

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

**SEMI-AUTOMATIC PACK AND PALLETIZE**

**INDUSTRIAL ENGINEERING**

**AND**

**EQUIPMENT BUDGET COST FOR PHASE ONE**

**WITH**

**CONCEPTUAL EQUIPMENT**

**FOR**

**PHASE TWO AND THREE**

**JD GRAY ASSOCIATES  
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**PACED PACK AND PALLETIZE**

**INDUSTRIAL ENGINEERING SERVICES**

- Will customize (time study, line balance, work station instructions/tools/layout/visual aids/parts, training, implementation) products to a semi-automated PACK AND PALLETIZE paced assembly line technique.
- Our proposed semi-automated assembly conveyor - will incorporate the labor savings or output gain of our standards and methods program (15%), our paced assembly system (10%-25%) and our semi-automated cells (30%-35%) and our semi-automated materials handling systems (5-10%).
- Phase One - Typical operation of a Paced Pack and Palletize Line - 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 from one station to another) approximately 48 inches at the same time at a speed of one foot per second...then remain stationery for the time set on the variable dwell timer which will create a pace for the eight 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. This proposal only addresses Phase One.
- Future Phase Two work cell automation has been addressed by the addition of a precision pallet locating system. Robotic insertion could be used to insert components or add/remove product to/from the carton or packaging area. 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. A future Phase Three would semi-automate the materials handling of components from the stockroom as well as the packaged product to finished goods.

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Industrial Engineering Proposal

**Semi-Automated Manufacturing System  
Paced Pack and Palletize With Robotics**

**Phase One — Indexing Paced Packaging Conveyor System (See Red Items on Layout for Phase One)**

- Phase One allows an [upfront initial gain of 25%-40%](#) 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.

Service Activity	Fee Per Family	Number of Families	Service & Fee Selection
<a href="#">Work Measurement (G)</a>	\$1,800		
<a href="#">Line Balance (G)</a>	\$1,200		
Final Paced Unpack/Repack Equipment Specification/Quote (G)	\$ 900		
Component Part Containerization	\$1,200		
Work Station Layout (G)	\$1,800		
<a href="#">Work Station Visual Aids</a>	\$1,500		
Work Station Fixtures/Tooling	\$ 600		
Work Station Bill of Material	\$ 600		
Work Station Instructions	\$ 900		
Group Leader Training (G)	\$ 600		
Paced System Set-up	\$ 900		
Paced System Installation (G)	\$1,500		
Paced System Follow-up (G)	\$1,500		
Industrial Engineering Fixed Price	\$15,000		
(G) Required for Guaranteed First-Year Payoff			
Expenses - Travel and Per Diem for One Week Onsite Data Collection	\$1,500 USA		
Expenses – Travel and Per Diem for One Week Onsite System Installation	\$1,500 USA		
Industrial Engineering and Expenses	\$18,000		

