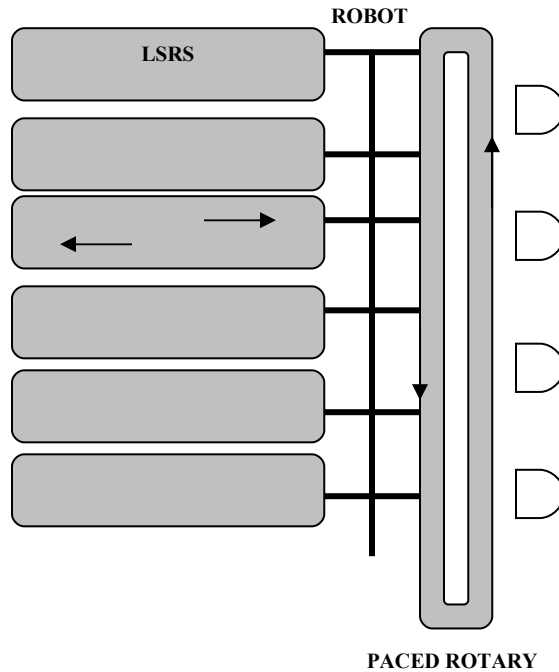


# SEMI-AUTOMATED MANUFACTURING SYSTEM PICK AND PACK SYSTEM WITH ROBOTICS

## AUTO PICKING AND REMOTE PACED PACKING CONCEPT



## INDUSTRIAL ENGINEERING PROPOSAL AND EQUIPMENT BUDGET COST

SELECT DESIRED SERVICE AND CALCULATE YOUR COST

FOR A

30% to 50% GAIN POTENTIAL

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

**Industrial Engineering Proposal**

**Semi-Automated Manufacturing System - Pick and Pack System With Robotics**

***Phase One — Indexing Paced Conveyor System***

- Phase One allows an upfront initial gain of 30%-50% before any automation takes place.
- The time-balanced Phase One System prepares for Phase Two Semi-Automation by eliminating future time bottlenecks for operations not to be mechanized.
- Our staff has time and motion, performance leveling, and split station methodology know-how developed over the processing of thousands of assemblies for the paced platform technique.

**SELECT DESIRED SERVICE AND CALCULATE YOUR COST**

Service Activity	Fee Per Family	Number of Families	Service & Fee Selection
<u>Work Measurement (G)</u>	\$1,800		\$
<u>Line Balance (G)</u>	\$1,200		\$
Final Paced Pick and Pack & Storage System (Flow Rack or LSRS) Equipment Specification/Quote (G)	\$1,100		\$
Discreet Component Part Containerization	\$1,200		\$
Discreet Component Part Container Pattern in Tote Tray	\$1,000		\$
Discreet Tote Tray Pattern in LSRS Bin or Bundled Component Part Pattern in Flow Rack Lane	\$1,500		\$
Work Station Layout (G)	\$1,800		\$
<u>Work Station Visual Aids</u>	\$1,500		\$
Paced System Work Station Fixtures/Tooling	\$ 600		\$
Paced System Work Station Bill of Material	\$ 600		\$
Paced System Work Station Instructions	\$ 900		\$
Group Leader Training (G)	\$ 600		\$
Storage and Paced System Set-up	\$1,000		\$
Storage and Paced System Installation (G)	\$1,700		\$
Storage and Paced System Follow-up (G)	\$1,500		\$
Industrial Engineering Fixed Price	\$18,000		\$
(G) Required for Guaranteed First-Year Payoff	(\$9,700)		\$
Expenses - Travel and Per Diem for Three Weeks Onsite Data Collection	\$4,500 (USA)		\$
Expenses – Travel and Per Diem for Three Weeks Onsite System Installation	\$4,500 (USA)		\$
Industrial Engineering and Expenses			\$

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**EQUIPMENT COMPONENTS AND BUDGET COST**

**TOTE FLOW RACK** – Three sections. Two tote tray section comprising of four tiers of ten 50'L X 24" W gravity roller containing 1000 totes or a two-hour WIP supply. Total of 40 lanes each equipped with a lighttree visual and scheduling programming devices as well as a braking system in each lane – Installed \$125,000. One pallet section comprising of two tiers of one 50'L X 48"W breaking gravity roller – Installed \$25,000.

