

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

## **Questionnaire**

### **Can your existing car transmission or engine assembly methodology be improved?**

Transmission or engine companies or other manufacturers of large and heavy assemblies that are interested in increasing output and/or decreasing unit cost, should answer these questions regarding their existing primary materials handling system:

- Are the in-process engines without a rotating holding fixture and moved by a
  - \* Live roller conveyor and affixed to crate bottoms
  - \* Slider bed conveyor
  - \* Chain-driven wooden pallet conveyor
  - \* Chain-driven steel pallet conveyor
  
- Are the in-process transmissions or engines with a rotating holding fixture
  - \* On a stationary cart
  - \* Transported manually on a castered cart
  - \* Transported manually by tow-line on a castered cart
  - \* Transported automatically by tow-line on a railed cart
  - \* Transported automatically by chain-driven wooden pallet conveyor
  - \* Transported automatically by chain-driven steel pallet conveyor
  
- Is the existing conveyor system capable of in-line work cell automation, that is to say does the transmission or engine have to be removed from the primary materials handling system for robotic assembly/test or can robotic assembly/test be performed while the engine is on the primary materials handling system? Conveyors capable of in-line automation must run using an index and dwell mode and not run continuously. The chain driven pallets must have precision pallet locating blocks and the work cell to be mechanized must have a precision pallet locating system. The conveyor pallet with a precision locating system is the table for robotic assembly. A rotating assembly fixture creates optimum worker ergonomics. Only well supported steel pallets are capable of heavy weights. If the existing primary materials handling system utilizes chain driven pallets are they synchronous or asynchronous? Only synchronous conveyors create a worker pace.
  
- Are the existing work stations line balanced, that is to say does each station have approximately the same time to perform their work tasks or within 5% of the control station (longest time)? If a synchronous conveyor system, is the control station time set on a timer and does the entire transmission or engine conveyor system run in accordance to that time setting creating a pace for all engine assembly workers?