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Payment Schedule

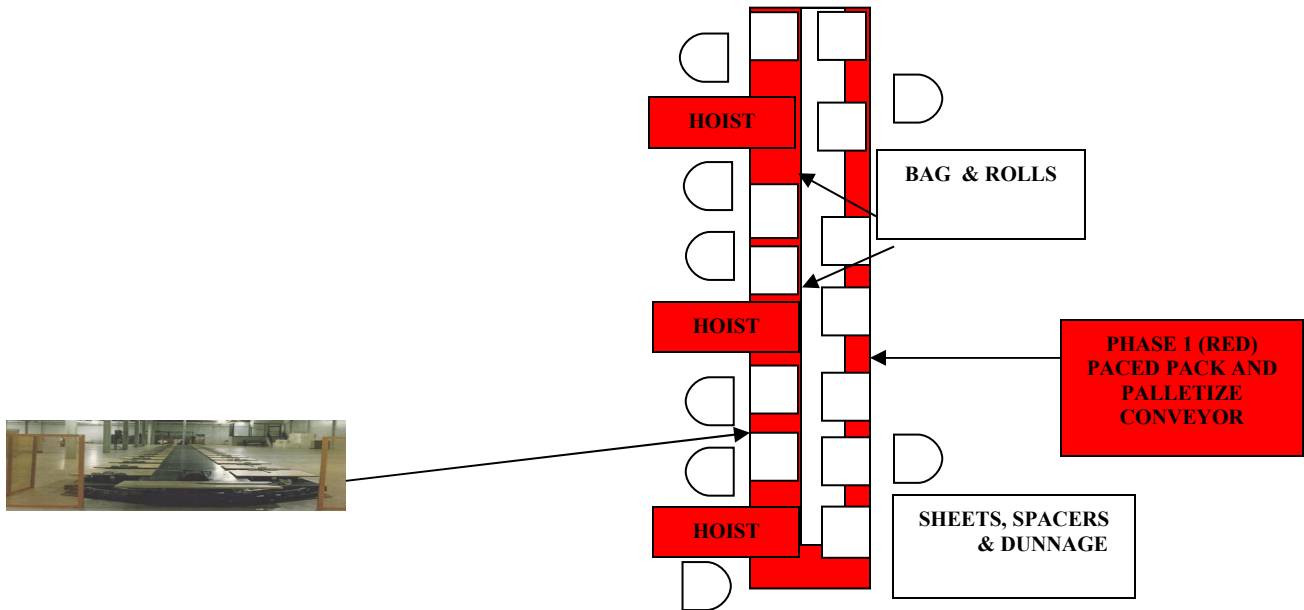
- |  |    |
|--|----|
| 1. 20% upon approval and Purchase Order Assignment | \$ |
| 2. 20% end of 1 <sup>st</sup> month                | \$ |
| 3. 20% end of 2 <sup>nd</sup> month                | \$ |
| 4. 20% end of 3 <sup>rd</sup> month                | \$ |
| 5. 20% upon implementation          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

Quotation Number 1806

Pricing includes all on-site travel expenses.

In order to proceed a Purchase Order is required from your company.

If there are additional families desired to be added to our assembly conveyor industrial engineering service activity, an additional consulting fee of \$18,000 per family is required.



**PACED PACK AND PALLETIZE CONVEYOR EQUIPMENT** – Pack into cases and then into a final shipping crate or box that includes loading, inspection and pallet strapping. Heavy Duty Packaging Conveyor Model 4848, 35' 6" OL, 20" H, 18 pallets, 6 pallets/side (3 pallets on each end), Variable Dwell time, 3 operator/side with 4 supports...\$120,037. Quotation No: 1807