**SYNCHRONOUS PRECISION INDEXING CONVEYOR** – Fixtures mounted to hold formed carton in an upright position. Standard Linear or Rotary Conveyor Model 2424, 12' 6" OL, 18 pallets, three operator with four supports. Standard options include variable speed indexing, fluorescent lighting fixtures, and electrical outlets beneath pallet, upper supports to support lighting fixtures, pneumatic quick disconnect with air piping, tool tray railing, and overhead rail with trolleys. Standard Precision Pallet Locating System. One shot pin locating device and 18 pallet shot pin blocks - Installed \$55,000

**AUTO BOX** – Fully automatic case former with hot melt glue bottom case sealer. Hot melt glue top case sealer. Top and bottom pressure sensitive case taper. Intermediate case-transport powered conveyors. Carton feed magazine. PLC controlled – Installed \$150,000

**PICK AND PLACE ROBOT** – Multi-axis-servo, multi-end-effector, conveyor synchronous unloader – Installed - \$150,000

**LIVE STORAGE AND RETRIEVAL CAROUSEL** – Top drive carousel for standard and light duty applications controls using a footswitch. Fifty-six bin unit, 20 inch bin depth, 85 inch bin height and 24.5 inch bin width, with adjustable dust free wire shelves on varying spacing, overall bin height including single yoke is 104.15 inches, shelf rating of 75 lbs, shelf spacing six inch standard. Each bin includes lighttree visual and scheduling programming devices. – Two Installed Units - \$170,000

**INSERT AND EXTRACT ROBOT** - Parallel jaw gripper, variable servo-controlled gripper clamping pressure, precision linear bearings on gripper clamp and reach axis, all electric operation, spring-set platform holding brake, chain break sensors and catch brakes on masts, over-speed sensor, path-clear sensors, automatic chain take-up, powder coat finish, stainless steel bed and software controls – Two Installed Units - \$220,000

**TOTE TRAYS** – Used in both LSRS and robotic phases. Insert and extract robots require rigid and identical dimensional boxes for high thru put removal – two thousand totes - \$50,000. **TRAY INSERTS** – Used only during the fully automation phase. Partitions to keep counted and stacked containers upright for pick and place robot removal – two thousand inserts - \$10,000

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**HORIZONTAL CAROUSEL (LSRS)**

An automated storage and retrieval device consisting of a series of shelving sections (bins) mounted on a horizontal, closed-loop oval track. When activated, the bins rotate to bring requested items to the operator or automated picker.

**Bottom Drive Carousel**

Bottom drive carousels are horizontal carousels engineered for larger live loads and heavier duty cycles.

**Twin Bin Carousel**

Twin bin horizontal carousels are suited for small part picking applications requiring higher density, selectivity and throughput.

**Top Drive Carousel**

Top drive horizontal carousels are designed for standard and light duty applications.

**Pallet Carousel**

Pallet horizontal carousels store heavy-duty pallets for picking, buffering, and building split-pallet loads.

**SAVINGS**

**Labor Productivity**

*Gains up to 800% over the use of conventional shelving and racks 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*.

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**PACED SYSTEM WITH ROBOTICS EQUIPMENT AND ATTENDANT  
INDUSTRIAL ENGINEERING SERVICES**

- Will customize (time study, line balance, work station instructions/tools/layout/visual aids/parts, training, implementation) your products to a semi-automated assembly line technique. JD Gray Associates requires four families (minimum number for contract) of different build sequences to prepare and cost our industrial engineering service proposal. Please feel free to use your most labor intensive families.
- Our proposed semi-automated pick and pack paced conveyor - will incorporate the labor savings or output gain of our standards and methods program, our paced system and our semi-automated cells dependent on what level of labor controls you now have in-place. In addition to the preliminary conveyor equipment specification supplied, we will need your input regarding future products and their respective shift output to ensure the conveyor system is sized correctly and that there are sufficient in-line workstations to meet your throughput parameters. The final equipment conveyor configuration will be based on your answers to these and other questions as well as future on-site work measurement observations.
- Typical operation of a Pick and Pack Paced Line with Robotics system - supervisor plots setting on variable dwell timer for the length of time the pallet is to remain in a stationery position before indexing to the next station...this is the station control time we would develop during the line balancing segment of our proposal. The entire chain-driven string of 18 pallets will index automatically (eliminating manual movement of assembly from one station to another) approximately 24 inches at the same time at a speed of one foot per minute...then remain stationery for the time set on the variable dwell timer which will create a pace for the six operators to finish their respective work task before a chime goes off indicating the dwell time has been depleted and signaling the next automatic index.
- We will develop a work task for each operator as well as instruction sheets and visual aids. There will be overhead lighting mounted to the conveyor system, a tool rail running the entire length of each side of the rotary conveyor and electrical/pneumatic outlets spaced at intervals servicing each of the six operators. The variable speed-indexing feature adjusts traverse timing depending on pallet width. Work cell automation has been addressed by the addition of a precision pallet locating system. Robotic insertion could be used to gather or attach mechanical fasteners (i.e. staple, strap etc.) or add/remove the assembly to/from the pallet. Customer provides actual robot and fixtures. Our equipment manufacturer has fixture and robot fabrication capabilities as well as PLC programming and if increasing the number of workstations at a future date is desired, they will expand the conveyor to whatever number of pallets required.

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

**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 billed separately.
- 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: \_\_\_\_\_

Contract Terms:

Payment Schedule

1. 20% upon approval and Purchase Order	\$
2. 20% end of 1 <sup>st</sup> month	\$
3. 20% end of 2 <sup>nd</sup> month	\$
<b>4.</b> 20% end of 3 <sup>rd</sup> month	\$
5. 20% upon implementation	\$

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 \$18,000 plus travel expenses per family is required.

Requires pre fabricated assembled product. We will submit our semi-automatic, precision indexing, paced assembly conveyor system industrial engineering and equipment proposal upon request.

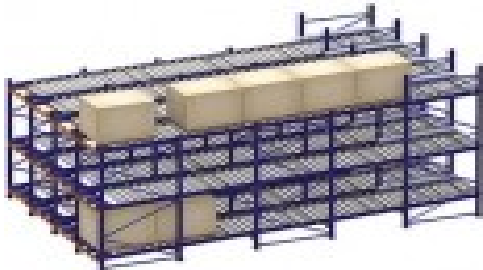
**Phase Two — Semi-Automated Work Cells**

- Phase Two includes custom robot design and fabrication, programming, and electrical and mechanical installation.
- The shot pin platform-locating device under the cell to be mechanized permits gradual Phase Two semi-automation and cost. Product mechanization leads to an additional 30%-35% savings
- To be performed under separate agreement upon completion of Phase One