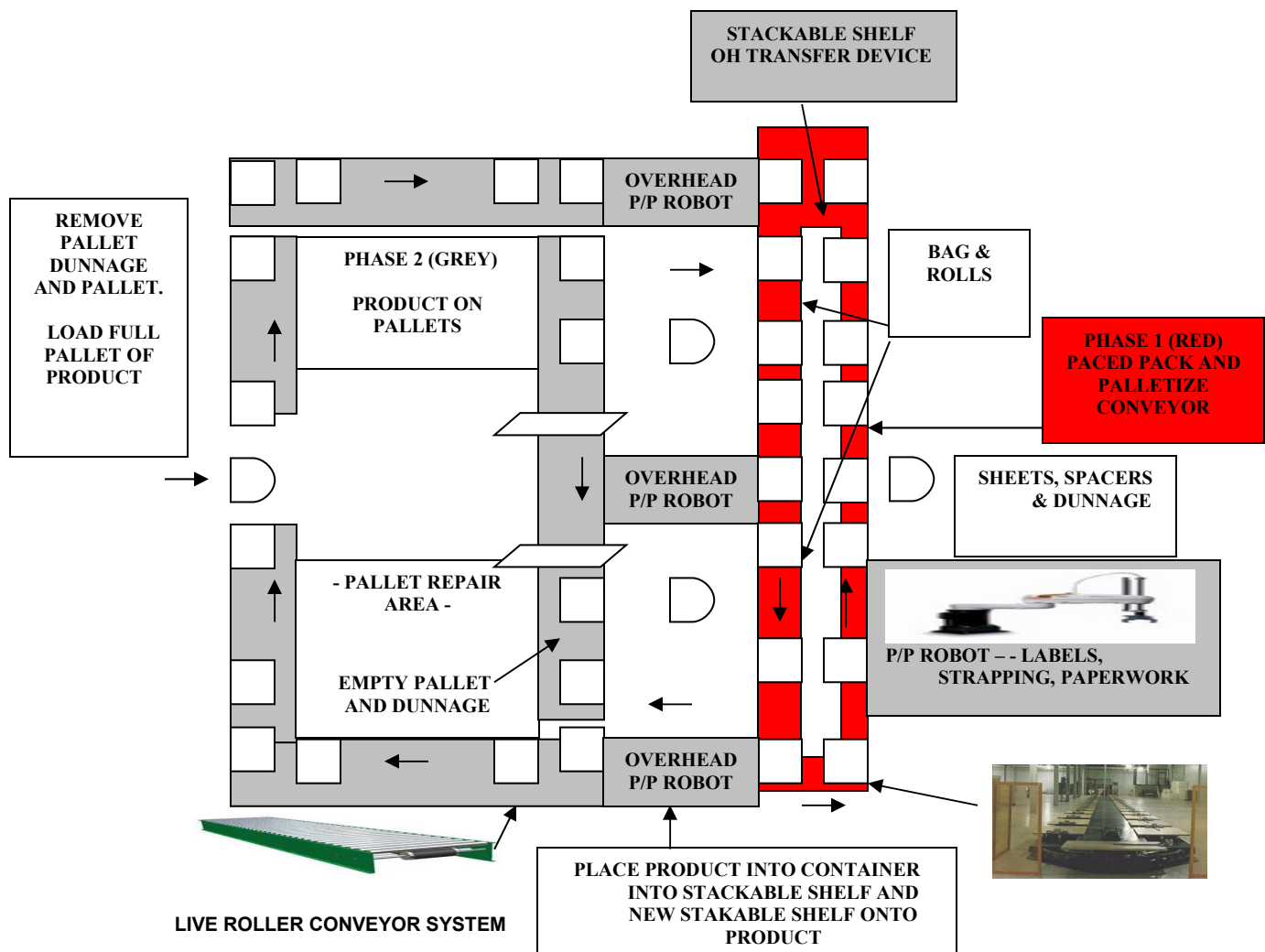
Heavy Duty Rotary Options. Variable speed indexing, fluorescent lighting fixtures, electrical outlets beneath pallet for six operators, upper supports to support lighting fixtures, pneumatic quick disconnect with air piping for six operators, tool tray railing, overhead rail with trolleys for six operators...\$15,188. Quotation No: 1808

Heavy Duty Rotary Precision Pallet Locating System (for future Phase Two in-line work cell robotics) for One Work Cell. 1 shot pin locating device and 18 pallet shot pin blocks... \$13,796. Quotation No: 1809

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**Phase Two — Semi-Automated Work Cells (See Grey Items on Layout for Conceptual Phase Two)**

- Phase Two includes custom Pick/Place Robot design and fabrication, programming, 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.
- Includes complete final equipment specifications and RFQ's, work station time rebalance balance, visual aids and task instructions, robotic station leveling, training and installation to ensure attainment of maximum benefits and return-on-investment.
- Product mechanization leads to an additional 30-35% savings.
- The Phase Two proposal will be presented under separate cover at the conclusion of Phase One.