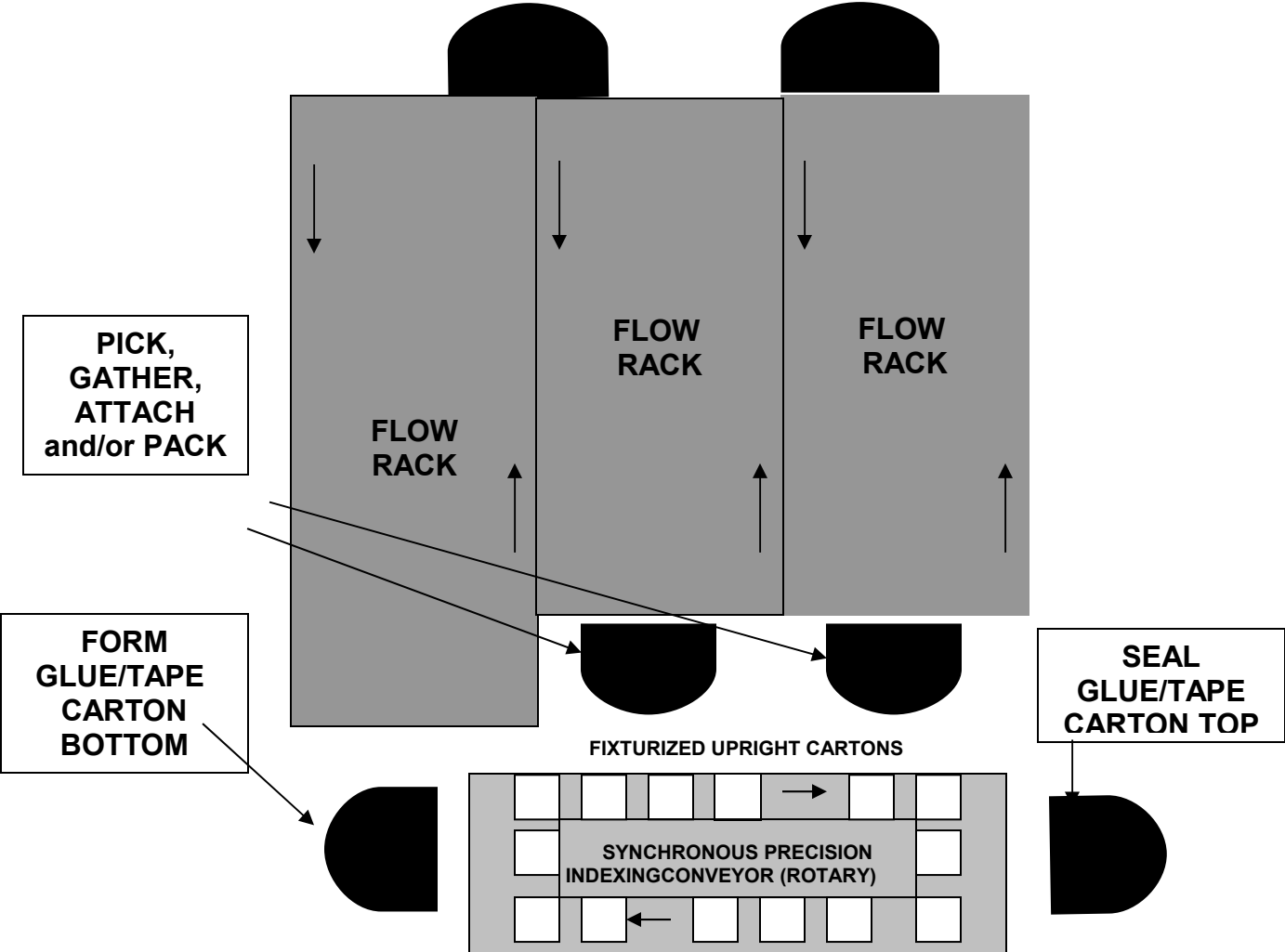
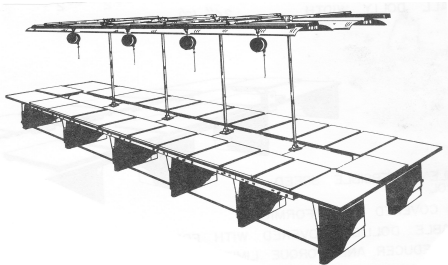
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**PACING PACKAGING CONCEPT USING FLOW RACK FOR 2-HOUR W-I-P**

**FLOW RACK**



**SYNCHRONOUS PRECISION INDEXING CONVEYOR**



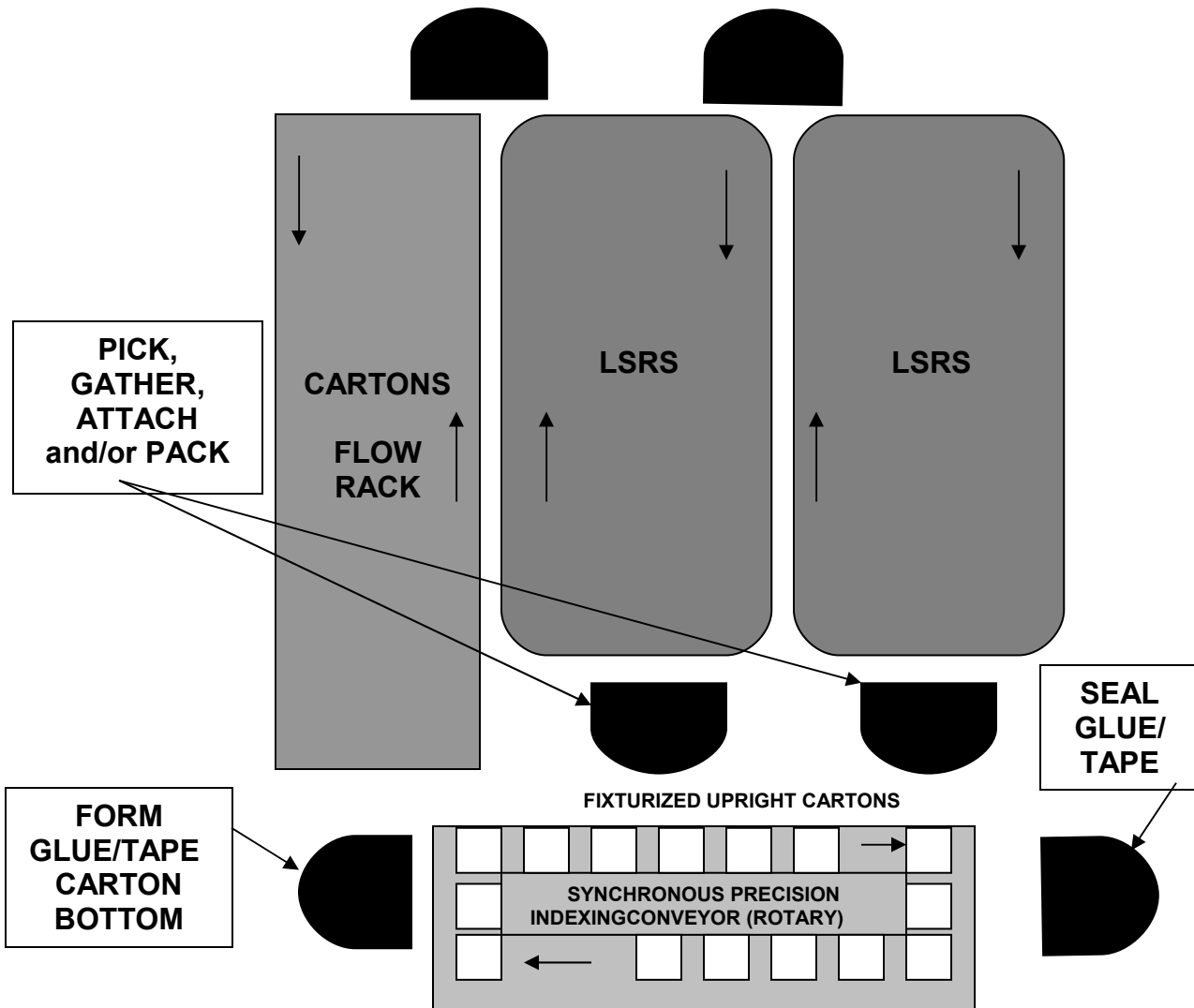
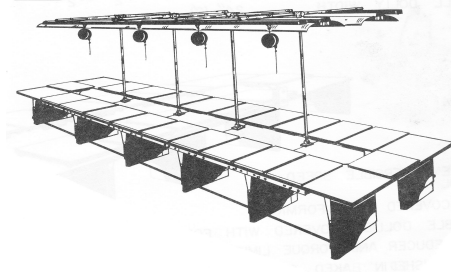
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**SEMI AUTOMATION PACING PACKAGING CONCEPT USING LSRS FOR 2-HOUR  
W-I-P**