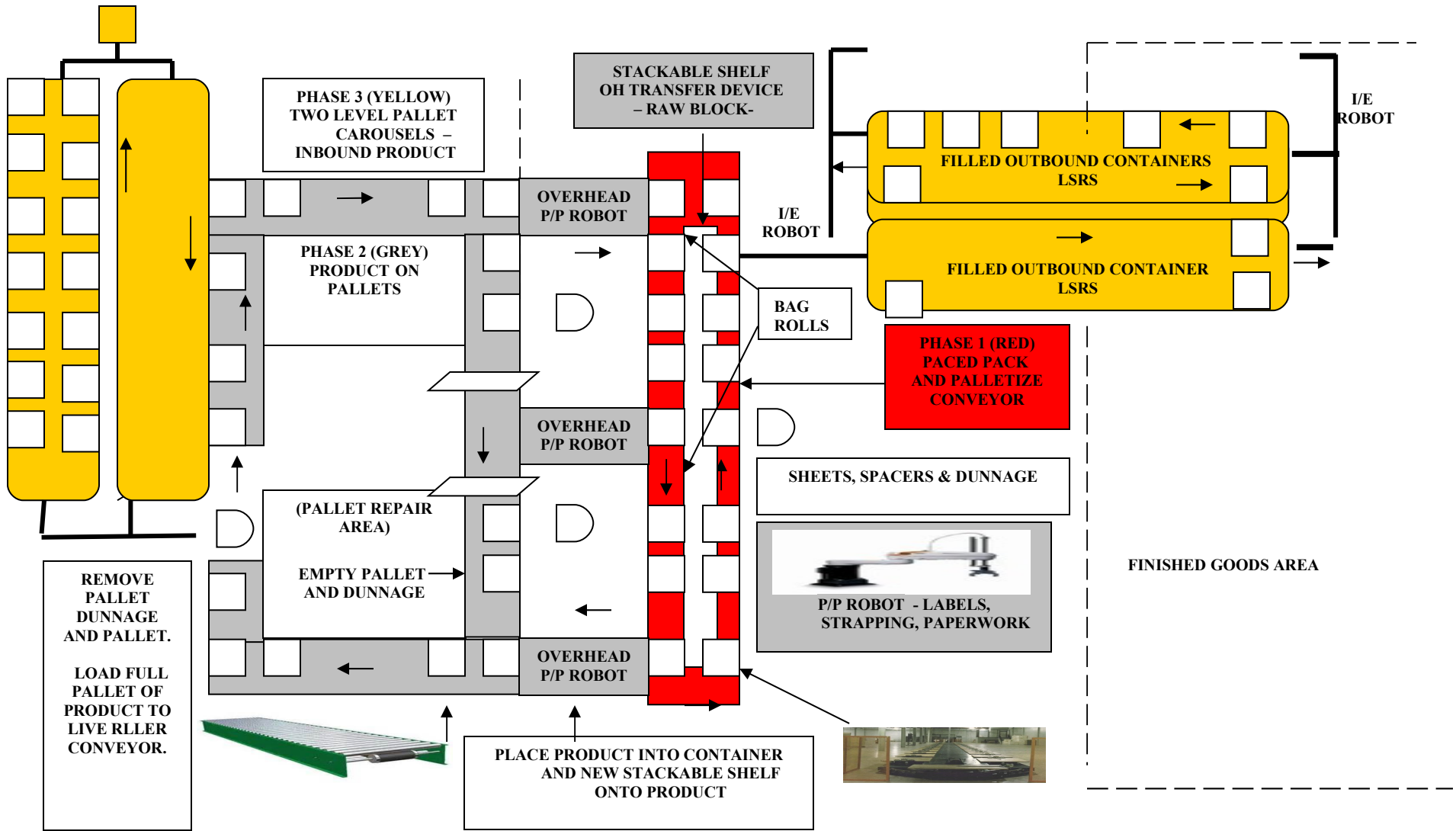


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***Phase Three – Semi-Automated Materials Handling (See Yellow Items on Layout for Conceptual Phase Three)***

- Phase Three includes Live Storage and Retrieval Carousel and Insert/Extract Robot sizing, design and fabrication, programming, electrical and mechanical installation.
  
- Includes complete final equipment specifications and RFQ's, pallet carousel part patterns, pallet carousel routing sheets and picking lists, traffic and station leveling, training and installation to ensure attainment of maximum benefits and return-on-investment.
  
- Materials Handling mechanization leads to an additional 5 to 10% savings.
  
- The Phase Three proposal will be presented under separate cover at the conclusion of Phase Two.

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**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 \_\_\_\_\_

Date \_\_\_\_\_

Purchase Order No \_\_\_\_\_

\_\_\_\_\_  
(signature)

\_\_\_\_\_  
(signature)

COMPANY

JD GRAY ASSOCIATES