**LIVE STORAGE AND RETRIEVAL SYSTEM**



**SYNCHRONOUS PRECISION INDEXING CONVEYOR**

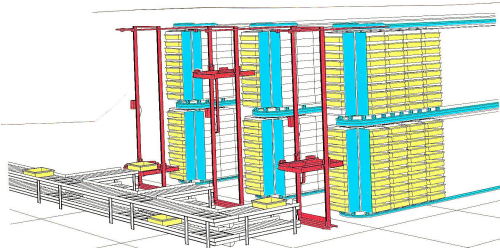




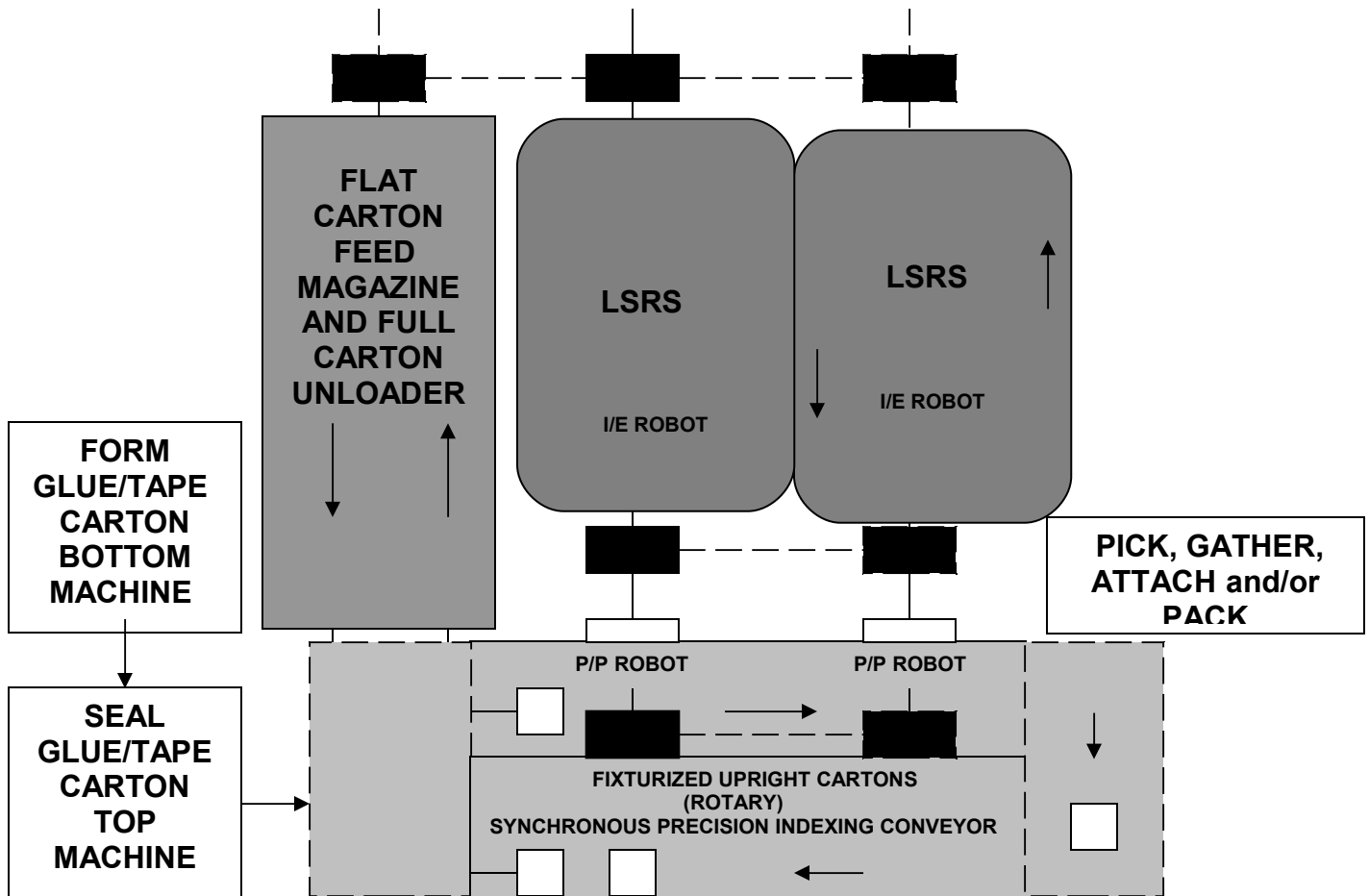
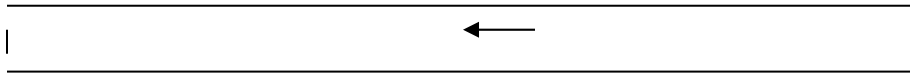
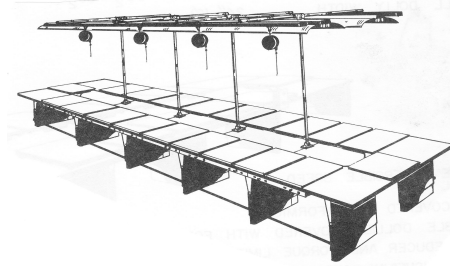
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**AUTOMATION PACING PACKAGING CONCEPT USING LSRS FOR 2-HOUR W-I-P**

**INSERT/EXTRACT ROBOTS**  
*Horizontal carousels + I/E robots*



**SYNCHRONOUS PRECISION INDEXING CONVEYOR**



CLICK ON THE RED LINK FOR OUR COVER STORY [ARTICLE](#) ENTITLED  
"YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE"  
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